

Seedlings of some tropical trees and shrubs mainly of South East Asia

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Centre for Agricultural Publishing and Documentation, Wageningen, 1972

ISA-303522

ISBN 90 220 0416 3

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Printed in Belgium

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Preface

Knowledge about seedlings often provides information for scientific taxonomic knowledge, and, besides, forestry needs the ability to identify seedlings of trees and several other plants.

This work is an attempt to make methodical descriptions and illustrations of seedlings of a number of tropical trees and a few subherbaceous plants in south-east Asia, from which the author hopes that both tropical botany and tropical silviculture may profit, especially forestry in Java for which the work was primarily designed.

In 1921 the Forest Research Institute in Bogor, Indonesia, commissioned the author to draft a description of the seedlings of trees and some other plants which were important to silviculture in Java at that time. Consequently some species were selected which do not occur naturally in Java. A list of 188 relevant species was made up before the beginning of the work. All these species have been treated in this book. The seedlings were grown in the garden of the Forest Research Institute in Bogor. One of them, however, could not be grown there, so the description was taken from the book of R. S. TROUP, 'Silviculture of Indian Trees', 1921. Some others had already been described by TROUP in the same publication or by J. LUBBOCK in his 'On Seedlings', 1892. The author made new descriptions of these species too.

Drawings were made of the 187 species grown and described in Bogor, but by 1967 some plates had disappeared.

All the species are alphabetically arranged in Chapter VI according to family, genus and species. This sequence was chosen on the advice of PROF. DR C. G. G. J. VAN STEENIS, Rijksherbarium, Leiden, The Netherlands.

The descriptions of families and genera, and the keys, refer only to species treated in this book.

The basic material was obtained from:

1. numbered trees in the Government Botanical Garden in Bogor.
2. numbered trees in the Government Agricultural Garden in Bogor,
3. numbered trees of the Forest Research Institute, Bogor, in several forest districts in Java,
4. collections in Javanese forests by the Government Forest Service in Java,
5. the Forest Research Institute in Dehra Dun, India,
6. collections in Java by the author.

Most of the material from Java has been collected as green living twigs with ripe fruit on them. This fresh material was packed in baskets and forwarded immediately to the author's laboratory at the Forest Research Institute, Bogor.

Nearly every dispatch was identified, in fresh condition, at the Herbarium of the Government Botanical Garden in Bogor. The voucher-specimens were preserved at the Herbarium of the Forest Research Institute in Bogor.

Most of the numbered trees in Java had previously been identified using flowering twigs in sicco.

First, the descriptions of the seedlings were made and then the drawings produced, using the fresh material.

Descriptions and drawings were made at two stages of development: when the seedling was very young and when the plant was showing approximately normal leaves. In the original manuscript, a description was also given of the vegetative characters of the adult plant as a third stage of development. A comprehensive description of this third stage, written in Dutch, was taken from KOORDERS AND VALETON (s. Chapter V. Literature). However, when the manuscript was now being prepared for printing, these extensive descriptions of the third stage were omitted.

The manuscript was ready for print in Dutch in 1924 but its printing was postponed indefinitely. In 1967–1971, however, it was taken up again and translated into English. The Glossary and Outline (Chapters I and II) were revised in these years; for the botanical names the book of C. A. BACKER and R. C. BAKHUIZEN VAN DEN BRINK JR., 'Flora of Java', 1963–1968, was used. Some synonyms were taken from KOORDERS and VALETON.

The Indonesian names have been taken from literature: HEYNE, KOORDERS AND VALETON, etc. (s. Chapter V. Literature)¹.

Acknowledgements

The author wishes to express his sincere gratitude to: Mr P.M.W. DAKKUS, Hortulanus of the Government Botanical Garden, Bogor, and Mr VAN HELTEN, Director of the Government Agricultural Garden, Bogor, both of whom were kind enough to consent to the collecting of material in their gardens;

the Forest Conservators and their staff of the Government Forest Service who made the greater part of the study possible by collecting and forwarding material;

Dr C.A. BACKER and Dr J.G. BEUMÉE, Government Herbarium, Bogor, for personally identifying more than three thousand dispatches immediately after arrival;

PROF. DR C. C. BERG, University, Leiden, The Netherlands, for giving advice on the present use of published Indonesian names;

DR F. H. ENDERT, Forest Research Institute, Bogor, for personally identifying some dispatches immediately after arrival;

PROF. IR I. A. DE HULSTER, Agricultural University, Wageningen, The Netherlands, for his lively interest, and his advice on the printing and publishing;

PROF. DR C. G. G. J. VAN STEENIS and DR M. JACOBS, Rijksherbarium, Leiden, for

¹ Many more Indonesian names have been collected and published in recent years by the Forest Research Institute at Bogor. They are not mentioned in this book.

tracing the drawings belonging to the manuscript, for their lively interest in the work and for having been kind enough to study the manuscript in the years 1970 and 1971 and to give suggestions for the translation;

IR SUDIARTO, Director of the Forest Research Institute, Bogor, for agreeing to put the drawings at his disposal;

Mr KADIS, Mr MASUD, Mr WIRJO and Mr MANGUNDIMEDJO, Bogor, for preparing the drawings according to the author's directions;

Mr H.G.L. WIEKHART, Photolitho Institution Koningsveld, Leiden, for advising on the use of the drawings for reproduction;

Miss A.A.E. BURGER, Zeist, The Netherlands, for carefully keeping the Dutch manuscript whilst the author was still working in the tropics;

Mrs. G. BURGER, for all her generous assistance;

the Board of the Fonds Landbouw Exportbureau (L.E.B.-fonds) and the Centre for Agricultural Publishing and Documentation (Pudoc), Wageningen, for their willingness to publish the book.

The author considers himself fortunate that the research on seedlings of tropical trees of south-east Asia is being continued at Bogor, and appreciates having been able to give some advice on this matter to Mr E.F. DE VOGEL, Rijksherbarium, Leiden, who in 1971 set off to Bogor to take part in the research.

October, 1972.

Wassenaar, The Netherlands.
Santhorstlaan 64.

Dr D. BURGER HZN.

Translated from the Dutch by the author, Mrs. G. BURGER and Mrs. S. FESTING.

I Glossary^{1, 2}

abaxial, on side away from axis.

aberrant, different from usual structure, departing from the type; *aberration*, non-typical structure.

abruptly acuminate, with drawn out point on broad extremity; *abruptly pinnate* (*paripinnate*), pinnate ending with a pair of leaflets.

acaulescent, becoming stemless.

acicular, s. *needle-shaped*.

acileate, s. *prickly*.

acuminate, with drawn out top (with concave sides); *-acute*, with drawn out acute top; *-obtuse*, with drawn out blunt top.

acute, with sharp top.

adaxial, at side next to axis.

adherent, the union of parts usually separate.

adnate, united with a dissimilar organ.

adventitious, produced in a abnormal place (buds and roots); *-root*, root not born from the radicle or its subdivisions.

aërenchyma, loose tissue containing air.

alate, s. *winged*.

alternate, not opposite, by turns left and right; *alternating whorls*, whorls the leaves of which are inserted between the leaves of the preceding whorl and those of the next whorl.

amplexicaul, stem-embracing; s. *semi-*.

-angular, with x angles; *obtusangular*, with obtuse angles; *sharply angular*, with acute angles, 3-, 4-, etc., *multangular*, with 3, 4, etc., many angles.

annular, placed in a ring.

annulate, ring-shaped.

anterior, turned away from main axis, reverse of posterior.

apex, top; *apical*, on top.

apicula, sharp and short but not stiff point in which a leaf may end; *apiculate*, with an apicula.

applanate, flattened out or horizontally expanded in stead of round or globular.

1 In Chapter II, Outline, most of these terms have been entered into a system.

2 In other and more recent publications different terms are often met; JACKSON (1965) should be consulted, and especially DUKE (1969).

appressed, lying close and flat for the whole length on another organ.

arachnoid, like a cobweb.

armature, any kind of defence such as prickles or thorns.

ascending, oblique with erect end.

asymmetrical, with dissimilar sides.

attenuate, s. *narrowed*.

auricle, small earlike lobe at the base; *auriculate*, (*auricled*), with small ear-like lobes at the base.

axil, angle between two organs; *axillary*, growing in an axil.

balance-hair, stellate hair with 2 arms.

base, extremity of attachment.

bi-, in compound words meaning: twice; *-alate*, with 2 wings; *-conjugate*, *-geminate*, s. *-paripinnate*; *-dentate*, dentate with dentate teeth; *-furcate*, 2-forked, with 2 prongs; *-morphous*, of two forms; *-nary*, consisting of 2 members; *-odd-pinnate*, odd-pinnate with odd-pinnate parts; *-palmate*, palmately compound with palmately compound parts; *-paripinnate*, paripinnate with paripinnate parts; *-pinnate*, pinnate with pinnate parts; *-pinnatifid*, pinnately cleft with pinnately cleft parts; *-seriate*, in 2 rows, s. *seriate*; *-serrate*, serrate with serrate teeth; *-ternate*, ternate with ternate parts.

blade, s. *lamina*

brachyblast, short shoot.

branching, scheme of branching (*ramification*).

branchlet, small branch, ultimate division of a branch.

bristle, thick stiff hair; (s. *seta*).

bud, top with undeveloped leaves; *apical-*, bud on top of an axis, not in an axil; *-scale*, scale on a bud.

bundle, *fascicle*.

caducous, falling early.

calyx, the outermost of the floral envelopes.

canaliculate, s. *channelled*.

canescent, growing grey or hoary.

carinate, *keeled*, with a ridge like the keel of a boat.

cataphyll, early leaf-forms of a plant or shoot, as cotyledons, bud-scales, rhizome-scales, etc., in German "Niederblätter" (JACKSON, 1965); but brown or hyaline scale leaves succeeding the cotyledons (DUKE, 1965); *cataphyllary*, of the nature of the foregoing; *cataphylls*, cataphyllary leaves.

caudate, with tail-like top.

cauline, produced by the stem.

channelled, hollowed out like a gutter.

cicatrice, s. *scar*.

cilium (pl. *cilia*), hair on an edge; *ciliate*, fringed with fine hairs.

circinate (circinnate), coiled into a ring or partially so.

circumscissile, cut circularly around.

clavate, s. *club-shaped*.

club-shaped (clavate), thickened towards the top.

clypeate, s. *peltate*.

coalescent, united by growth.

collet, base of root.

common, general or principal as opposed to partial; supporting more than one organ.

compound (of leaves), divided to the rachis; the leaflets falling without tearing, which is not always clear but still the leaf is called compound; *doubly-*, *twice-*, *repeated-*, 2 or more compound; *de-*, several times divided or compound.

conduplicate, folded together lengthwise; *-induplicate*, the blade folded lengthwise along the midrib so that the halves of the upper surface lie together; *-reduplicate*, the blade folded lengthwise along the midrib so that the halves of the lower surface lie together.

conferruncate, adherent by adjacent faces.

contortuplicate, 1. twisted and plaited or folded, 2. twisted back upon itself.

connate, united (similar organs).

conspicuous, very clearly visible.

constricted, suddenly drawn together; *contracted*, narrower than surroundings; *constriction*, place where drawn together, where contracted.

convolute, when one part is wholly rolled up in another one.

cordate, with notched base; *semi-*, cordate but with one-sidedly notched base.

coriaceous, leathery.

corrugated, s. *rugose*.

costa, main nerve, midrib; *costate*, with one or more primary longitudinal nerves.

cotyledon, leaf of an embryo, seedlobe.

-cotylar (-cotyledonous), with x (o — many) cotyledons; *-cotyly*, the condition in question; *aniso-*, with unequal cotyledons; *crypto-*, 1. with cotyledons not emerging from the seed, 2. without manifest cotyledons; *gamo-*, with united cotyledons; *phanero-*, 1. with cotyledons emerging from the seed, 2. with manifest cotyledons; *pseudo-*, simulating cotyledons; *schizo-*, with a division of a cotyledon either by forking or complete separation into two; *synco-*, with united cotyledons, s. *gamo-cotylar*.

cotyledonary node, place of insertion of the cotyledons.

creeping, running along the ground, rooting at intervals.

crenate, with blunt protrusions and sharp incisions.

crispate, much waved and folded, waves and folds small.

cuneate (wedge-shaped), regularly narrowed into the base.

curvinerved, main nerves diverging from the base, curved and afterwards coming nearer to each other (s. *diverging*).

cuspid, sharp rigid point; *cuspidate*, tipped with a cusp.

cyanotic, cornflower blue.

cystolith, mineral concretion, usually of calcium carbonate, on a cellulose stalk.

deciduous, falling in season.

declivous, obliquely downwards.

decompound, s. *compound*.

decurrent, prolonged on another organ beyond insertion.

decurved, bent downwards.

decussate, in pairs alternately at right angles.

deltoid, (*triangular*), with angle at the base.

dentate, toothed with acute protrusions and blunt incisions; *denticulate*, minutely toothed.

depressed, *sunken*, sunk.

developed (e.g. leaves), fully outgrown (e.g. leaves).

digitate, s. *palmately compound*.

disciform, *disk-shaped*, with the shape of a disk.

distichous, in 2 opposite rows; *-alternate*, alternate in 2 opposite rows; *-opposite*, opposite in 2 opposite rows.

domatia (pl.), small depressions in the surface of a leaf.

disk-shaped, s. *disciform*.

dot, translucent or coloured spot; *dotted*, with dots.

doubly compound, s. *compound*.

drepaniform, s. *falcate*.

dull, not shining.

eglandular, without glands.

elliptic, regular oval; *transversely-*, oval but inserted at a side, with index < 1 .

emarginate, bluntly incised (not notched), usually at extremity.

entire, with even margin without toothing or incisions.

eophyll, first few leaves with green expanded blades developed by the seedlings, as opposed to the brown rudimentary scale leaves of fixed number which precede them.

epicotyl, first internode of the stem above the cotyledons.

epigeous, above the ground.

erect, upright; *erecto-patent*, between spreading and erect.

even pinnate, s. *pari-pinnate*.

exalate, wingless.

expanded, spread out.

exsculptate, with small depressions as though dug out.

exstipulate, without stipules.

falcate, (*drepaniform*), *sickle-shaped* but 2-dimensional.

fan-shaped, in the form of a fan.

fascicle, bundle; *fascicled*, in bundles.

felted, matted with intertwined hairs.

felty, like felt to touch.

ferrugineous, iron-rust-coloured.

fetid, stinking, malodorous.

filiform, thread-shaped.

fimbria (*fringe*); *fimbriate* (*fringed*), with hairlike appendages on the margin.

flaccid, withered and limp, *flabby*.

fleshy (*succulent*), thick, not flexible; *thick-*, very thick and massive.

flexuous, repeatedly curved.

foliaceous, leaf-like, flat and broad, having the texture or shape of a leaf.

foliar, relating to a leaf; *foliary axil*, angle between stem and upper side of leaf;

foliary spine, spine in the place of a leaf.

-foliate, denoting the number of leaves.

-foliolate, denoting number of leaflets.

foliole, s. *leaflet*.

fragrant, with a nice odour.

fringe, s. *fimbria*.

fugacious, perishing and falling very soon.

fuliginous, sooty, or soot-coloured.

furrow, *groof*; *furrowed*, *grooved*.

fusiform, s. *spindle-shaped*.

geniculate, abruptly bent so as to resemble the knee-joint.

glabrous, without hairs; *glabrescent*, becoming glabrous or slightly so.

gland, 1. secreting structure, 2. warty swelling; *stipitate-*, gland on stalk; *glandular*, with glands; *-hair*, hair with gland on top; s. *eglandular*.

globose, almost spherical; *semi-*, half globose.

growing point, growing tip, growing cone, extremity of the stem, or cone of growth; s. *vegetative*.

hairiness (*pubescence*), type and quantity of hairs; *hairy*, with hairs.

halbert-shaped, s. *hastate*.

hastate (*halbert-shaped*), with basal lobes turned outward; s. *semi-*.

haustorium (pl. *haustoria*), sucker of parasitic plants.

hispid, with rough hairs.

hoary, grey from fine hairs.

hyaline, colourless or translucent.

hypocotyl, stem below the cotyledons.

hypogeous, below ground; s. *semi-*.

imparibipinnate, bipinnate with terminal leaflet on each top.

imparipinnate (*odd-pinnate*), pinnate with one terminal leaflet; rachis whether or not mucronate, mucro whether or not falling; the number of leaflets has no significance in this connection.

imperfectly bi-tri-pinnate, only lowest half of common rachis bearing bi-tri-pinnate parts.

incised, 1. cut into, 2. cut sharply into margin; *incision*, indentation in margin of foliar organ.

incrassate, thickened, made stout, s. thickened.

index (in this book), proportion of length to breadth of a blade.

idioblast, special cell in a tissue which markedly differs from the rest in form, size or contents.

indument, any covering, such as hairiness.

induplicate, with the margins bent inwards and the external face of these edges, applied to each other, without twisting.

inermous, without spines or prickles.

inserted, placed, attached; *insertion*, place where born.

intergrade, between 2 forms.

internode (*internodium*, pl. *internodia*), stem between nodes.

interpeticular, 1. between petioles, 2. enclosed by expanded base of a petiole. 3. applied to connate stipules which have coalesced from two opposite leaves.

intramarginal nerve, nerve within the margin, near and parallel to the edge.

intrapeticular, within the petiole, or between it and the stem.

involute, with edges rolled inwards.

-jugate, with x pair of opposite leaflets; *jugum* (pl. *juga*), pair of opposite leaflets.

keeled, s. *carinate*.

kidney-shaped, s. *reniform*.

lacerate, torn or irregularly cleft.

lactiferous (*laticiferous*), with latex.

laevis, s. *smooth*.

lamina (*blade*), uppermost part of a leaf or leaflet, usually flat and spread out.

lanate, s. *woolly*.

lanceolate, tapering to each end, broadest in centre (in this book and in many older ones)¹, with index > 3.

lateral, born from the side of an organ; *-axis*, axis borne by main axis; *-bud*, bud on stem or branch, not on top of it; *-leaflets*, leaflets born from the side of an axis, not from the top of it; *-lobe*, lobe on the side of an organ; *-nerve*, nerve borne by main nerve; *-root*, branch of main root.

laterally compressed, cylindrical but flattened on two opposite longitudinal sides.

latex, milky juice.

laticiferous (*lactiferous*), with latex.

lax, *loose*.

¹ In many modern publications: narrow, tapering to each end, greatest breadth at about one-third from the base.

leaf, principal appendage or lateral organ borne by the stem; *leaflet*, separate division of a compound leaf.

lengthwise, s. *longitudinal*.

lens-shaped (*lenticular*), doubly convex.

lenticel, lens-shaped corky organ on root, stem or petiole in different forms and colours.

lenticular, s. *lens-shaped*.

lepidote, with small scurfy scales.

ligneous (*lignous*), woody.

liguliform, *strap-shaped*, *broadly linear*.

linear, narrow with parallel sides, with very big index.

livid, *lead coloured*; *shining-*, shining like lead.

lobe, protrusion between incisions which do not go down further than half length or quarter breadth of a lobed organ; *lobed*, *lobate*, incised less than half length or quarter breadth.

longitudinal, *longitudinally*, *lengthwise*, in the direction of the length of an organ.

lucid, s. *shining*.

lunalar, half-moon-shaped.

maculiform, *spot-shaped*.

main (*primary*), *chief*; *-nerve*, midrib, costa, sometimes there is more than one main nerve; *-root*, main descending axis under the collet; *-stem*, main ascending axis above the collet.

malodorous, stinking.

margin, edge; *marginal*, on the edge; *-nerve*, nerve along edge; *marginate*, with a margin of distinct character.

mealy (*farinaceous*), as if covered with meal, often with stellate hairs, papillae or scurf; *-pubescent*, with meal-like hairs.

membranous, thin and semi-transparent.

-merous, denoting parts or numbers, as dimerous, etc.

mesophyll, interior parenchyma of a leaf, the part between the nerves.

metaphyll, mature leaf as opposed to the young forms.

midrib, s. *main nerve*, *costa*.

monomorphous, of one form only.

monopode (*monopodium*), stem growing at the top; *monopodial*, with monopode.

mucro, sharp, short, straight terminal point on nerve, midrib or rachis, protruding from the leaf; *mucronate*, with a mucro.

multi-, many; *-foliolate*, with many leaflets.

narrowed (*attenuate*), gradually growing more narrow.

nectary, organ in which nectar is secreted.

needle-shaped, approximately needle-like (leaf of Pinaceae).

nerve (*vein*), simple or unbranched slender rib; *nervation*, arrangement of nerves; *x-nerved*, with x nerves from base.

net-nerved (*reticulate*, *retinerved*), veined like network.

nigrid, black.

node, part of stem normally bearing leaves.

notch, in this book: shallow sharp incision; *notched*, with a notch.

ob-, as a prefix, means inversely or oppositely.

obcordiform, inversely heart-shaped, at the top broader and notched.

oblique, 1. with unequal sides, 2. slanting.

oblong, broadest in centre, with index $\pm 2-3$; *-obovate*, in shape of an egg, 2-dimensional, broadest above centre, with index $2-3$; *-ovate*, 2-dimensional, broadest below centre, with index $\pm 2-3$; *transversely-*, with index $\pm \frac{1}{2}-\frac{1}{3}$.

obovate, 2-dimensional, in shape of an egg, broadest above centre, with index < 2 ;

-lanceolate, 2-dimensional, broadest above centre, with index > 3 .

obovoid, 3-dimensional, in shape of an egg, broadest above centre, with index < 2 .

obreniform, inversely kidney-shaped, with index < 1 , top slightly notched or exsculptate, base rounded.

obtuse, blunt or rounded.

ocrea, tubular stipule; *ocreate*, with ocreae.

odd-pinnate, s. *imparipinnate*.

one-sided-applanate, unilaterally applanate, laterally compressed but at one side only.

operculate, with a lid.

opposite, position of 2 organs inserted in the same height facing each other.

orbicular, almost circular.

organ, any definite part of a structure.

outgrown, fully developed.

ovate, 2-dimensional, in shape of an egg, broadest below centre, with index < 2 ;

-lanceolate, 2-dimensional, broadest below centre, with index > 3 .

ovoid, 3-dimensional, in shape of an egg, broadest below centre, with index < 2 .

palm, the palm of the hand.

palmate, lobed or divided so that the sinuses point to the base.

palately, in a palmate manner; *-compound*, (*digitate*), all leaflets on the top of the main rachis; *-x-merous*, palately x-foliate, s. *-foliate*.

palmati-, *palately*; *-fid*, palately cut down half way length or quarter breadth;

-lobate, *palately* lobed, cut down less than half length or quarter of breadth;

-nerved, palately veined, veins diverging from base; *-partite*, cut nearly to the base in a palmate manner.

parallel, parallel or nearly so; *-nerved*, with several parallel or nearly parallel nerves from the base.

paripinnate (*abruptly pinnate*, *even-pinnate*), pinnate ending in a pair of leaflets, the rachis whether or not mucronate, the mucro whether or not falling; the number of leaflets has no significance in this connection.

partite, cut down more than half of length or quarter of breadth.

passing into, 1. changing into, 2. grading into.

patent, s. *spreading*.

pedatinerved, with short stopping midrib and 2 strong lateral nerves inserted on it near its base, giving rise to others which extend only to the top.

pellucid, wholly or partially transparent; *-dots*, transparent puncts, not to be confused with common cells, the distance between the dots is usually larger than their diameter; *-margin*, transparent margin.

peltate (*clypeate*, *shield-shaped*), inserted between margins; with *-hairs*, with shield-shaped hairs.

penninerved, s. *pinninerved*.

petiolar spine, spine instead of a petiole.

petiolate, with a petiole.

petiole, foot-stalk of a leaf.

petiolulate, with a petiolule.

petiolule, petiole of a leaflet.

phyllodium, leaf-like broadened rachis.

phyllotaxy, arrangement of leaves.

pilose, with soft and distinct hairs.

pinna (pl. *pinnae*), primary leaflet of a pinnate leaf; *pinnate*, compound with leaflets on each side of the rachis; *pinnately*, in pinnate fashion; *pinnatifid*, pinnately incised reaching quarter of breadth; *pinnatilobate*, pinnately incised not reaching quarter of breadth; *pinnatipartite*, pinnately incised down to or nearly to midrib; *pinniform*, feather-shaped; *pinninerved*, pinnately veined.

pinnule (*pinnula*, pl. *pinnulae*), secondary pinna of a bipinnate leaf.

platter-shaped, *scutelliform*.

plicate (*pleated*), folded into plaits, usually along the veins like a closed fan.

plumose, feathered, as the pappus of thistles.

polymorphous, of many forms.

pore, small aperture; *porous*, pierced with small holes.

posterior, next to or towards the main axis, reverse of anterior.

prickle, sharp hard outgrowth from rind or bark; *prickly* (*aculeate*), with prickles.

primary, s. *main*.

procumbent, lying along the ground.

prominent, standing out, raised.

prostrate, lying flat.

pruinose, with a thin waxy powdery secretion on the surface, usually white.

puberulous, slightly hairy.

pubescence, s. *hairiness*; *pubescent*, with soft hairs or down; *softly pubescent*, with very soft hairs.

punctate, dotted.

pungent, ending in a rigid and sharp point, as in a holly-leaf.

quadruplinerved, 4-nerved, with midrib dividing into 4.

- rachis* (pl. *raches*), axis of compound leaf; in this book: petiole included.
- radicle*, root of an embryo.
- ramification*, s. *branching*.
- ramified*, with branches.
- ramillary spine*, spiniform branch or -branchlet, branch or branchlet transformed into a spine.
- recline*, turned or bent downward.
- recurvato-uncinate*, hooked backward.
- regular*, may be bisected in more than 2 ways into symmetrical parts.
- remote*, far from one another; *remotely dentate*, dentate with a considerable distance between the teeth.
- reniform* (*kidney-shaped*), with index < 1 , top rounded, base slightly cordate or exsculptate, and bluntly lobed.
- repand*, with slightly uneven margin, less so than sinuous; s. *undulate*.
- repeated compound*, s. *compound*.
- resiniferous*, containing or secreting resin.
- reticulate*, s. *net-nerved*.
- retinerved*, s. *net-nerved*.
- retuse*, shallow-emarginate at a rounded top; s. *emarginate*.
- revolute*, rolled back from margin or top.
- rhomboid* (*rhomboidal*), broadest in centre, almost quadrangular, lateral angles obtuse, inserted at angles; -*ovate*, ovate with angular sides.
- ridge*, elevated line; *ridged*, with ridges or ribs.
- root*, descending axis beneath collet; *root-tubercle*, radical small tuber.
- rough to touch*, scabrous.
- rounded*, broad-obtuse.
- rugose* (= *corrugated*), wrinkled; *rugulose*, slightly wrinkled.
- sagittate* (*sagittiform*), arrow-shaped, enlarged at notched base which has 2 acute straight lobes.
- scabrous*, rough to touch.
- scalariform*, with ladderlike markings.
- scale*, fleshy or dry or leaflike or membranous organ, like the scale of a fish; -*shaped*, in the form of a scale.
- scaly*, s. *squamate*.
- scandent*, climbing.
- scar* (*cicatrice*), mark left by fallen organ.
- scent*, smell, odour.
- scutelliform*, platter-shaped.
- secondary*, borne by primary member.
- secund*, part or organ directed to one side only, usually by torsion.
- semi*-, half; -*amplexicaul*, partly stem-embracing; -*cordate*, s. *cordate*, but with one-sided notched base; -*hastate*, with only one basal lobe, which is turned

- outward, s. *hastate*; *-hypogeous*, half above, half under ground.
- sequence*, the following up; e.g.: *eophyll-*; *reverse-*, next organs simpler than earlier ones.
- seriate*, disposed in series of rows, either transverse or longitudinal; s. *bi-*.
- serrate*, with sharp teeth and sharp incisions; *serrulate*, serrate with minute teeth.
- sessile*, without petiole or petiolule.
- seta*, bristle or bristle-shaped body.
- sheath (vagina)*, broadened structure, embracing the bearing organ; *sheathing*, enclosing as though by a-; *-shaped*, with the form of a-; *closed -*, with connate margins; *open-*, with margins not connate.
- shield-shaped*, having the shape of a shield; s. *peltate*.
- shining (lucid)*, glossy (sometimes only slightly).
- short-shoot*, dwarfed fertile branch.
- shrub*, small woody perennial without main bole.
- siccus*, dry; *in sicco*, when dry.
- silky*, with soft appressed shining hairs.
- simple*, not compound.
- sinistrorse*, twining in an anticlockwise direction observed from above.
- sinuous*, deeply waved.
- smooth (laevis)*, without ribs, furrows, warts, wings, scales, not angular, not rough.
- sparse*, few.
- spindle-shaped*, terete but tapering towards each end.
- spine*, organ, transformed into a sharp pointed hardened stiff structure; *spinescent*, ending in a spine or sharp point; *spiniform*, thornlike; s. *foliary-*, *petiolar-*, *ramillary-*; *spinous*, *spiny*, with spines.
- spirally arranged*, placed one by one on nodes, subsequent leaves alternately on 3 or more sides.
- split*, incised to half length or half of half breadth.
- spongy*, sponge-like.
- spot-shaped*, *maculiform*.
- spreading (patent)*, having an outward direction, approximately at right angles to the bearing organ.
- spurious whorl*, seemingly a whorl, but members not really inserted at the same height, s. *whorl*.
- squamate*, with scales.
- stellate*, *star-shaped*, radiating like the points of a star; *-hairs*, hairs of a starlike form.
- stem*, main descending axis above collet.
- stinking*, malodorous.
- stipel (stipella, pl. stipellae)*, stipule on leaflet; *stipellate*, with stipels; *stipitiform*, having the appearance of a trunk; *stipular-* scar, scar of fallen stipule; *stipulary spine*, spine in the place of a stipule; *stipulate*, with stipules; *stipule*, pl. *stipules (stipula, pl. stipulae)*, appendage on each side of insertion of a leaf.
- stipitate*, s. *-gland*.

strap-shaped, s. *liguliform*.

striate, with fine lengthwise parallel lines, grooves or ridges.

strict, close or narrow and upright, very straight.

subopposite, nearly opposite.

subulate, *awl-shaped*, thin, sharp, conical.

succulent, s. *fleshy*.

sunk, depressed, sunken.

supracotyledonary, inserted above the cotyledons.

switch-plants, plants whose leaves are absent or reduced, with green shoots acting in place of leaves; these green shoots are called *switch-twigs*.

swollen, s. *thickened*.

sympode, sympodial axis; *sympodial*, with main axis replaced by side-axis.

taxonomy, classification.

tapering, regularly diminishing in diameter in one direction.

taperpointed, narrowed with convex or straight sides near the top.

tap-root, thick conical main root.

tendril, filiform production, cauline or foliar, by which a plant may secure itself in position.

terete, circular in transverse-section.

terminal leaflet, leaflet on top of a compound leaf; *-lobe*, top lobe.

ternate, in three.

tertiary, borne by secondary member.

testa, seed coat.

thickened (*incrassate*, *swollen*, *tumid*), thicker than surroundings.

thread-shaped, filiform.

tomentose, with felty hairs.

transversally elliptic, s. *elliptic*; *transversally oblong*, etc., with index < 1 .

tri, in compounds meaning thrice, three or triple; *-angular*, 1. *triangel-shaped*, angle on top; 2. with a triangular transverse section; *-morphous*, of three forms; *-pinnate*, pinnate with bipinnate parts; *-pinnatifid*, pinnately cleft with bipinnately cleft parts *-ternate*, with palmately placed biternate parts; *-plinerved*, with a midrib dividing into three; *-plternate*, ternate with biternate parts.

trichome, a growth of hair, or any hairlike outgrowth of the epidermis.

truncate, as though cut off at the end, right angled to the longitudinal axis.

tubercle, s. *root-tubercle*.

tumid, s. *thickened*.

turning, *becoming*, e.g.: yellow turning brown.

twiners, plants which twine round their support; *twining*, winding spirally.

uncinate, hooked.

undulate, waved, incisions and protrusions blunt; 1. in the plane of the blade, 2. up and down; s. *repand*.

unequal, dissimilar; *-sided*, with dissimilar sides, s. *asymmetrical*.

uni, one-, -jugate, with one pair of leaflets; *-lateral*, at one side; *-laterally applanate*, flattened at one side; (s. *laterally compound*); *-nerved*, with one primary nerve from the base without clearly observable lateral nerves.

vagina, s. *sheath*.

vaginant, s. *sheathing*.

vegetative, concerned with the growth of the plant, not with flowers and fruits; *-cone* (*growing tip, growing point*); *-organs*.

vein, s. *nerve*.

vernation, the order of unfolding from leaf-buds.

vernicoose, shiny, as though varnished.

verruca, s. *wart*; *verruciform*, wart-shaped.

verticil, s. *whorl*; *verticillate*, s. *whorled*.

villous, with long weak hairs.

viviparous, germinating or sprouting from seed or bud, while attached to the parent plant.

wart (*verruca*), hard or firm blunt excrescence; *-shaped*, in form of a wart; *warty*, covered with warts.

waved, s. *undulate*.

wedge-shaped, s. *cuneate*.

whorl (*verticil*), arrangement of 3 or more organs in a circle at the same height round an axis; s. *alternating-*; *whorled* (*verticillate*), in whorls.

wing, membranous or leaflike expansion of an organ; *winged* (*alate*), with a membranous fleshy or leaflike expansion.

woolly (*lanate*), densely clothed with woolly hairs; *-hairs*, long curled hairs.

zigzag, angularly connected in one plane.

II Outline¹

A. A *seedling* is a plant born from seed and not by vegetative reproduction. The term seedling is in most cases used to refer to very young individuals. In this book, two stages of development are described. This classification in two stages has to be arbitrary. The term first stage is chosen: a. for a seedling which possesses epigeous cotyledons and develops a first leaf, b. for a seedling with hypogeous cotyledons which develops a first fully grown leaf. The term second stage is chosen for a plant which has already developed some almost normal leaves (young form). In the descriptions, the sequence and the number of the leaves are mentioned. A different scheme is necessary when dealing with either viviparous plants or those which show scale-shaped first leaves. Such deviations have been explained in the descriptions of the species.

The *size and height of the seedling* are often unsuitable for identifying it, but these measures are important for the general impression the plant makes. The dimensions which are given, were found on the observed specimens, at the first stage: a. the total size including the root, and b. the size above the collet excluding the root.

Latex and resin may be present in a seedling (the plant may or may not be lactiferous (laticiferous) or resiniferous), easy to observe in young fresh plants, when wounded. The colour of the latex is opaque, white, yellow or red.

The *scent* of a plant, especially when crushed, is sometimes characteristic, for example: stinking, malodorous, fragrant, odorous, but it often disappears in sicco.

The *colours* of the parts of the plant can be characteristic, but they may also turn into another colour, for example: by becoming grey or hoary (= canescent) and they often disappear or change especially in sicco. In this book colours are described as observed on fresh material. Colours may not be very bright, for example: ferrugineous, lead-coloured, with a leaden shine, dirty, sooty or soot-coloured (fuliginous).

The *organs* of the seedling are definite parts of the structure. The most important organs are: root, cotyledons, stem, leaves, buds, and appendages of the external surface. But not all are always present. Sometimes a plant (switch plant) shows switch twigs. A plant can have some armature, it can be spinous or prickly (= aculeate) or inermous. The place of an organ can be posterior or anterior. Sometimes a plant is climbing (= scandent). The organs can be more or less conspicuous.

¹ This book was ready for printing in 1924; since then more recent terms have been added. See Chapter I Glossary.

B. The *root-system* begins with a radicle, changes with age, and the development is mostly dependent on growing conditions. The length of the roots may be characteristic but observation is often difficult especially of the lateral ones; it is easiest in loose fertile sand. The colour also, often changes with age. The tips of the roots often show a variation in colour. These colours are characteristic, but they disappear usually after the seedling has been taken out of the soil. The position of the collet may be uncertain. The collet may or may not be thickened (= swollen, = tumid). This thickening can be slight, moderate or considerable, and also gradual or sudden (= abrupt), sometimes one-sided or disk-shaped (= disciform). The primary or main root is straight or flexuous; if flexuous: slightly, moderately or considerably so; it may or may not be thicker than the lateral roots; it may or may not be a tap-root. Adventitious roots can be borne by the collet (*Monocotyledones*) or borne by organs above the collet. Lateral roots can be: absent, few, numerous, moderate in number or very numerous, straight or flexuous; if flexuous: slightly, moderately or considerably so; spreading (= patent) or declivous; unbranched or branched; if branched (= ramified): moderately or much so; they are often thread-shaped (= filiform). Special organs in the root-system may be present: root-tubercles caused by symbiotic bacteria or other micro-organisms, and haustoria, neither of them to be confused with phytopathological symptoms.

C. *Cotyledons* have only a few morphological characteristics distinguishing them from other leaves. They may or may not be foliaceous. They are inserted on the cotyledonary node. Their number differs: the plant can be mono-, di-, 3-, 4-, poly-cotylar (= -cotyledonous), the condition in question resp. mono- up to polycotily. If there are two cotyledons (*Dicotyledones*), they are opposite, sometimes subopposite. If there are more than two they are placed (= inserted) together in one whorl (= verticil). They are hypogeous, epigeous or semihypogeous; sometimes, if there are more than one, unequal in this relation. If there are two, they are equal or unequal, asymmetrical and equal, or asymmetrical and one another's mirror image. If there are two hypogeous cotyledons they possess blades which lie opposite one another at either side of the stem, or together at one side of the stem (secund); the upper sides may face each other and can be in close contact (conferruminate), or diverge; they may or may not stay enclosed in the seed-rest, in the seed-coat (= testa), partly covered with the seed rest. Cotyledons observed by the author are simple, stipulate or exstipulate, and they sometimes have developed axillary buds. Cotyledons may be united into a cotyledon-body. The plant is called: phanero-, crypto-, syn- (gamo-), aniso-, schizo-cotylar (-cotyledonous) depending upon the character of its cotyledons. The condition in question is called: phanerocotily, etc. Other characters can be described as is done with other leaves, see E and J. Most of the characters of the cotyledons are constant, characterising and diagnostic.

D. The *stem* can show: hypocotyl, epicotyl, nodes, internodes (= internodia), main stem, branches and branchlets. The stem may be: erect, erecto-patent, ascending,

procumbent, prostrate, creeping, twining, straight, curved or flexuous, geniculate, woody (lignous), sometimes feather-shaped (= pinniform) and in that case it often has distichously placed leaves and a sideward bend. The length and thickness, especially of the hypocotyl and the epicotyl, are more often characteristic than the length of the internodes. The hypocotyl can be hypogeous, epigeous or semi-hypogeous. The thickness of the hypocotyl is, at the first stage, a rather constant characteristic. The base of the hypocotyl may or may not be thickened; if thickened the thickening can be gradual or abrupt, one sided or disk-shaped (= disciform). Sometimes the stem shows the nodes extra distinctly even after the leaves have fallen. The stem can be *zigzag*, or spiral owing to obtusangular connection of the internodes. The stem can be built monopodially or sympodially, being a monopode or a sympode. The side of lateral organs borne by the stem can be abaxial or adaxial. The branches of the stem can be short (= short-shoots). Sometimes a plant does not get a stem (= acaulescent). For further details see F and J.

E. The *leaves including the cotyledons* are vegetative organs, borne by the stem, divided in groups: cataphyll, eophyll and metaphyll. The vernation can be interesting. The leaves can be pseudo-cotylar (= -cotyledonous); the condition in question: pseudocotily. The leaves are often flat, thin, and approximately horizontally expanded. Other organs with these characters are often called foliaceous. But, a leaf can be scale-shaped, needle-shaped (acicular), strap-shaped (liguliform), platter-shaped (scutelliform, or scalariform). Leaves may or may not be fully developed (= outgrown, = fully grown). The foliar axil is often the place where a bud is inserted.

The phyllotaxy is an important characteristic. The leaves can be opposite, whorled (= placed in whorls = verticils, being verticillate), placed in alternating whorls; the whorls can be spurious. The leaves can be spirally arranged, decussate, distichous-opposite, or distichous-alternate. Authors sometimes take the terms decussate, distichous-alternate, spirally arranged and alternate together in the term alternate; in this book it is not done. The terms given for the phyllotaxy are also used in the description of the scheme of branching (= ramification). The branches are usually inserted in the foliar axils, but the branching is not always similar to the phyllotaxy because not all axils bear lasting branches. One seedling may show different phyllotaxes. The first leaves are usually supracotyledonary but sometimes telescoped at the cotyledonary node.

The *parts of a leaf* may be a blade (= lamina) and a petiole. These organs have a top (= apex) and a base. An axillary bud is often born in the axil between leaf and stem. The leaf is sessile or petiolate, amplexicaul or semi-amplexicaul or neither. Sometimes it is decurrent and sometimes winged (= alate); the leaf may or may not be sheath-shaped. A sheath (= vagina) can be closed or open. The petiole is often flat above, sometimes channelled (= canaliculate). Leaves are stipulate or without stipules (= exstipulate), see G. For further details referring to leaves see F, H and J.

The blade (= lamina) of a leaf can be lobed, split or partite. Further: palmately (= palmati) lobate, palmatifid, of palmatipartite (derived from the word palm); also

pinnatilobate, pinnatifid, pinnatipartite. These characteristics can be double: bi-, tri-, etc. On the top of a leaf a terminal lobe may or may not be present. The blade or its parts can be involute, revolute, convolute, reclinate. The surface of the blade can be flat, crispate, plicate, wrinkled (= rugose), slightly wrinkled (= rugulose); further: dull, glossy or slightly glossy. The blade can show dots (= puncts), being dotted (punctate), and the dots can be wholly or partly transparent (= pellucid). The margin (= edge) can be entire, dentate, remotely dentate, denticulate, bi-dentate, crenate, serrate, serrulate, bi-serrate, repand, sinuous, undulate in the plane of the blade or waving up and down, conduplicate, conduplicate-induplicate, conduplicate-reduplicate, contortuplicate, reduplicate, induplicate. The toothing (= indentation) can be coarse or fine. Besides, the margin can be fringed (fimbriate), involute, revolute, wholly or partly transparent (= pellucid). The top of the blade can be truncate, rounded, taperpointed, acuminate, acute, or caudate. The very tip can be obtuse, acute, abruptly acuminate, notched (*in this book*: sharply incised), emarginate, retuse, mucronate (a mucro or a cusp may or may not be very soon falling (= fugacious), caducous, apiculate, acuminate-acute, acuminate-obtuse. The base of the blade can be truncate, rounded, acuminate, cuneate, acute, cordate (= sharply incised), semi-cordate, or exculptate. Besides, the base can be decurrent, grading or changing (or narrowing) into the petiole, auricled (= auriculate), arrow-shaped (= sagittate, sagittiform), hastate, semi-hastate, asymmetrical, or showing none of these characteristics.

The *shape of the blade* may or may not be that of a shield (shield-shaped = peltate = clypeate); further: orbicular, elliptic, oblong, lanceolate, rhomboid (= rhomboidal), falcate (= drepaniform), ovate, triangular, heart-shaped (= cordiform), reniform (= kidney-shaped), obovate, deltoid, obcordiform, obreniform, fan-shaped, linear, ligulate, subulate, needle-shaped (= acicular), transversally elliptic, transversally oblong, oblong-ovate, ovate-lanceolate, oblong-obovate, rhomboid-ovate, obovate-lanceolate, asymmetrical; besides, it can be globose, ovoid, obovoid, lens-shaped (= lenticular), etc. A blade has length, breadth and an index. Sometimes combinations of the terms mentioned above are used. Not all authors use these terms in the same way.

As far as thickness is concerned the blade can be: membranous, thin, coriaceous, thin-coriaceous, thick-coriaceous, fleshy, or thick-fleshy (succulent); sometimes intermediate forms of these terms are met.

The blade possesses a nervation and a mesophyll. The nervation can show nerves, only one midrib (= costa) or more primary longitudinal veins (costate), lateral nerves and it may or may not show an intramarginal nerve. The blade can be pedatinerved, 3-4-etc.-nerved (= triplinerved, quadruplinerved, etc.), netnerved (= retinerved, reticulate), or palmately- (= palmati-), parallel-, curvi-, pinni- (= penni-), uninerved. The nerves may be sunk (= depressed, sunken), or prominent, sometimes to a different extent on the upper and on the under surface of the blade. Sometimes the nervation is indistinct. It can be described much more detailed than is done in this book.

A leaf can be simple or compound. Compound leaves possess a rachis (pl. rachis) (in this book described inclusively with the petiole), and leaflets. The rachis can be tipped with a mucro being mucronate, or with a cusp being cuspidate. The rachis can have the shape of a phyllodium. The leaflets (= folioles) can have a petiolule (being petiolulate) or they are sessile. The blades (laminae) of the leaflets are called blades as is the case with leaves. Sometimes a compound leaf possesses only one leaflet (= 1-foliate); in most cases it is palmately compound (digitate) or pinnately compound (= pinnate). The pinnate leaf has pinnae (sing. pinna). Digitate compound leaves are 2-, 3-, etc. x-foliate (= x-merous); (3-foliate = ternate). The pinnate leaf can show opposite or alternate leaflets, if opposite there are one or more pairs of leaflets. Besides, the pinnate leaf can be paripinnate (= abruptly pinnate = even pinnate), or odd-pinnate (= imparipinnate). A compound leaf can be doubly compound or several times compound (= decompound), for example: bipalmate, biternate or triternate, bipinnate or tripinnate, biparipinnate, bigeminate (= biconjugate) or bi-oddpinnate (= bi-imparipinnate). In these cases there can be a common (= primary) rachis and secondary and tertiary rachis, a primary pinna and secondary ones, primary leaflets and secondary ones. A bipinnate leaf can be imperfectly bipinnate, and a tripinnate one imperfectly tripinnate. Blade and petiolule of a leaflet are described in the same way as is done with the blade and the petiole of leaves.

F. The stem or its parts: *hypocotyl*, *epicotyl*, *petiole*, *rachis* and *petiolule* have a certain length and thickness (s. D); they can be terete, laterally compressed or at one side (= unilaterally) applanate, spindle-shaped, tapering (generally upwards), angular; thickened (swollen, tumid, incrassate) or constricted (the condition called: constriction) in special places; if angular: obtusangular or sharply angular, 3-, 4-, etc., multangular; rough to touch (= scabrous) or smooth; ridged, furrowed, winged (= alate), not winged (= exalate), striate (in most cases lengthwise, = longitudinally).

G. *Stipules* (= stipulae, sing. stipule = stipula) may or may not be present. Stipules may exceptionally be inserted intrapetiolar or interpetiolar; if interpetiolar the stipules of opposite leaves are frequently connate. Leaflets can show stipels (= stipellae, sing. stipella) and are called stipellate. The blade of stipels and stipules can be described in the same way as is done with the blade of leaves. However, sometimes they form an ocrea and the leaf in question is ocreate.

H. *Cotyledons*, *leaves*, *leaflets*, *cusps*, *a mucro*, *petioles*, *petiolules*, *stipules*, *stipels* and *bud-scales* generally are articulary though not always distinctly joined to their base. They can be caducous, very early falling (fugacious), or deciduous, leaving a scar (= cicatrice) which is not always clearly visible.

I. *Buds* if present are axillary, apical or adventitious. They can have bud-scales, but the buds of the seedlings described in this book very seldom do. These bud-scales can take the position of a stipule, of 2 stipules, of a leaf with stipules or of a leaf.

J. *Appendages* (= induments) of the external surface are organs which do not occupy the position of stem, leaf, stipule, stipel or root. They are hairs (trichome), glands, scales, prickles, warts (= verruca, pl. verrucae), cystoliths, lenticels, domatia, dots (= puncts), spots (= macula, pl. maculae), nectaries, wrinkles. An organ with dots is called dotted (= punctate), with glands glandular, without glands eglandular, with scales scaly (= squamate), with prickles prickly (= aculeate), with warts warty (= verrucose), with wrinkles wrinkled (= rugose = corrugated, or rugulose). The hairiness (= pubescence) can be pilose, tomentose, villous, silky (= sericeous), hispid, felted, woolly (= lanate), plumose. Hairs on a plant can be straight and rather stiff but when dry (in sicco) woolly. *In this book* they are described when fresh. The hairs can further be glandular or bristly (= being setae). They can be branched (= ramified) or simple, balance-hairs or stellate ones; stellate hairs may or may not be 3-, 4-, etc.- or much branched. Sometimes hairs are shield-shaped (= peltate = clypeate); they can be cilia (sing. cilium); an organ with cilia is called ciliate. Hairs can make a fringe (= fimbria), in which case the leaf is called fringed (fimbriate). Some authors express hairiness in more detail: soft, long, etc.; this grading is very relative, especially when observed on the fresh plant using a magnifying glass; besides, not all authors use these terms to convey the same meaning. Hairs can further be: sparse, dense, appressed, spreading (patent), hooked (= uncinat), hooked backward (= recurvato-uncinat), mealy (= farinaceous), mealy-pubescent, arachnoid. A plant can be glabrous, glabrescent, pruinose. Glands can show different shapes, such as sessile or stipitate, stipitiform, club-shaped (= clavate).

K. A *spine* and a *tendril* can be present instead of a branch (= ramillary), instead of a leaf (= foliary), of a petiole (= petiolar), or of a stipule (= stipular). Spines can be branched (= ramified), for example forked (= furcate). Several organs can be spinescent. A tendril can be cauline or foliary.

L. *Organs can be united*; if they are similar ones: connate, if non-similar: adnate, if united by growth: coalescent.

M. *Several organs can be*: annular, ring-shaped (annulate), applanate, binary, bundled (fascicled), erect, erecto-patent, flaccid, intergrade, keeled (= carinate), narrowed (= attenuate), strict, seriate, biseriate, spreading (= patent), regular, lax (= loose), spot-shaped (= maculiform), lacerate, adherent, operculate.

N. *Anatomic characters* are very rarely mentioned in this book, for example when aërenchyma or idioblasts are present.

O. *Aberrations are sometimes met*, and organs may show an aberrant structure.

III Pronunciation of the Indonesian names¹

The Indonesian names of the plant species mentioned in this book have been collected by several people, such as forest scientists, botanists, etc., in the period Indonesia was The Netherlands East Indies. As most of them were Dutch, the notations of the names were made in a Dutch way and the names should in principle be pronounced as the Dutch do. Dutch pronunciation is explained and illustrated in any Dutch-English dictionary. By this, however, one will still not always get the completely correct pronunciation because: 1. the local languages include many pronunciations which cannot be rendered in a Dutch way, and: 2. the pronunciation varies in different regions.

Today, Javanese characters have been replaced by Roman ones in the Indonesian schools. These are used much as in the Dutch language; however, the Dutch *oe* (English *oo* as in book) has been replaced by *u*. Because Indonesians pronounce many of the characters as the Dutch do, an Indonesian who knows the plants of his region is able to recognise the local names if they have been printed in this way. He is often able 1. to give the correct local pronunciation, and 2. to help in finding a plant in the forest.

It is obviously advisable not to start with a home made pronunciation, but to show the printed name first and then ask how to pronounce it.

1 For the above remarks the author is indebted to PROF. DR C. C. BERG, University, Leiden.

IV Signs, abbreviations and abbreviated geographic names

Signs

>	=	larger than
<	=	smaller than
Ø	=	diameter
±	=	approximately

Abbreviations

s.	=	see
sing.	=	singular
pl.	=	plural
cot.	=	cotyledon(s)
B.	=	BACKER and BAKHUIZEN VAN DEN BRINK Jr.
LUBB.	=	LUBBOCK
K. et V.	=	KOORDERS and VALETON

Abbreviated geographic names

Alf.	=	Alfur language
Amb.	=	Ambon
Bal.	=	Bali
Bat.	=	Batavia, Djakarta
Batak.	=	Batak language
Bill.	=	Billiton, Belitung
Born.	=	Borneo, Kalimantan
Bug.	=	Buginese language
C.	=	Central
Celeb.	=	Celebes, Selebes, Sulawesi
Daj.	=	Dajak language
Djak.	=	Djakarta
E.	=	East
Jav.	=	Javanese, Java, Djawa
Key.	=	Key islands, Pulau pulau Kai

Lamp.	=	Lampung country
Mad.	=	Madura
Mak.	=	Makassar
Mal.	=	Malay language
Menad.	=	Menado
Minah.	=	Minahassa
Minangk.	=	Minangkabau-country
Mol.	=	Moluccas, Molukku
N.	=	North
Pad.	=	Padang
Palemb.	=	Palembang
S.	=	South
S. E.	=	South East
S. E. C.	=	Sumatera East Coast
Seleb.	=	Celebes, Selebes, Sulawesi
Sum.	=	Sumatra, Sumatera
Sund.	=	Sundanese language
S. W. C.	=	Sumatera West Coast
Tern.	=	Ternate
Tim.	=	Timor
W.	=	West

V Literature cited

- BACKER, C. A. Schoofflora voor Java (Ranunculaceae — Myrtaceae). (= Schoofflora for Java): 1-676. In Dutch only. Visser and Co., Weltevreden, Batavia, Netherlands East Indies, 1911.
- BACKER, C. A. and R. C. BAKHUIZEN VAN DEN BRINK Jr. Flora of Java (Spermatophytes only). I-III; I: 1-648, II: 1-641, III: 1-761. 1963-1968. Wolters-Noordhoff N. V., Groningen, The Netherlands.
- COSTER, Ch. Iets over de diktegroei en inhoudstoffen van de djatistam (*Tectona grandis* L. f.). *Tectona* XVI: 1046-1057. Batavia, 1923.
- DUKE, J. A. Keys for the identification of some prominent woody species in eight forest types in Puerto Rico. *Ann. Missouri Bot. Garden* 52 (3): 314-350. Crops research division, Agricultural Service, U.S. Dep. of Agr., Beltsville, Maryland, U.S.A., 1965.
- On tropical tree seedlings. I. Seeds, seedlings, systems and systematics. *Ann. Missouri Bot. Garden* 56 (2): 125-161, 1969.
- ENDERT, F. H. Geslachtstabellen voor Nederlandsch-Indische boomsoorten naar vegetatieve kenmerken, met een beschouwing over de practische en systematische waarde dezer kenmerken. (= Identification of genera of Netherlands East-Indian trees, using vegetative characteristics, with an explanation referring to the practical and systematic value of these characteristics). In Dutch only. Thesis Wageningen, The Netherlands: 1-242. H. Veenman en Zonen N. V., Wageningen, 1928.
- HEYNE, K. De nuttige planten van Nederlandsch-Indië. (= The profitable plants of the Netherlands East Indies). In Dutch only. I-IV; I: 1-504, II: 1-349, III: 1-402, IV: 1-254. (1st Ed.). Departement van Landbouw, Nijverheid en Handel, Batavia, 1915-1917.
- JACKSON, B. D. A glossary of botanic terms with their derivation and accent. 4th Ed, 1928. Reprinted 1965, with a supplement: 1: 481. G. Duckworth and Co. Ltd. London, Hafner Publish. Co. Inc., New York.
- KOORDERS, S. H. and Th. VALETON. Bijdragen tot de kennis der boomsoorten van Java. (Addimenta ad cognitionem Florae Javanicae). I-XIII. 1894-1914. In Dutch and Latin. Mededeelingen uitgaande van het Departement van Landbouw no. 18 etc., Mededeelingen uit 's Lands Plantentuin no. XIV etc. G. Kolff en Co., Batavia, 's-Gravenhage.
- LUBBOCK, J. A contribution to our knowledge of seedlings. I-II; I: 1-608, II: 1-646. Kegan Paul, Trench, Trübner & Co. Ltd, London, 1892.
- MEIJER Drees, E. Germination and seedlings of some *Acacia* species. Dept. Econ.

- Zaken. Korte Mededelingen Boschbouwproefstation 75. *Tectona* XXXIV (1-2): 1-45. Summary in English. Buitenzorg, Java, 1941.
- OEVER, H. TEN,. Die natürliche Verjüngung des Djati, *Tectona grandis*. Ein Beitrag zur tropischen Forstwirtschaft. J. Schweizer Verlag (Arthur Sellier). München and Berlin. J.H. de Bussy, Amsterdam, 1912.
- TROUP, R. S. The silviculture of Indian Trees. I-III: 1-1195. Clarendon Press, Oxford, 1921.
- WIND, R. Over zaadonderzoek in het algemeen en onderzoekingen omtrent bloei, vruchtdracht en kieming van den djati. *Tectona* XIV: 16-64; 379-427. Buitenzorg, 1921.

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Descriptions and keys

VII Descriptions and keys

ANACARDIACEAE

B. II: 146; K. et V. IV: 66; LUBB. I: 369; TROUP I: 235

Cotyledons epigeous or hypogeous, 2. *Phyllotaxy* spiral, but if 1st leaves developed: 1st 2 leaves opposite. *Leaves* exstipulate, simple or compound, if cotyledons hypogeous 1st leaves scale-shaped. *Plant* whether or not with latex.

- | | |
|---|--------------------------------|
| 1. A. cotyledons and/or 1st leaf present | 2 |
| B. higher developed leaves present | 4 |
| 2. a. cot. hypogeous; 1st leaves scale-shaped | <i>Gluta renghas</i> 3 |
| b. cot. epigeous; 1st leaves developed | 3 |
| 3. a. cot. top acute; leaves compound | <i>Dracontomelon puberulum</i> |
| b. cot. top emarginate; leaves simple | <i>Buchanania arborescens</i> |
| 4. a. leaves compound | <i>Dracontomelon puberulum</i> |
| b. leaves simple | 5 |
| 5. a. blade base rounded or cordate | <i>Gluta renghas</i> |
| b. blade base acute | <i>Buchanania arborescens</i> |

BUCHANANIA SPRENG.

B. II: 146, 147; K. et V. IV: 69

***Buchanania arborescens* (BL.) BL. (*B. florida* SCHAUER)**

B. II: 147; K. et V. IV: 70

Jav.: popohan, getasan (*Kedung djati*), rengas-manuk (*Palabuan*)

Fig. 1

Size at 1st stage (1st 2 leaves only) 5–16½ cm, 3½–7 cm above collet; at 2nd stage (13–23 leaves) 12–23 cm above collet. *Roots* brownish yellow turning blackish brown; tips white; primary root at 1st stage moderately to very flexuous, much thicker than lateral ones; collet not thickened; lateral roots at 1st stage few or moderate in number, very flexuous, unbranched. *Hypocotyl* epigeous, erect, straight, 3–7 cm; at 1st stage 1½ mm thick at base, sometimes thickened below and tapering up- and downwards, terete, near top slightly laterally compressed, smooth, green or red, white or yellow at base, with simple patent short colourless hairs. *Cotyledons* epigeous, 2, equal, or

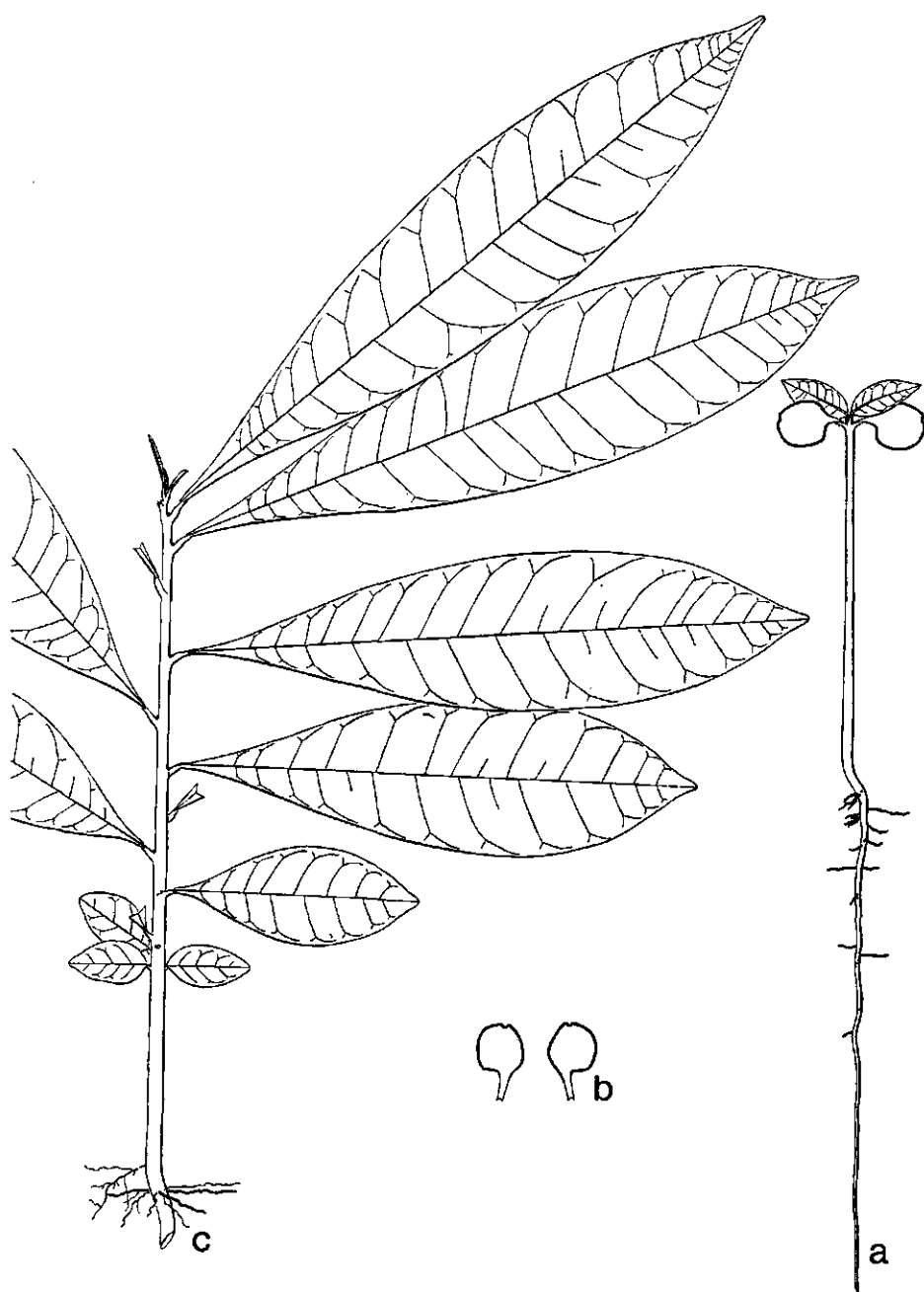


Fig. 1. *Buchanania arborescens* a. young seedling, $1/1\times$; b. cotyledons, $1/1\times$; c. older seedling, $1/2\times$.

asymmetrical and one another's mirror image, foliaceous, petiolate; petiole broadened, 2–3 mm, green, hairy like hypocotyl; blade orbicular or elliptic, usually asymmetrical, with index ± 1 or slightly > 1 , $4\frac{1}{2}$ –7 by 4–7 mm, fleshy, having an emarginate top and a base narrowed into petiole, with fanlike nerves, entire, sometimes repand, dull dark green above, dull light yellowish green sometimes red-blotched beneath, glabrous. *Epicotyl* erect, straight, 0–7 mm, hairy. *Stem* erect, straight, terete, smooth; at 2nd stage green at top, with small orbicular yellow lenticels on lower part, on upper part simple yellow hairs. *Phyllotaxy* spiral, but 1st 2 leaves opposite or subopposite. *Leaves* exstipulate, simple, petiolate; petiole flattened above, convex beneath, green, hairy like stem; blade thin, pinninerved prominently on both surfaces. *1st Leaf* petiole short; blade ovate or oblong, with index $1\frac{1}{2}$ –3, 2 – $4\frac{1}{2}$ by 1 – $2\frac{1}{2}$ cm, having an acute top and an acute base narrowed into the petiole, entire or repand sometimes undulating up and down, slightly glossy dark green above, dull green below, sparsely hairy like stem or glabrous. *Highest leaves* (2nd stage) blade lanceolate, with an acuminate top and a taperpointed base narrowed into petiole, entire, glossy dark green above, slightly glossy green below, midrib beneath very sparsely hairy like stem. *Top of plant* hairy, green.

Seeds from 5 motherplants from different localities.

DRACONTOMELON BL.

B. II: 147, 151; K. et V. IV: 113

***Dracontomelon puberulum* MIQ. (*D. mangiferum* BL., nom. illeg.)**

B. II: 151; K. et V. IV: 114

Jav.: da-u, dahu, ra-u. *Mad.*: theuðh

Fig. 2

Size at 1st stage (1st 2 leaves only) 6–20 cm, $3\frac{1}{2}$ –10 cm above collet; at 2nd stage (± 12 leaves) ± 35 cm above collet. *Roots* dirty brown; tips white; primary root at 1st stage slightly flexuous, much thicker than lateral ones; collet gradually and moderately thickened sometimes at one side; lateral roots at 1st stage very numerous, very flexuous, sparsely or unbranched. *Hypocotyl* epigeous, erect, straight, 3–7 cm; at 1st stage 2 mm thick in lower part, tapering up- and downwards, terete, smooth, green, sometimes streaked with red, white at base, with simple patent very short colourless hairs. *Cotyledons* epigeous, 2, equal, or asymmetrical and one another's mirror image, foliaceous, petiolate; petiole ± 3 mm, 2 mm broad at base, near top broader and grading into blade, channelled, green, with simple very short colourless hairs; blade irregularly asymmetrical-ovate or rhomboid, flat above, globose beneath, lengthwise ridged beneath, with index 2 – $2\frac{1}{2}$, 9–14 by 5–7 mm, in centre $\pm 2\frac{1}{2}$ mm thick, fleshy, with an acuminate top, entire, on both surfaces dark dull green, with irregular red streak-shaped blotches beneath, hairy like petiole, ciliate. *Epicotyl* erect, straight,



Fig. 2. *Dracontomelon puberulum* a. young seedling, $1/1\times$; b. cotyledons, $1/1\times$; c. older seedling, $1/4\times$.

$\pm 1\frac{1}{2}$ cm, hairy like hypocotyl. *Stem* erect, straight, or spiral owing to obtusangular connection of internodes. *Phyllotaxy* spiral, but 1st 2 leaves opposite. *Leaves* exstipulate, imparipinnate. *1st 2 Leaves* 3-foliolate; rachis $\pm 1\frac{1}{2}$ cm, 1 mm thick, terete, smooth, green, hairy like hypocotyl; petiolules of lateral leaflets $\pm 2-3$ mm but of terminal leaflets $\pm 5-10$ mm, $\frac{1}{2}$ mm thick, other characters like those of rachis; blade of leaflets ovate or elliptic or oblong, asymmetrical in lateral leaflets with index ± 3 , ± 3 by 1 cm, in terminal leaflet largest, thin, having an acute top and in lateral leaflets an asymmetrical acute base, pinninerved and midrib prominent on both surfaces but lateral nerves prominent beneath, intramarginally nerved, coarsely serrate, both surfaces dull green and hairy like hypocotyl. *3rd Leaf* 2 pairs of leaflets. *Highest leaves* (2nd stage) ± 9 -foliolate; rachis thickened at base, terete, lengthwise 2-ridged in upper part, green but brownish green near top, hairy like hypocotyl; leaflets distichous-alternate sometimes opposite. *Lowest leaflets* petiolule $\pm \frac{1}{2}$ cm, terete, hairy like hypocotyl; blade of these leaflets asymmetrical-ovate, with index $\pm 1\frac{1}{2}$, ± 4 by $\pm 2\frac{1}{2}$ cm, thin, with an acuminate acute top and an asymmetrical base which is sometimes exculptate, pinninerved, prominently nerved on both surfaces, dull green above but nerves red, dull light green beneath, entire, both surfaces hairy like hypocotyl. *Terminal leaflet* petiolule $\pm 1\frac{1}{2}$ cm; blade lanceolate or obovate or obovate-oblong, with index ± 3 , ± 14 by $\pm 4\frac{1}{2}$ cm, base asymmetrical-acute or -rounded, margin entire but rarely near top coarsely serrate. *Top of plant* with dense white hairs.

Seeds from 3 motherplants from different localities.

GLUTA L.

B. II: 146, 150; K. et V. IV: 93

Gluta renghas L.

B. II: 150; K. et V. IV: 94

Jav.: ingas, rengas, rengas-tembaga

Fig. 3

Size at 1st stage (2-3 developed leaves only) 60-81 cm, 6-32 cm above collet; at 2nd stage (15-17 developed leaves) 70-107 cm above collet. *Plant* with greyish white latex in all parts. *Roots* brownish black; primary root at 1st stage slightly flexuous, much thicker than lateral ones; collet gradually and moderately thickened; lateral roots at 1st stage very numerous, very flexuous, patent, much branched. *Hypocotyl* hypogeous, very short. *Cotyledons* hypogeous, 2, their upper surfaces in close contact, thick-fleshy, together covered with testa, shortly petiolate, together globose, $\varnothing \pm 1\frac{1}{2}-2\frac{1}{2}$ cm. *Epicotyl* erect, 0-3 $\frac{1}{2}$ cm, terete. *Stem* erect, straight, terete, smooth; at 2nd stage brown near base, green near top. *Phyllotaxy* spiral; groups of developed leaves separated by longer internodes and scale-shaped leaves. *1st 5-9 Leaves* undeveloped, scale-shaped. *Developed leaves* exstipulate, simple, shortly petiolate; blade lanceolate,

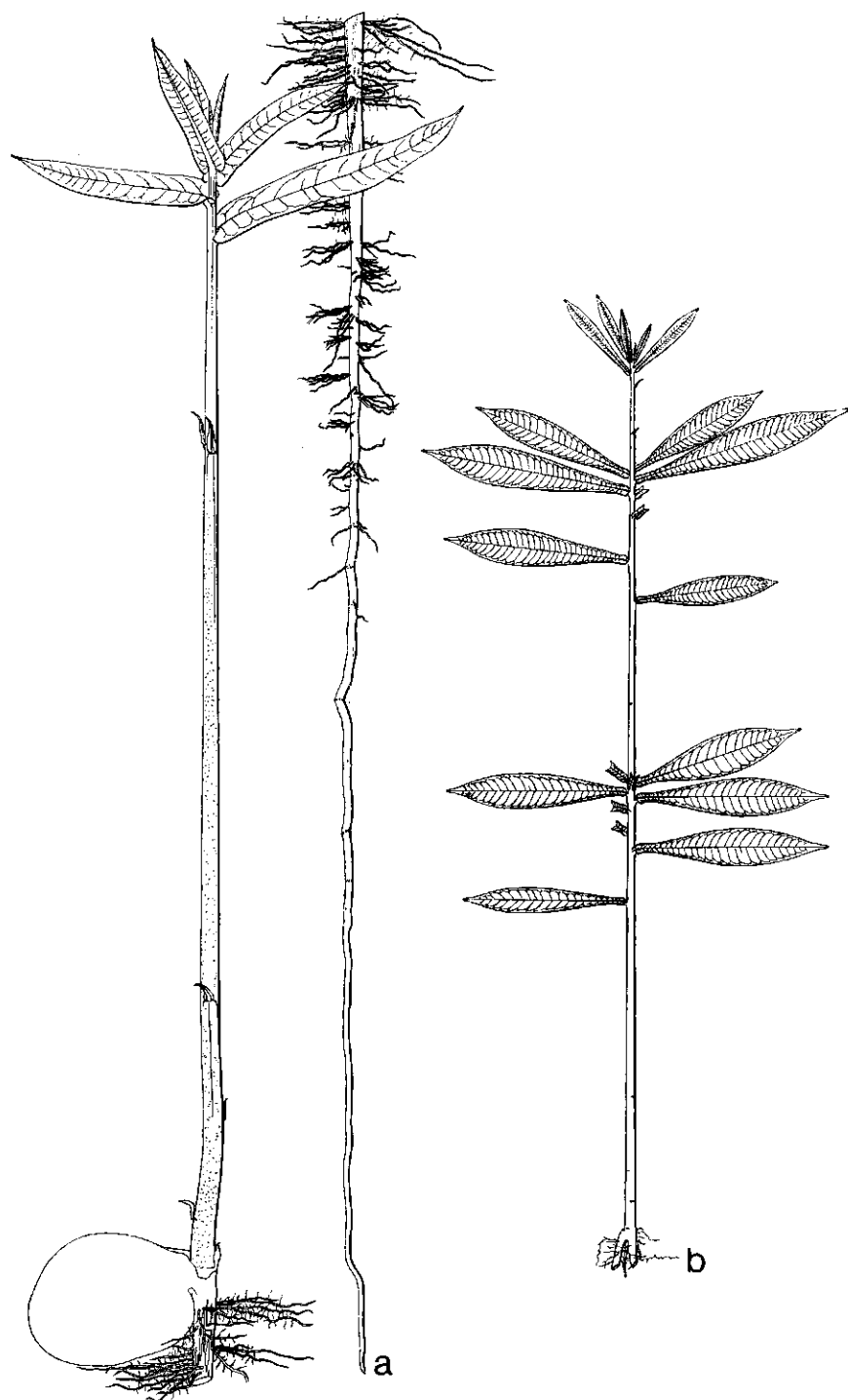


Fig. 3. *Gluta reinghas* a. young seedling, $1/2\times$; b. older seedling, $1/8\times$.

with index 5–9 in higher groups narrower than in lower ones, coriaceous, having an acuminate top, pinninerved, prominently nerved beneath, entire, slightly glossy dark green above, dull light green beneath, glabrous. *1st Developed leaf* blade $6\frac{1}{2}$ –18 by 1–2 $\frac{3}{4}$ cm, with acute top and rounded or slightly cordate eared base. *Highest leaves* (2nd stage) blade up to 25 by 4 $\frac{1}{2}$ cm, with acute or obtuse top and cordate eared base. *Top of plant* glabrous, green.

Seeds from 3 motherplants from different localities.

ANNONACEAE

B. I: 100; K. et V. IX: 269; LUBB. I: 103; TROUP I: 8

Cotyledons epigeous, 2, foliaceous, petiolate. *Phyllotaxy* spiral, but higher leaves often distichous-alternate. *Leaves* exstipulate, simple, petiolate, entire. *Stem* short-haired.

Cotyledons and(or) 1st leaf and(or) higher leaves present.

a. cot. 1 $\frac{1}{2}$ –2 cm long, glabrous; 1st leaf: blade elliptic or ovate, with index ± 2 ; higher leaves obovate or elliptic *Cananga odorata*

b. cot. > 2 cm long, hairy; leaves: blade with index > 2, ovate-oblong or ovate-lanceolate. *Saccopetalum horsfieldii*

CANANGA HOOK f. et THOMS.

B. I: 101, 105; K. et V. IX: 279; TROUP I: 9

Cananga odorata (LMK.) HOOK. f. et THOMS. (*Canangium odoratum* BAILL.)

B. I: 105; K. et V. IX: 279; TROUP I: 9

In many languages: kenanga. *E. Jav.:* wangs

Fig. 4

Size at 1st stage (1st leaf only) 13–26 cm, 3–6 $\frac{1}{2}$ cm above collet; at 2nd stage (13–15 leaves) 23–30 cm above collet. *Plant* fragrant. *Roots* white or off white, turning yellowish white; tips white; primary root at 1st stage slightly flexuous, slightly thicker than lateral ones; collet gradually and moderately thickened; lateral roots few, moderately flexuous, sparsely branched. *Hypocotyl* epigeous, erect, straight, 3–5 cm; at 1st stage 1 mm thick, tapering upwards, gradually thickened downwards, sometimes 4-angular near top, near base terete, dark red or green, white at base, glabrous. *Cotyledons* epigeous, 2, equal, or asymmetrical and one another's mirror image, petiolate; petiole 2 mm, breadth > thickness, red or green, glabrous; blade ovate or elliptic, with index 1 $\frac{1}{2}$ –2, 15–20 by 8–15 mm, thin, having a rounded obtuse top and a

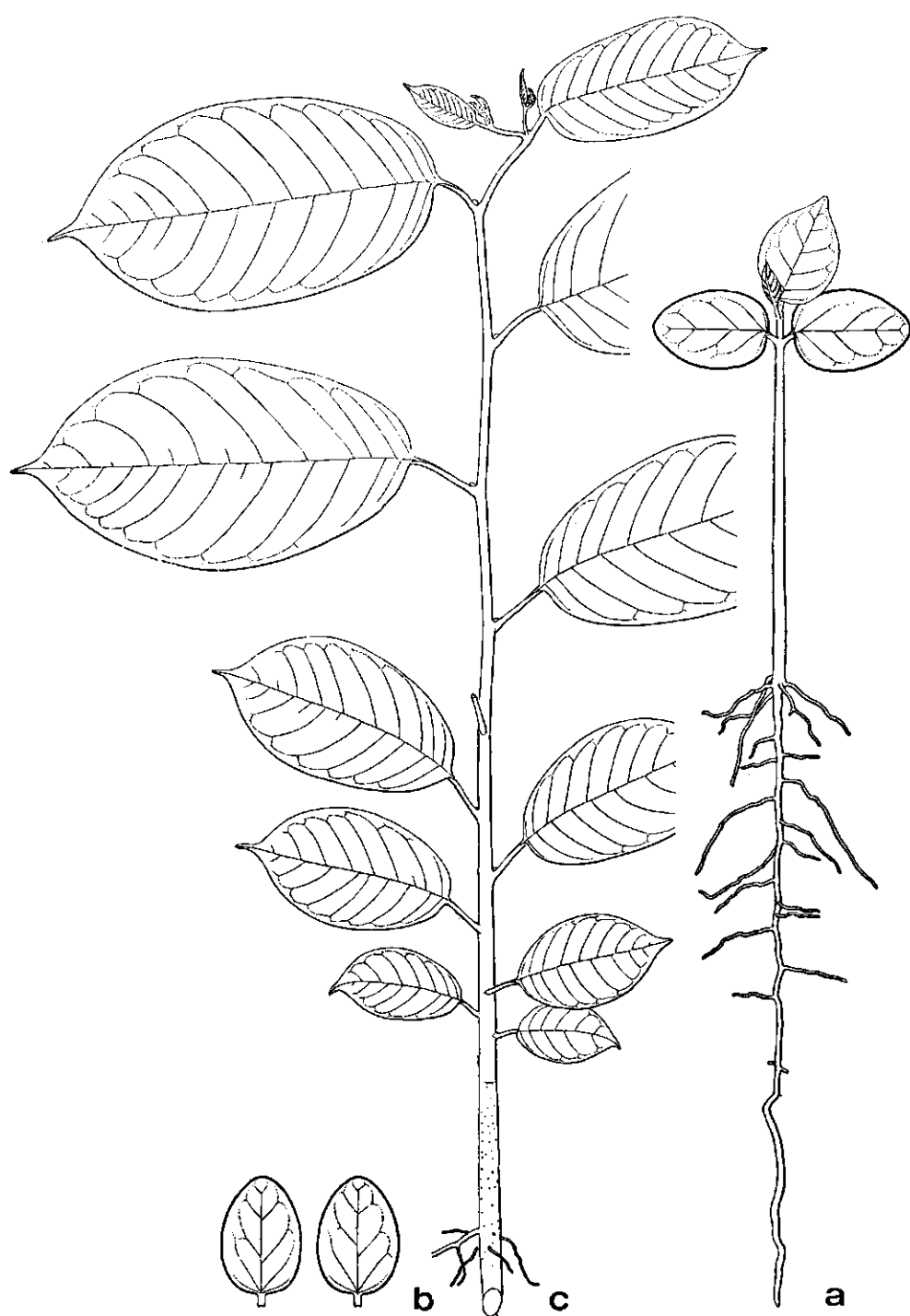


Fig. 4. *Cananga odorata* a. young seedling, $1/1\times$; b. cotyledons, $1/1\times$; c. older seedling, $1/2\times$.

rounded sometimes exculptate base, pinninerved but palmatinerved at base, entire, dull green, glabrous. *Epicotyl* $1\frac{1}{2}$ –3 mm. *Stem* erect; at 2nd stage spiral owing to obtusangular connection of internodes, terete, green or reddish brown, with simple short patent colourless hairs. *Phyllotaxy* spiral. *Leaves* exstipulate, simple, petiolate; petiole up to $2\frac{1}{2}$ cm, in 1st leaf 3–5 mm, flattened or slightly channelled above, convex beneath, green or brownish red, hairy like stem; blade of 1st leaf elliptic or ovate, of \pm 12th leaf obovate or elliptic, with index \pm 2, of 1st leaf 2 – $2\frac{1}{2}$ by 1 – $1\frac{1}{2}$ cm, of \pm 12th leaf up to $10\frac{1}{2}$ by 6 cm, thin, 1st leaf having an acute or acuminate obtuse top, \pm 12th leaf having an acuminate acute top and an acute or rounded base narrowed into petiole, pinninerved and (in higher leaves) nerves slightly prominent above but very prominent beneath, entire, both surfaces slightly glossy green, sometimes dull, especially on nerves hairy like stem. *Top of plant* hairy, green.

Seeds from 3 motherplants from different localities.

SACCOPETALUM BENN.

B. I: 101, 108; K. et V. IX: 341; TROUP I: 9

Saccopetalum horsfieldii BENN. (*Miliusa horsfieldii* (BENN.) BAILL. ex PIERRE)

B. I: 109

Sund.: kalak. *Jav.*: djanglot, kalak kembang, wanitan

Fig. 5

Size at 1st stage (1st leaf only) 18–30 cm, 7–11 cm above collet; at 2nd stage (4–9 leaves) 12–16 cm above collet; 1st branch not precisely in the axil of a leaf, which obscures the difference between stem and branch; in this description the longest one has been considered to be the main stem. *Roots* yellowish white turning pale yellow; tips orange; primary root at 1st stage moderately flexuous, much thicker than lateral ones; collet not or gradually and slightly thickened; lateral roots moderate in number, patent, moderately branched. *Hypocotyl* epigeous, erect, straight, sometimes slightly

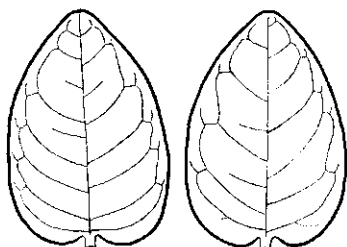


Fig. 5. *Saccopetalum horsfieldii* cotyledons, $1/1\times$.

curved at base, 4–7 cm; at 1st stage $2\frac{1}{2}$ mm thick, tapering upwards, terete, smooth, green, base brown; with simple patent colourless hairs. *Cotyledons* epigeous, 2, equal, or slightly asymmetrical and one another's mirror image, petiolate; petiole 1 mm, breadth > thickness, green, hairy like hypocotyl; blade cordiform, thin, with index 1–1.6, 22–33 by 17–25 mm, having an acute or obtuse top and an exculptate base, pinninerved and midrib prominent on both surfaces, entire, both surfaces slightly glossy green; midrib on both surfaces hairy like hypocotyl. *Epicotyl* $1\frac{1}{2}$ – $2\frac{1}{2}$ cm. *Stem* erect; at 2nd stage feather-shaped with a sideward bend, terete, smooth, green, near base brown simple patent colourless hairs and many of them uncinat. *Phyllotaxy* spiral, above 1st branch distichous-alternate. *Leaves* exstipulate, simple, petiolate; petiole 1–2 mm, green, hairy like stem; blade ovate-oblong or ovate-lanceolate, with index $2-3\frac{1}{4}$, to $4\frac{3}{4}$ by $1\frac{1}{2}$ cm, thin, having a taperpointed sometimes slightly acuminate obtuse sometimes acute mucronate top and in the 1st leaf rounded sometimes slightly cordate base and in higher leaves a cordate rounded lobate base, in higher leaves above 1st branch an asymmetrical and at posterior side a lower and broader base, pinninerved, prominently nerved beneath, entire, slightly glossy green above, dull beneath, ciliate, both surfaces hairy like stem especially on midrib but not uncinately. *Top of plant* yellowish, in older plants brown, with dense hairs.

Seeds from 1 motherplant.

APOCYNACEAE

B. II: 218; K. et V. I: 81; LUBB. II: 216; TROUP II: 663

ALSTONIA R. BR.

B. II: 220, 226; K. et V. I: 115; TROUP II: 668

Roots white turning yellow or yellowish white; collet gradually and slightly thickened. *Hypocotyl* epigeous, erect, straight. *Cotyledons* epigeous, 2, equal, foliaceous, petiolate; blade oblong or ovate-oblong, thin, having an obtuse top and a rounded base narrowed into the petiole, pinninerved, entire. *Stem* erect. *Phyllotaxy* lower leaves decussate. *Leaves* exstipulate; developed ones simple, petiolate, pinninerved. *Plant* with white latex.

Cotyledons and/or 1st leaf present.

a. hypocotyl and base of cot. blade very short-haired; hypocotyl terete

A. spectabilis

b. hypocotyl and cot. blade glabrous; hypocotyl at 1st stage much laterally compressed with 2 lengthwise ridges ending between cot. *A. angustiloba*

***Alstonia angustiloba* MIQ. (*Paladelphina angustiloba* (MIQ.) RICH.)**

B. II: 226; K. et V. I: 117; TROUP II: 668. Rather similar to *Alstonia scholaris* (L.) R. BR. and not distinguished from it by Indonesians.

Indonesian names of *A. scholaris*: *Mal.*: kaju gabus, pulai. *Sund.*: lame. *Jav.*: pule. *Mad.*: polaj. *Daj. S.E. Born.*: hanja lutung (?). *Mak.*: rita. *Alf. Amb.*: rite. *Banda:* tewer. *Ternate*: hange

Fig. 6

Size at 1st stage $3\frac{1}{2}$ –18 cm, $1\frac{1}{2}$ –4 cm above collet; at 2nd stage (8–12 developed leaf-whorls) 27–68 cm above collet. *Plant* with white latex. *Roots* white turning yellowish white; primary root at 1st stage very flexuous, sparsely or unbranched, whether or not slightly thicker than lateral ones; collet gradually and slightly thickened; lateral roots at 1st stage few, very flexuous, sparsely branched. *Hypocotyl* epigeous, erect, straight, 15–32 mm; at 1st stage 1 mm thick, laterally much compressed, with 2 sharp lengthwise ridges ending between cotyledons, pale green, white at base, glabrous. *Cotyledons* epigeous, 2, equal, petiolate; petiole $1\frac{1}{2}$ –2 mm, breadth > thickness, green; blade ovate-oblong, with index 2–3, 7–11 by $2\frac{1}{2}$ –5 mm, thin, having an obtuse top and a rounded base narrowed into petiole, pinninerved, prominently nerved beneath, entire, dull green, glabrous. *Epicotyl* 6–13 mm, glabrous. *Stem* erect, straight; at 2nd stage terete, smooth, green at top, grey below, with linear rhomboid or orbicular or lengthwise elliptic white or yellowish white lenticels, glabrous. *Phyllotaxy* lowest leaves decussate, higher ones in alternating whorls, 5th or 9th to 7th or 12th developed ones 3 in whorl, succeeding ones 4 in whorl and more. *Leaves* exstipulate; developed leaves alternating with scale-shaped ones inserted a little higher; branches in axil of scale-shaped leaves. *Developed leaves* simple, petiolate; petiole green, glabrous; blade thin, having an obtuse top and an acute base narrowed into petiole, pinninerved (midrib prominent on both surfaces), entire, glabrous. *1st Developed leaf* petiole 2–5 mm; blade elliptic or ovate, with index $1\frac{1}{2}$ –2, 7–14 by 5–8 mm, both surfaces dull green. *Developed leaves* 4 in whorl; petiole ± 1 cm, 2 mm thick, flattened above, convex beneath, appendix at base above; blade lanceolate or oblong, with index ± 3 , up to 18 by 6 cm, having a shortly acuminate obtuse top, with very numerous parallel lateral nerves, intramarginally nerved, dull dark green above, dull greyish green beneath. *Top of plant* green, glabrous; young leaves glossy green.

Seeds from 2 motherplants from different localities.

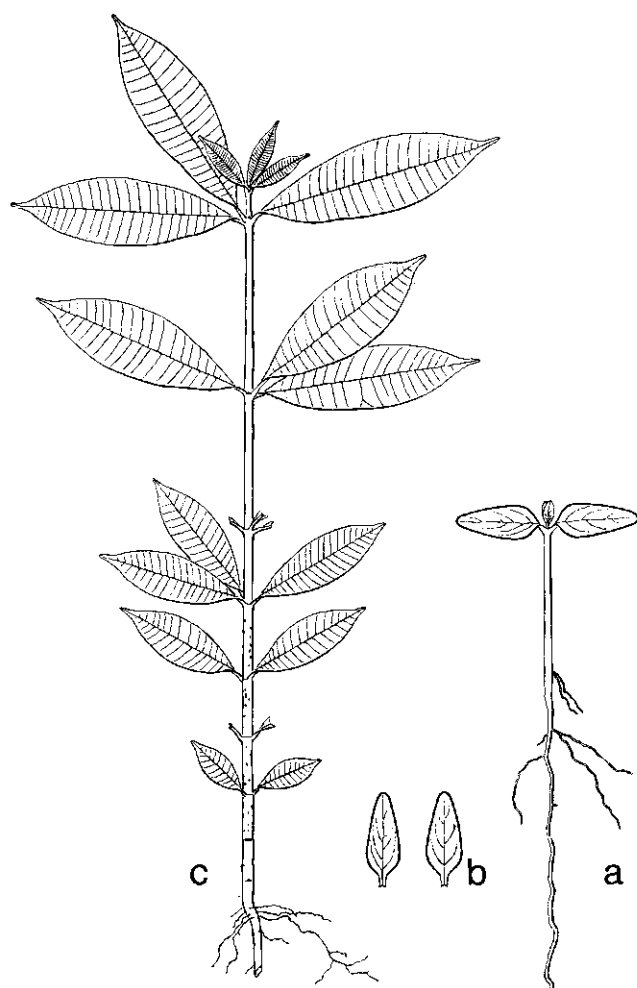


Fig. 6. *Alstonia angustiloba* a. young seedling, $1/1 \times$; b. cotyledons, $1/1 \times$; c. older seedling, $1/4 \times$.

***Alstonia spectabilis* R. BR. (*A. villosa* BL.)**

B. II: 226; K. et V. I: 122

Jav.: balung, ilat-ilat, legaran. Timor: pole

Fig. 7

Size at 1st stage (1 pair of leaves only) 5–16½ cm, 1¼–3½ cm above collet. Plant with white latex. Roots white turning yellow; primary root at 1st stage very flexuous, whether or not slightly thicker than lateral ones; collet gradually and slightly thickened; lateral roots at 1st stage moderate in number, very flexuous, moderately or unbranched. Hypocotyl epigeous, erect, straight, 1½–3 cm; at 1st stage ½–1 mm thick, tapering upwards, terete, smooth, pale green, base white, with simple very short

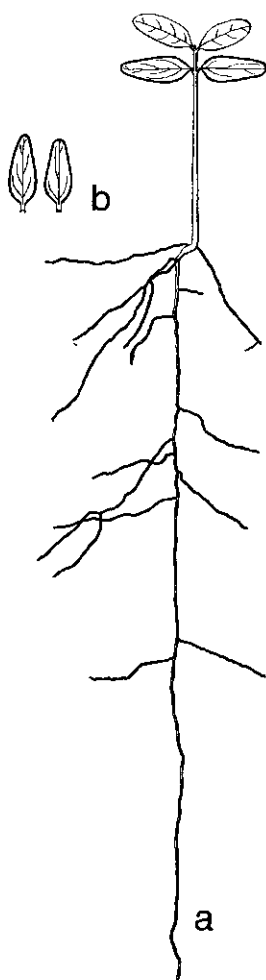


Fig. 7. *Alstonia spectabilis* a. young seedling, 1/1 × ; b. cotyledons 1/1 × .

dense patent colourless hairs. *Cotyledons* epigeous, 2, equal, shortly petiolate; blade oblong or ovate-lanceolate, with index $2\frac{1}{2}$ –3, 9–10 by 3–4 mm, thin, having an obtuse top and a rounded base narrowed into petiole, pinninerved, entire, both surfaces dull green, hairs near base on midrib like those on hypocotyl. *Stem* erect, green, glabrous. *Phyllotaxy* of lowest leaves decussate. *1st Pair of leaves* exstipulate, simple, petiolate; petiole short, blade oblong or lanceolate, with index 3, 8–12 by 3 mm, thin, having an obtuse top and an acute base narrowed into petiole, pinninerved, entire, dull green, glabrous. *Top of plant* green, glabrous.

Seeds from 1 motherplant. N.B. No 2nd stage obtained.

ARAUCARIACEAE

B. I: 87

AGATHIS SALISB.

B. I: 88

Agathis dammara (LAMB.) L. C. RICH. (*A. alba* JEFFREY, *A. loranthifolia* SALISB.)

B. I: 89

Mal.: pohon damar daging, damar putih (*Mol.*), radja kaju. *Bangka*: bebulu, bebules.

W. Born.: subung. *E. Borneo*: kaju tjina

Fig. 8

Size at 1st stage (2 leaves only) 13–26 cm, 6–12 cm above collet; at 2nd stage (3–4 branches) ± 29 cm above collet. Strongly fragrant of resin when crushed. *Roots* reddish brown; tips white; primary root at 1st stage moderately flexuous, moderately thicker than lateral ones; collet not thickened; lateral roots at 1st stage moderate in number, very flexuous, moderately branched. *Hypocotyl* epigeous, erect, straight, 5–8 cm; at 1st stage 2 mm thick, not thickened at base, terete, near top laterally compressed, smooth, green or brown, white at base, glabrous. *Cotyledons* epigeous, 2, equal, sessile; blade lanceolate or ovate-lanceolate, with index 3–5, $3-6\frac{1}{2}$ by $1-1\frac{3}{4}$ cm, having an obtuse top and a rounded semi-amplexicaul base, coriaceous, palmately multinerved, no main nerve, entire, dark green slightly glossy above, pruinose beneath, glabrous. *Epicotyl* $\frac{1}{2}$ – $1\frac{1}{2}$ cm. *Stem* erect; at 2nd stage smooth, green, glabrous, spiral owing to obtusangular connection of internodes. *Phyllotaxy* along main stem spiral or alternate or whorled, along lateral branches distichous-opposite. *Leaves* on main stem scale-shaped, on branches foliaceous; 1st branch in axil of 2nd leaf; 2 pairs of leaves on each of lower branches, largest on the highest of these branches; exstipulate, simple, shortly petiolate; petiole $\pm \frac{1}{2}$ cm, smoothly grading into blade; blade ovate-lanceolate, coriaceous, having a taperpointed acute (in lowest leaves acuminate acute)

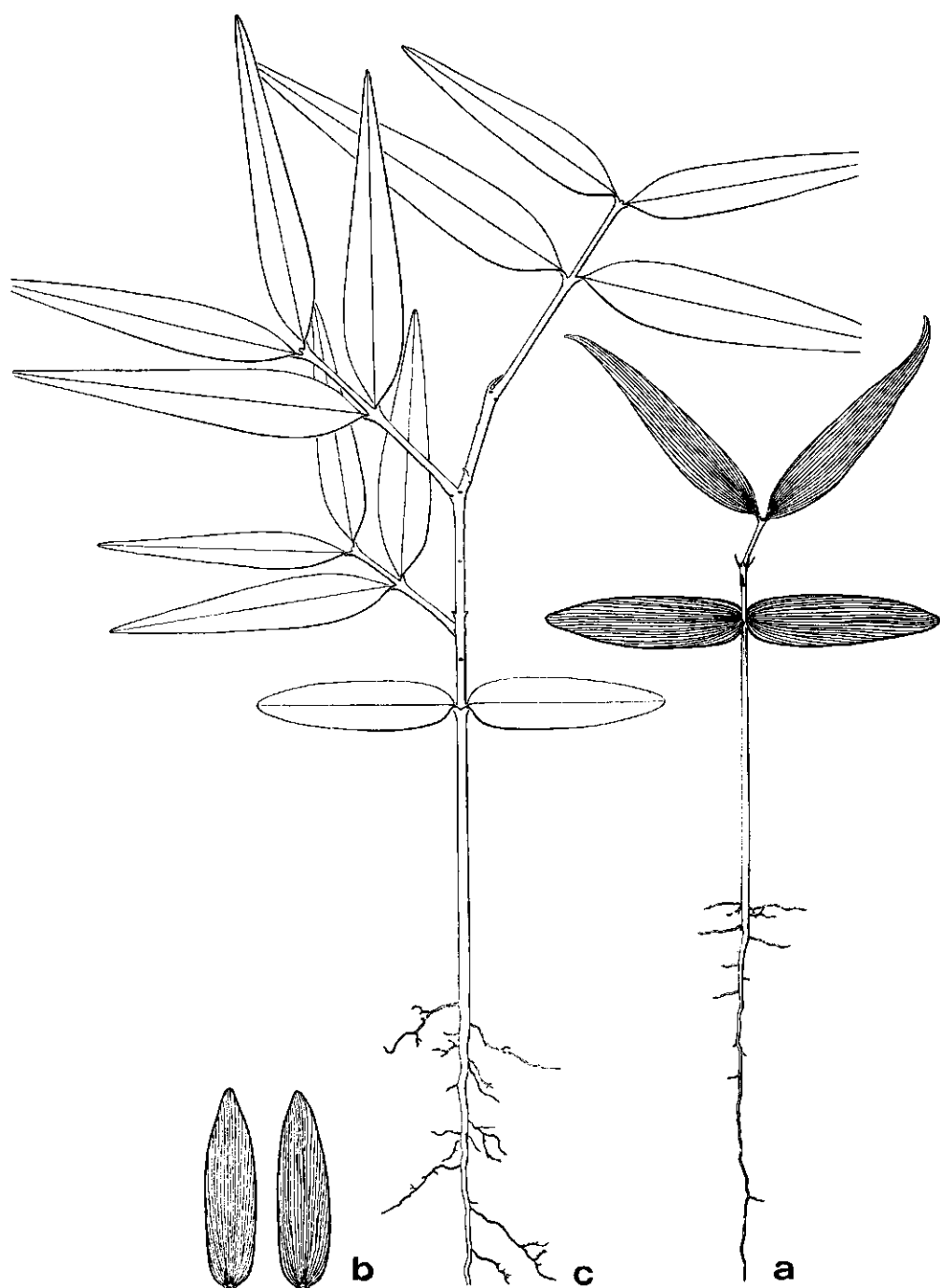


Fig. 8. *Agathis dammara** a. young seedling, 1/1 × ; b. cotyledons, 1/1 × ; c. older seedling, 1/1 × .

* In this reproduction of the original drawing dimensions are $\pm 1/5$ too small.

top and an acute base, palmately multinerved, no midrib, entire, green, slightly glossy above, pruinose beneath, glabrous; on 1st branch index 5–7, $5\frac{1}{2}$ –7 by $\frac{3}{4}$ – $1\frac{1}{4}$ cm, next ones larger. *Top of plant* with scale-shaped leaves.

Seeds from 2 motherplants from different localities.

ARECACEAE (PALMAE)

B. I: 4, III: 165; LUBB. II: 580; TROUP III: 965

CORYPHA L.

B. III: 166, 172; TROUP III: 976

Corypha utan LMK. (*C. elata* ROXB., *C. gebanga* BL. (SPHALM.), *C. gembanga* (BL.) BL., *C. sylvestris* (BL.) BL. nom. illeg.)

B. III: 172

Mal.: gawang (*Tim.*), putjuk (*Bat.*). *Atjéh.*: ibus. *Batak.*: ibus. *Sund.*: gebang. *Jav.*: gebang, putjuk. *Mad.*: potjok. *Mak.*: kuwala. *Bug.*: aka (*Wadjo*), to-u (*Boni*)

Fig. 9

Size at 1st stage (one leaf only) up to 65 cm, 15 cm above collet; at 2nd stage (± 10 –11 leaves) a little higher. *Roots* yellowish brown turning grey; primary root at 1st stage up to 43 cm; collet gradually and slightly thickened; lateral roots at 1st stage moderate in number, branched; adventitious roots at 1st stage few or absent; at 2nd stage primary root still present but dead, replaced by numerous adventitious roots first smooth turning transversely wrinkled. *Hypocotyl* hypogeous, erect, straight, very short; at 1st stage 4 mm thick, terete, smooth, yellowish brown, with simple white hairs. *Cotyledon* hypogeous or semihypogeous, 1, with top inside testa, petiolate; petiole $5\frac{1}{2}$ cm sheathed, irregularly terete, thickened under the opening of the seed, yellowish brown or dirty yellow, with simple short hairs; top of petiole constricted in opening of seed, globose above opening, 7 mm thick, flattened above and beneath, yellowish white. *Epicotyl* very short, adnate to sheath of cotyledon. *Stem* erect, straight, very short. *Phyllotaxy* spiral. *Leaves* simple, curvinerved, entire. *1st Leaf* sheath 6 cm long; blade lanceolate, ± 2.5 cm by ± 6 mm, having an acute top and a base grading into the sheath, soon brown and dried up, glabrous. *Highest leaves* (2nd stage) sheath almost totally amplexicaul, white; petiole channelled, tapering upwards, on edges barbed with small hooks, green, glabrous; blade palmately partite, in higher leaves more lobes than in lower ones, lanceolately lobed, lengthwise plicate, coriaceous, crenate at top, prominently nerved beneath, dark green, dull above, glossy beneath, sparsely hairy on nerves; as from ± 6 th or 10th leaf 3-lobate; 3-lobed leaves: petiole 32–60 cm, $\frac{1}{2}$ –1 cm thick, lobes with index 5–7, 26–36 by

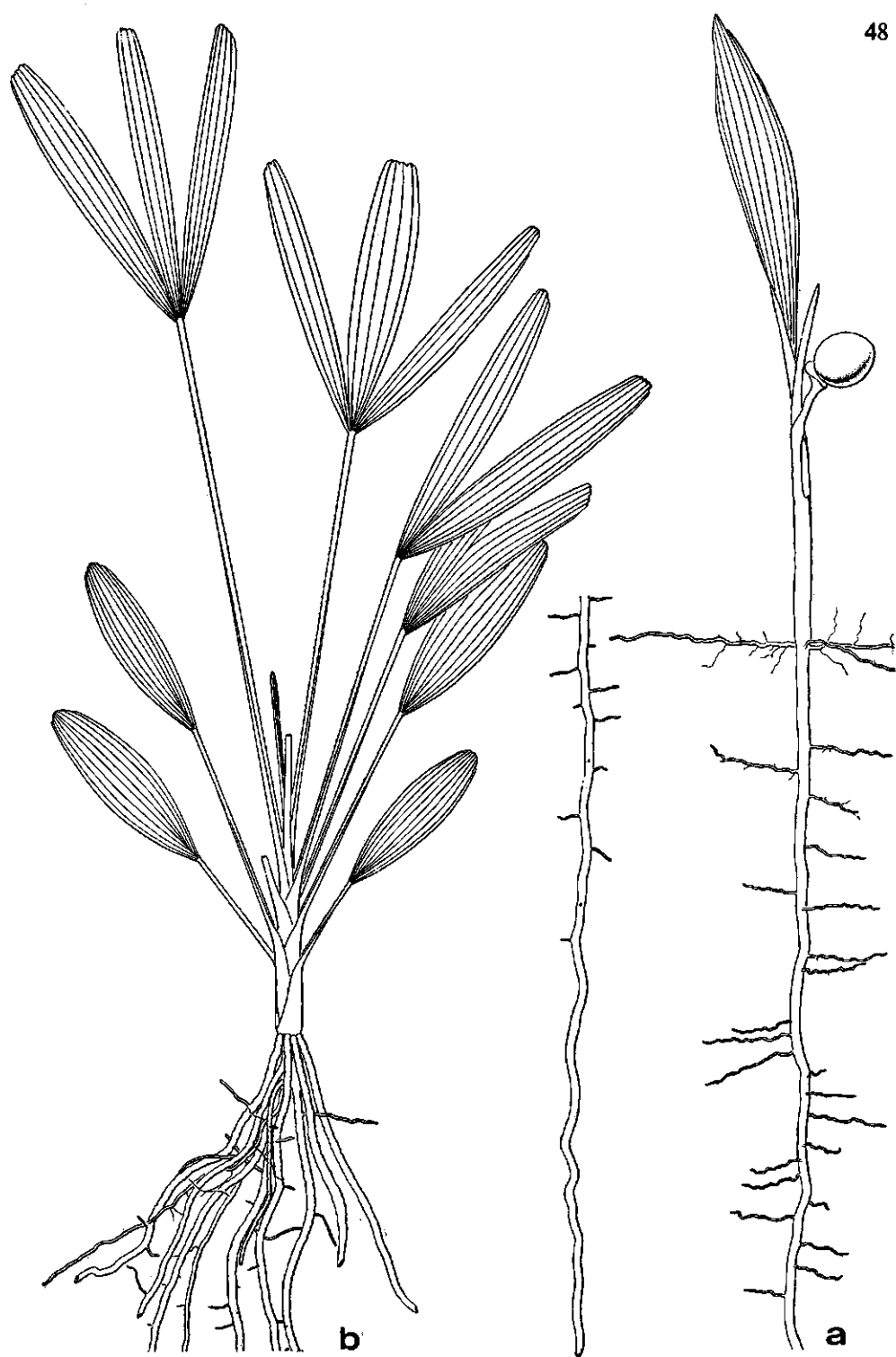


Fig. 9. *Corypha utan* a. young seedling, $1/2 \times$; b. older seedling, $1/8 \times$.

4-7½ cm. *Top of plant green.*

Seeds from 1 motherplant.

ASTERACEAE (COMPOSITAE)

B. II: 362, III: 655; LUBB. II: 98

Cotyledons epigeous, 2, equal, foliaceous, thin, small, petiolate. *Stem* terete, hairy. *Phyllotaxy* decussate, or spiral but 1st 2 leaves opposite. *Leaves* exstipulate, simple, petiolate. *First pair of leaves* very small.

Cotyledons and (or) 1st pair of leaves and (or) higher leaves (2nd stage) present

a. cot. blade top emarginate; 1st pair of leaves: blade palmately 3-nerved, entire or coarsely serrate; higher leaves: decussate, blade ovate coarsely serrate, base acute *Eupatorium inulifolium*

b. cot. blade top obtuse; 1st pair of leaves: blade 1-nerved, dentate; higher leaves: spirally arranged; blade elliptic or obovate dentate, base acuminate acute . . .

Pluchea indica

EUPATORIUM L.

B. II: 364, 377

Eupatorium inulifolium H. B. K. (*E. pallescens* DC., *E. javanicum* BOERL.)

B. II: 379

Sund.: babandjaran, darismin, ki dajang, k. ungkluk, k. papatong, k. rinju, papa tetan
Fig. 10

Size at 1st stage (1st pair of leaves only) 5½-16 cm, ½-2 cm above collet; at 2nd stage (8-11 pairs of leaves) 28-60 cm above collet. *Roots* white turning off white; primary root at 1st stage moderately flexuous, whether or not slightly thicker than lateral ones; collet gradually and slightly thickened; lateral roots at 1st stage few, moderately flexuous. *Hypocotyl* epigeous, erect, straight; at 1st stage 4-17 mm, ¼-½ mm thick, not thickened at base, white or red, glabrous. *Cotyledons* epigeous, 2, equal, foliaceous, petiolate; petiole 1 mm, green, glabrous; blade ovate, with index 1¼-1½, 3-3½ by 2-3 mm, thin, having an emarginate top and a rounded base narrowed into petiole, entire, dull green, glabrous. *Epicotyl* erect, straight, 1-4 mm, terete, with simple patent colourless hairs. *Stem* erect, straight, terete; at 2nd stage finely lengthwise ridged, green, hairy like hypocotyl. *Phyllotaxy* decussate. *Leaves* exstipulate, simple, petiolate; petiole green, hairy like stem; blade ovate, thin, both surfaces dull green and hairy like epicotyl. *1st Pair of leaves* petiole 2 mm; blade with index 1¼-1½, 4-5

by 3–4 mm, having an obtuse top and a rounded base narrowed into petiole; palmately 3-nerved, entire or coarsely serrate. *Highest leaves* (2nd stage) petiole flattened above convex beneath; blade ovate slightly or more distinctly 3-angular, having a taperpointed acute top and an acute base narrowed into petiole, pinninerved, near base 2 thick lateral nerves, coarsely serrate; largest leaf: petiole $1\frac{1}{2}$ –4 cm, index $1\frac{1}{3}$ – $1\frac{2}{3}$, $4\frac{1}{2}$ – $7\frac{1}{2}$ by 3– $4\frac{1}{2}$ cm. *Top of plant* hairy.

Seeds from 2 motherplants from different localities.

PLUCHEA CASS.

B. II: 369, 390

Pluchea indica (L.) LESS.

B. II: 391

Jav.: beluntas, luntas

Fig. 10

Size at 1st stage (1st 2 leaves only) ± 3 cm, $\frac{1}{2}$ cm above collet; at 2nd stage (± 17 leaves) ± 20 cm above collet. *Roots* white turning off white; primary root at 1st stage very flexuous, moderately thicker than lateral ones; collet slightly thickened into a disk; lateral roots at 1st stage few. *Hypocotyl* epigeous, erect, straight, ± 2 mm; at 1st stage $\pm \frac{1}{2}$ mm thick, slightly thickened into a disk at base, terete, smooth, white, glabrous. *Cotyledons* epigeous, 2, equal, foliaceous, petiolate; petiole $\pm \frac{1}{2}$ mm, broadened, green, glabrous; blade ovate, ± 2 by $1\frac{1}{2}$ mm, thin, having an obtuse top and a base narrowed into petiole, entire, dull green on both surfaces, glabrous. *Epicotyl* erect, straight, very short, terete, glabrous. *Stem* erect, straight; at 2nd stage terete, smooth, green, with simple white hairs. *Phyllotaxy* spiral but 1st 2 leaves opposite. *Leaves* exstipulate, simple, petiolate; petiole pale green; blade thin, having an acute top and an acuminate base narrowed into petiole, dentate, dull green on both surfaces, both surfaces with simple white hairs or glabrous. *1st 2 Leaves* petiole ± 1 mm; blade elliptic, with index $1\frac{1}{3}$, ± 4 by 3 mm, 1-nerved prominently beneath. *Highest leaves* (2nd stage) petiole flattened above, convex beneath, hairy; blade elliptic or obovate, having an acute mucronate top, pinninerved, midrib prominent on both surfaces but lateral nerves prominent beneath; largest leaf: petiole ± 1 cm, 2 mm thick; blade index 2, ± 8 by 4 cm. *Top of plant* with woolly hairs.

Seeds from 1 motherplant.

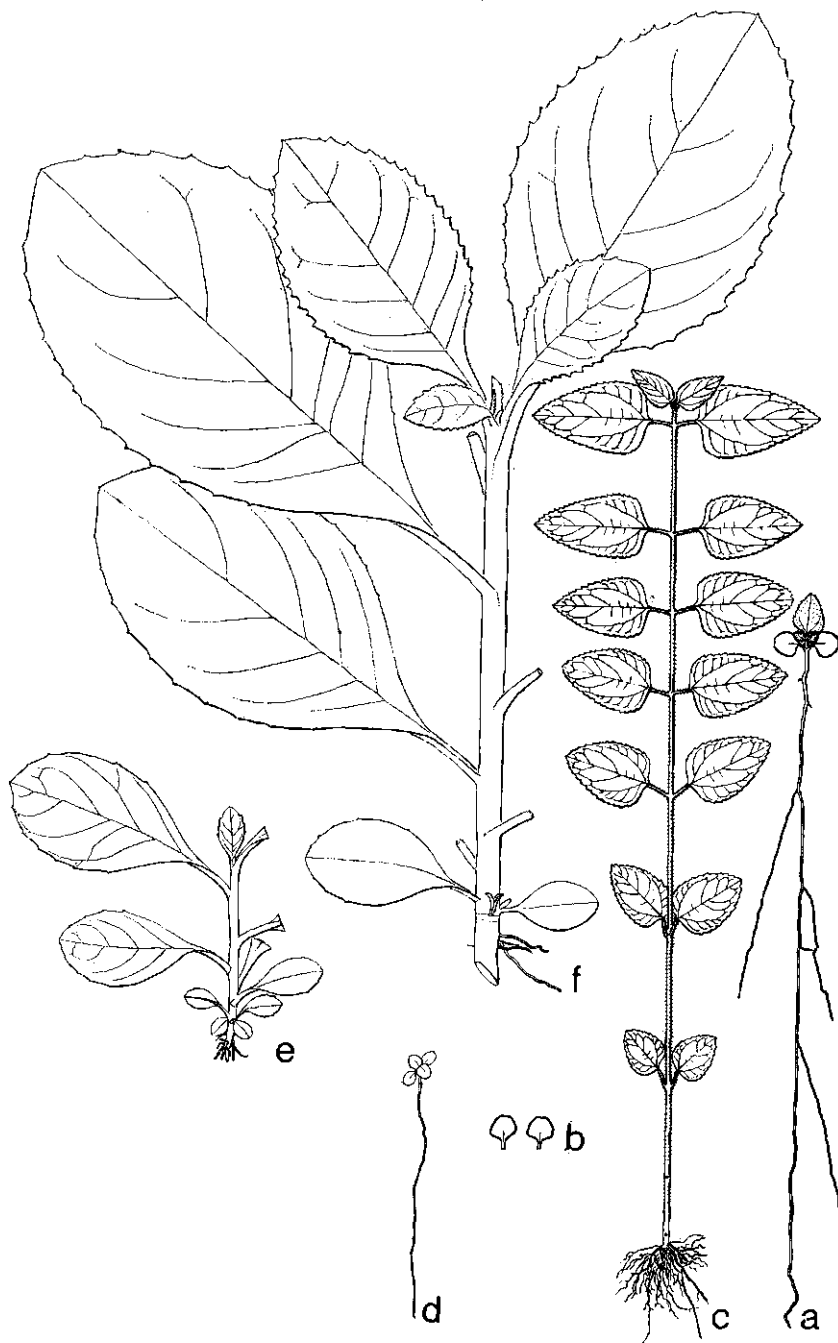


Fig. 10. *Eupatorium inulifolium* a. young seedling, $1/1\times$; b. cotyledons, $1/1\times$; c. older seedling, $1/4\times$. *Pluchea indica* d. young seedling, $1/1\times$; e. seedling with fullgrown 1st leaf, $1/1\times$; f. older seedling $1/1\times$.

BIGNONIACEAE

B. II: 534; K. et V. I: 64; LUBB. II: 332; TROUP II: 684

RADERMACHERA Z. et M.B. II: 534, 535, 540; K. et V. I: 71, ? *Stereospermum* CHAM; LUBB. II: 342, ? *Spathodea*; TROUP II: 684, ? *Stereospermum*.**Radermachera gigantea** (BL.) MIQ.B. II: 541; K. et V. I: 72 (*Stereospermum hypostictum* Miq.)*Mal.*: tuwi, t. batu. *Jav.*: bedali, dali, gedali, kedali. *Sund.*: ki padali. *Mad.*: kaju raras, karpote. *Alf. Minah.*: kutu-kutu, ma-atu, nahatus, wo-wohan

Fig. 11

Size at 1st stage (1st 2 leaves only) up to 5½ cm, 12–17 mm above collet; 2nd stage (12–14 leaves) 8–12 cm above collet. *Roots* off white turning yellowish white; primary root at 1st stage very flexuous, not thicker than lateral ones, usually poorly developed and replaced; collet gradually but slightly thickened; lateral roots moderate in number, very flexuous, sparsely branched. *Hypocotyl* epigeous, erect, straight, 9–15 mm; at 1st stage ½–1 mm thick, 4-angular, pale green, white at base, with simple very short colourless hairs. *Cotyledons* epigeous, 2, equal, petiolate; petiole ± 2 mm, green, hairy like hypocotyl; blade subreniform, with index $\frac{2}{3}$ – $\frac{4}{5}$, 4–6 by 6–10 mm (dimensions of general shape, i. e. as if top not emarginate), thin, deeply emarginate at top and thus 2-lobed, at base slightly exculptate and narrowed into petiole, palmately nerved but nerves indistinct, entire, dull green on both surfaces, ciliate, above near base sparsely hairy like hypocotyl. *Epicotyl* ± 4 mm; at 1st stage with simple hairs. *Stem* erect; at 2nd stage sometimes spiral owing to obtusangular connection of internodes, terete, laterally compressed under nodes, smooth, glossy, green, glabrous. *Phyllotaxy* spiral but 1st 2 leaves opposite. *Leaves* exstipulate; lowest leaves simple, petiolate; followed by imparipinnate ones, first 3-foliolate ones, then leaves possessing 2 pairs of lateral leaflets, upwards as from ± 12th or 14th leaf imperfectly impari-bipinnate with 2 pairs of leaflets 1st order. *1st 2 Leaves* petiole 3–4 mm, channelled, green, sparsely hairy like epicotyl; blade elliptic, with index ± 1½–1¼, 9–12 by 7–9 mm, thin, having an obtuse top and an acute narrowed base, pinninerved and midrib prominent beneath, serrate, dull green above, dull greyish green beneath, midrib beneath sparsely hairy. *Imperfectly impari-bipinnate leaves* rachis ± 11–16 cm, deeply channelled, green, glabrous; leaflets 1st order opposite, 2 pairs, in lowest pair with 1 pair 2nd order; rachis 2nd order channelled, green, glabrous; leaflets 2nd order opposite, petiolulate; blades ovate-oblong or ovate, thin-coriaceous, having an acuminate acute top and an acute narrowed base, pinninerved sunk above and prominently beneath, serrate, glossy green above, dull greyish green beneath, glabrous. *Top of plant* at 1st stage hairy, turning glabrous, green.

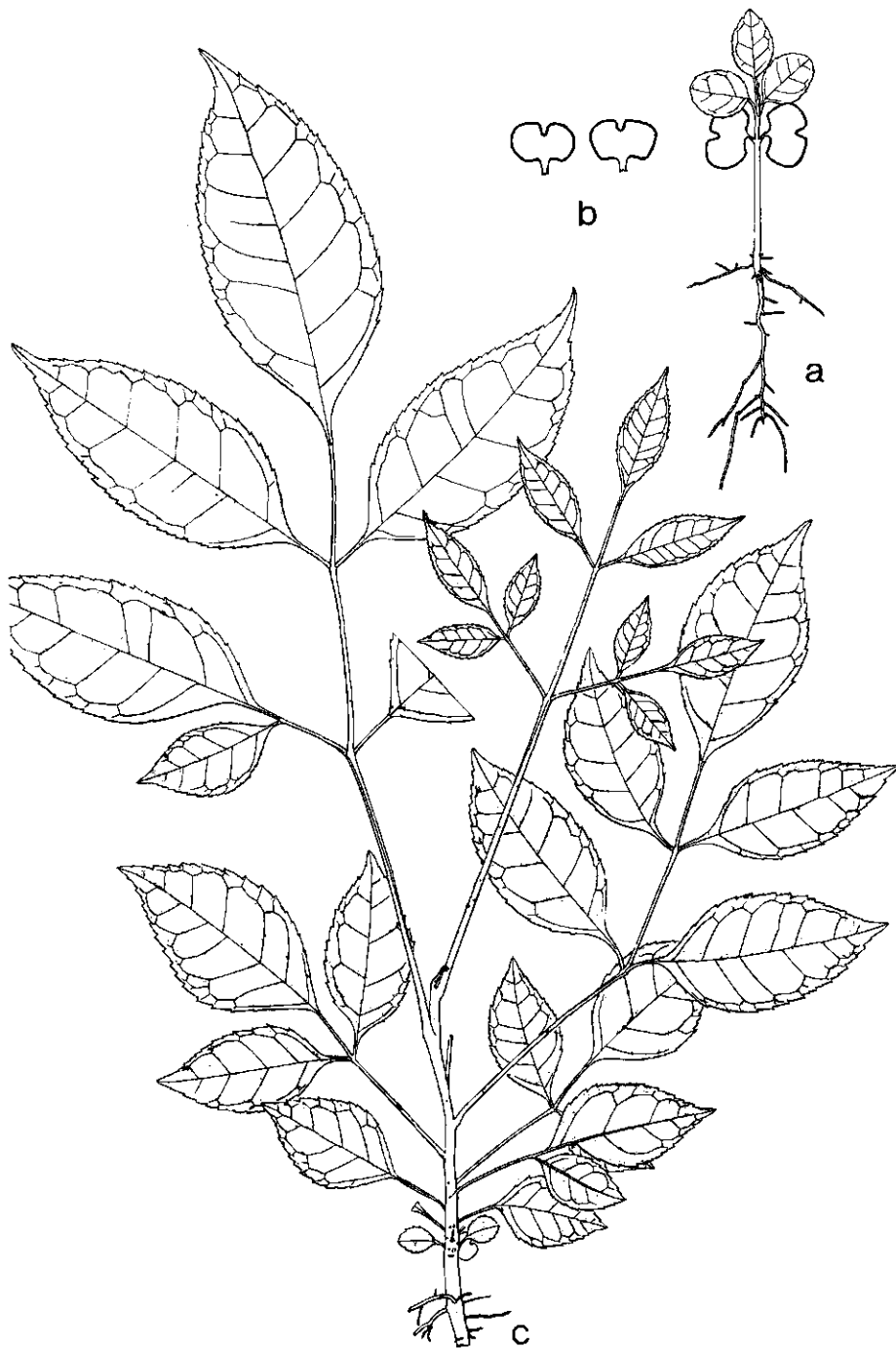


Fig. 11. *Radermachera gigantea* a. young seedling, $1/1 \times$; b. cotyledons, $1/1 \times$; c. older seedling, $1/2 \times$.

Seeds from 3 motherplants from different localities.

BOMBACACEAE

B. I: 416, III: 647; K. et V. II: 102, *Malvaceae*; LUBB. I: 243, *Malvaceae*; TROUP I: 135, *Malvaceae*

Cotyledons in *Bombax ceiba* epigeous and in *Durio zibethinus* usually left in the earth and torn off from the erecting epigeous hypocotyl, 2, petiolate, foliaceous or thick-fleshy. *Stem* glabrous or peltately hairy. *Phyllotaxy* spiral. *Leaves* stipulate, simple or palmately compound, 1st leaves whether or not scale-shaped.

Cotyledons and(or) 1st leaf and(or) higher leaves present

1. a. cot. foliaceous; 1st leaf developed; leaves palmately compound
Bombax ceiba
- b. cot. thick-fleshy; 1st leaf scale-shaped; developed leaves simple
Durio zibethinus

BOMBAX L.

B. I: 417, III: 647; K. et V. II: 121; TROUP I: 135

***Bombax ceiba* L.** (*B. malabaricum* DC., *Gossampinus malabarica* (DC.) MERR., *Salmaalina malabarica* (DC.) SCHOTT et ENDL.)

B. I: 418, III: 647; K. et V. II: 122; TROUP I: 135, fig. 60

Mal.: kapok kalingi (*Timor*), k. utan (*Djakarta*). *Sund.*: dangdeur, d. gede, d. leuweung
Jav.: randu agung, r. alas, r. wana. *Mad.*: nangher

Fig. 12

Size at 1st stage (1st leaf only) ± 35 cm, $7\frac{1}{2}$ –10 cm above collet; at 2nd stage (9–13 leaves) 29–47 cm above collet. *Roots* yellow turning dirty yellow; primary root at 1st stage very flexuous, slightly thicker than lateral ones; collet gradually and moderately but at 2nd stage sometimes considerably thickened; lateral roots moderate in number, many from collet, very flexuous, unbranched. *Hypocotyl* epigeous, erect, straight, 5–7 cm; at 1st stage $1\frac{1}{2}$ –2 mm thick, tapering upwards, terete but near top slightly and laterally compressed, smooth, pale green, white at base, glabrous (TROUP: glabrous or minutely pubescent). *Cotyledons* epigeous, 2, equal, simple, petiolate; petiole 5–13 mm, $\frac{1}{2}$ mm thick, $1\frac{1}{2}$ mm broad, channelled, green, glabrous; blade ovate (TROUP: cordate), with index ± 1 or slightly > 1 , 3–4 by $2\frac{1}{4}$ – $3\frac{1}{2}$ cm, thin, having an acuminate obtuse (TROUP: acute) top and a truncate or exculptate base narrowed into petiole, palmately 5–7-nerved, prominently nerved on both surfaces, entire, dull green above, dull light green beneath, glabrous. *Epicotyl* 1–2 cm. *Stem* erect, straight;

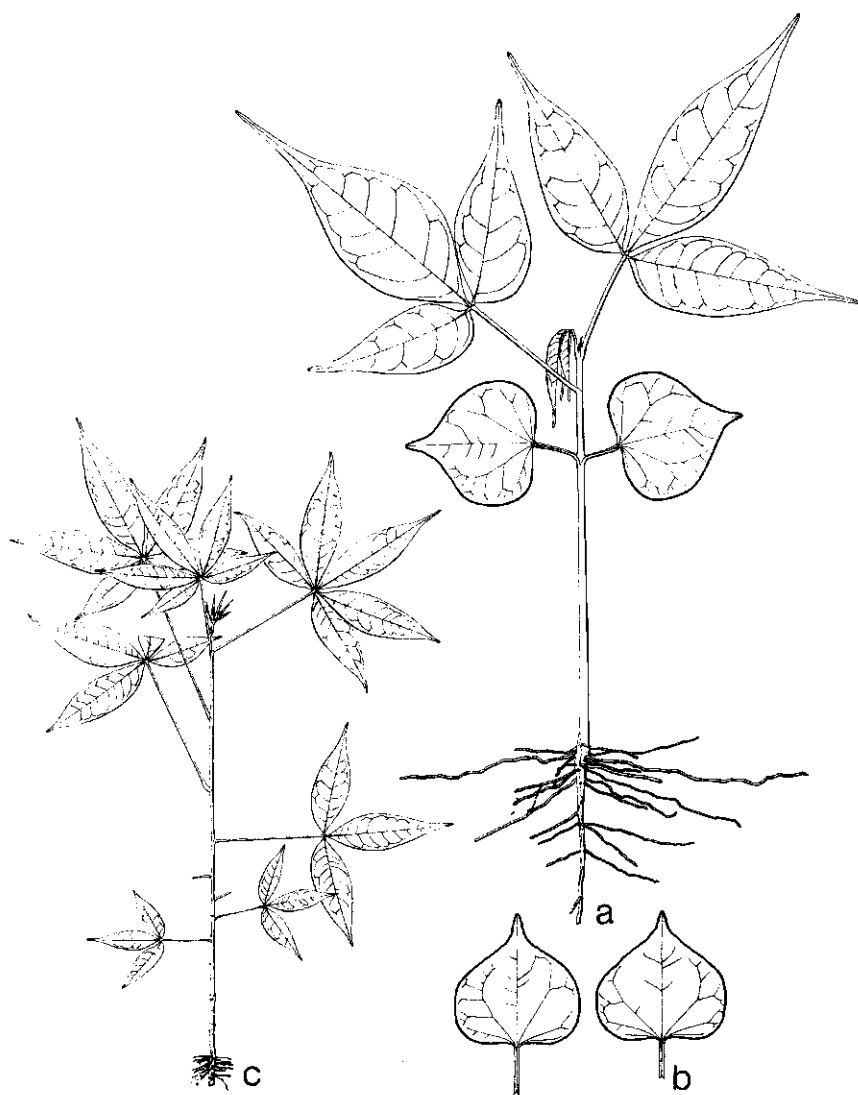


Fig. 12. *Bombax ceiba* a. young seedling, $1/2\times$; b. cotyledons, $1/2\times$; c. older seedling, $1/8\times$.

at 2nd stage terete, smooth, green, glabrous but later conical brownish black prickles on the bark. *Phyllotaxy* spiral. *Leaves* stipulate; lowest ones 3- rarely 1-foliolate, followed by some 4-foliolate ones, number of leaflets increasing with succeeding leaves, 7th or 11th and succeeding ones 5-foliolate (TROUP: first one or two simple); stipules very soon falling, narrowly 3-angular (TROUP: linear lanceolate), membranous, yellowish green, glabrous; rachis terete, smooth, thickened at base, green turning brownish red above, glabrous; leaflets sessile or very shortly petiolulate; blades thin, having an acuminate base, pinninerved, prominently nerved on both surfaces, entire, with a slightly revolute margin, dull green above, dull light green beneath, glabrous; terminal leaflet largest. *1st Leaf* rachis 2-3½ cm, 1 mm thick; blades oblong or ovate-oblong, in lateral leaflets asymmetrical, broader at posterior side, with index 2-3, 3½-8 by 1¼-3 cm, top acuminate acute. *5-Foliolate leaves* (2nd stage) rachis 12-20 cm, 2½-4 mm thick; blades lanceolate, but in lateral leaflets ovate-oblong or ovate-lanceolate, asymmetrical, broader at posterior side, with index 3-4, 7-17 by 2½-5 cm, top acuminate acute. *Top of plant* glabrous, green, sometimes glossy.

Seeds from 2 motherplants from different localities.

DURIO ADANS.

B. I: 417, 420; K. et V. II: 131; TROUP: I: 151

Durio zibethinus MURR.

B. I: 420; K. et V. II: 132; TROUP I: 151

Mal.: durian. *Sund.*: duren, kadu. *Jav.*: duren

Fig. 13

Size at 1st stage (1st developed leaf only) ±25 cm above collet; at 2nd stage (±12 leaves) ±45 cm above collet. *Roots* brown or dirty yellow; tips white turning brown or light brown; primary root at 1st stage a taproot, straight or slightly flexuous, much thicker than lateral ones; collet first gradually but at the top abruptly and considerably thickened; lateral roots at 1st stage moderate in number to very numerous, moderately or very flexuous, patent, moderately branched. *Hypocotyl* epigeous, erect, whether or not straight, 7-9 cm; at 1st stage fleshy, at ¼ length thickest and there 1¼-1½ cm thick, tapering up- and downwards, terete or slightly or more distinctly 4-angular, green, brown scaly. *Cotyledons* hypogeous, sometimes semihypogeous, rarely epigeous, 2, together at side of stem, covered with testa and upper surfaces in close contact, petiolate, usually left in the earth and torn off from the erecting epigeous hypocotyl; petiole 1¼-4 cm, channelled, green, brown scaly; blade with index 7, ±1½ by 2 cm, thick-fleshy, flat above, convex beneath, having an obtuse top and a cordate 1½ cm long-lobed base, glabrous above, peltate hairs with brown and irregularly margined and glandular shields beneath. *Epicotyl* erect, straight, ±5 cm; at 1st stage ±2-3 mm thick, terete, smooth, green, nearly entirely covered with peltate



Fig. 13. *Durio zibethinus* a. young seedling, $1/1 \times$; b. older seedling, $1/2 \times$.

hairs with brown fringed shields. *Stem* erect, straight, whether or not curved at base, or spiral owing to obtusangular connection of highest internodes, peltately hairy. *Phyllotaxy* spiral. *1st 2-3 Leaves* scale-shaped. *Developed leaves* stipulate, simple, petiolate; stipules fugacious, lanceolate, up to 2 cm long, having an obtuse or acute top, 1-nerved, glossy grey coloured and brown spotted beneath, hairy like stem; petiole ± 2 cm, $1\frac{1}{2}$ mm thick, with thickened top and base, terete, smooth, coloured and hairy like the under surface of the stipules; blade lanceolate, with index 3-4, $\pm 9-14$ by $3\frac{1}{2}$ cm, thin, slightly lengthwise folded upwards, having an acuminate acute top and a rounded or acute base, pinninerved and midrib prominent beneath, dull green and glabrous above, coloured and hairy beneath like under surface of stipules. *Highest leaves* (2nd stage) largest. *Top of plant* with peltate hairs; young leaves conduplicate induplicate.

Seeds from 4 motherplants from different localities.

BURSERACEAE

B. II: 112; K. et V. IV: 14; LUBB. I: 331; TROUP I: 174

Cotyledons epigeous, palmate. *Phyllotaxy* spiral but 1st 2 leaves opposite or sub-opposite. *Leaves* whether or not stipulate, imparipinnate, but 1st leaf 1-3-foliolate.

1. a. cotyledons palmati-partite; leaves stipulate *Garuga floribunda*
 b. cot. palmati-lobate, leaves exstipulate *Protium javanicum*

GARUGA ROXB.

B. II: 113; K. et V. IV: 16; TROUP I: 176

Garuga floribunda DECNE

B. II: 113; K. et V. IV: 17; TROUP I: 176 (*G. pinnata* Auct. non ROXB.)

Sund.: biru. *Jav.*: wiju. *Bug.*: baru

Fig. 14

Size at 1st stage (2 leaves only) 9-24 cm, 4-10 cm above collet; at 2nd stage ($\pm 15-22$ leaves) 47-82 cm above collet. *Roots* off white, turning light yellow; primary root very flexuous, not much thicker than lateral ones; collet gradually and slightly to much thickened; lateral roots very numerous, very flexuous, much branched. *Hypocotyl* epigeous, erect, sometimes curved at base, $3\frac{1}{2}-6\frac{1}{2}$ cm; at 1st stage 1-1 $\frac{1}{2}$ mm thick, tapering upwards, 4-angular, a beautiful bright red, green at top, white at base, with simple patent short colourless hairs; glabrous at base. *Cotyledons* epigeous, 2, equal or unequal, petiolate; petiole 5-7 mm, $\frac{1}{2}$ mm thick, flattened above, rounded beneath,

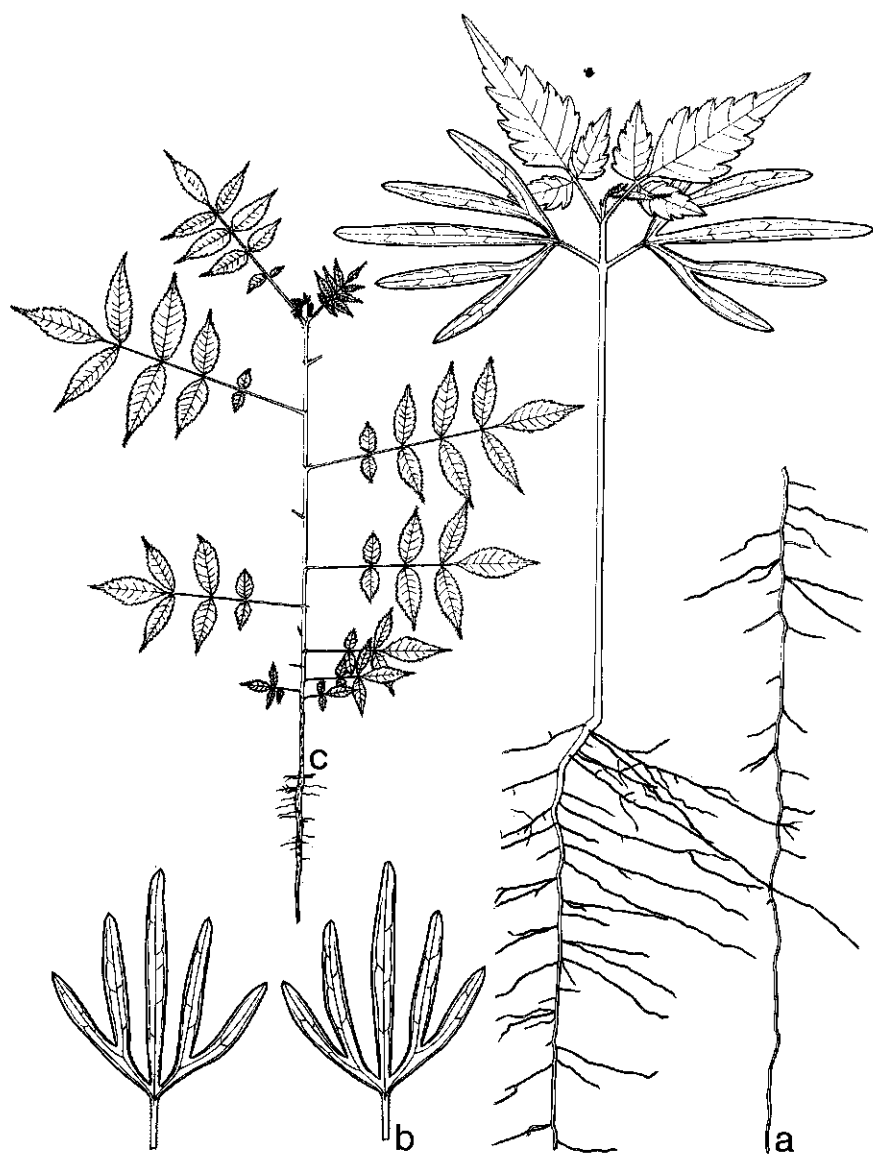


Fig. 14. *Garuga floribunda* a. young seedling, $1/1 \times$; b. cotyledons, $1/1 \times$; c. older seedling, $1/8 \times$.

green or red, hairy like hypocotyl; blade 3-palmately-partite; lateral lobes whether or not bifid; middle lobe longest, linear, 2–3 cm by $2\frac{1}{2}$ – $3\frac{1}{2}$ mm, all lobes thin, having an obtuse or acute top, palmately 3-nerved with middle nerve thickest and midrib prominent on both surfaces, entire, dull green above, dull greyish green but often red beneath, hairy above like petiole, glabrous beneath. *Epicotyl* $\frac{1}{2}$ – $1\frac{1}{2}$ cm. *Stem* erect, straight; at 2nd stage slightly angular near top, terete near base, green, near base with brown minute orbicular yellow lenticels, hairy like hypocotyl. *Phyllotaxy* spiral but 1st 2 leaves opposite. *Leaves* stipulate, imparipinnate, lowest leaf 1 pair of leaflets, number of pairs increasing with succeeding leaves, as from 12th or 16th leaf 4 pairs; stipules small, needle-shaped, green, hairy; rachis flattened above, rounded beneath, with simple colourless hairs; leaflets opposite, sometimes subopposite, shortly petiolulate; blades thin, pinninerved, coarsely dentate, on both surfaces hairy like rachis. *1st 2 Leaves* 1 pair of leaflets; rachis $\frac{1}{2}$ – $1\frac{1}{2}$ cm, $\frac{1}{2}$ mm thick, green; blades ovate or ovate-oblong, in terminal leaflet largest, with index 2– $2\frac{1}{2}$, $1\frac{1}{2}$ – $3\frac{1}{2}$ by $\frac{3}{4}$ – $2\frac{1}{2}$ cm, prominently nerved beneath, dull green above, dull greyish green beneath. *Leaves with 4 pairs of leaflets* rachis 13–20 cm, thickened at base, tapering upwards, green or brownish red above, green beneath; blades in 1st pair of leaflets very small, often irregular, 4–10 by 1–5 mm; blades in highest pair largest, oblong to lanceolate, with index $2\frac{1}{2}$ – $3\frac{1}{2}$, 9–12 by 3– $4\frac{1}{2}$ cm; blades in lateral leaflets having a long-acuminate acute top and an asymmetrically rounded base but blade in terminal leaflet having a rounded or acute base, prominently nerved on both surfaces, slightly glossy dark green above, dull green beneath. *Top of plant* hairy, green.

Seeds from 2 motherplants from different localities.

PROTIUM BURM. f.

B. II: 113; K. et V. IV: 20

***Protium javanicum* BURM. f.**

B. II: 113; K. et V. IV: 22

Sund.: tanggulun; *Jav.*: bernang, gulun, katos, trenggulun. *Mad.*: tangghulun

Fig. 15

Size at 1st stage (2 leaves only) up to ± 30 cm, up to ± 8 cm above collet; at 2nd stage (10 leaves) 10–16 cm above collet. Fragrant of resin when crushed. *Roots* white or dirty yellow or brown; tips white; primary root very flexuous, slightly to considerably thicker than lateral ones; collet gradually but slightly thickened; lateral roots very numerous, very flexuous, slightly to much branched. *Hypocotyl* epigeous, erect, straight, $2\frac{1}{2}$ – $7\frac{1}{2}$ cm; at 1st stage 1– $1\frac{1}{2}$ mm thick, terete, smooth, green near top, brown sometimes red near base, near top simple short and colourless hairs. *Cotyledons* epigeous, 2, equal, petiolate; petiole $1\frac{1}{2}$ –4 mm, 1 mm broad, broadened, green, hairy like hypocotyl; blades almost orbicular or broadly obovate, obtuse, 3-palmately



Fig. 15. *Protium javanicum* a. young seedling, $1/2 \times$; b. cotyledons, $1/1 \times$; c. older seedling, $1/1 \times$.

lobed, with \varnothing 2–2½ cm, thin, having an obtuse top and a rounded or slightly exculptate base narrowed into petiole, palmately 5-nerved and middle nerve thickest, prominently nerved beneath, entire, on both surfaces dull green, hairy above like hypocotyl especially on nerves, glabrous beneath. *Epicotyl* ¼–2 cm. *Stem* erect; at 1st and at 2nd stage spiral owing to obtusangular connection of internodes, angular near top, terete near base, near top hairy like hypocotyl, near base glabrous. *Phyllotaxy* spiral but 1st 2 leaves opposite or subopposite. *Leaves* exstipulate; 1st 2 leaves usually simple, next ones imparipinnate, first one pair of leaflets, then 2 pairs, \pm 10th leaf sometimes already 3 pairs. *1st Leaf* usually simple, petiolate; petiole 1–1½ cm, ½ mm thick, channelled above, green, hairy like hypocotyl; blade very variable, ovate or cordiform or oblong, sometimes 2–3-palmately-lobate or -palmatifid or -palmatipartite, sometimes 3-foliolate, thin, \pm ½–3 by ½–1 cm, having an acute top and a rounded sometimes acute sometimes cordate base, pinninerved, prominently nerved beneath, serrate, glossy or dull green above, dull green beneath, midrib on both surfaces but sometimes only above hairy like hypocotyl. *Leaves with 2 and 3 pairs of leaflets* rachis 2½–7 cm, thickened at base, channelled above with ridge between the two erect margins, green, hairy like hypocotyl especially above; leaflets opposite, petiolulate; petiolules \pm 1½ mm; blades elliptic or ovate, in terminal leaflet largest, in 1st pair of leaflets smallest, with index 2, up to 4½ by 2 cm, having an acuminate acute or obtuse top and an acute base narrowed into petiolule, entire; nerves prominent on both surfaces; other characters like those of 1st leaf. *Top of plant*: hairy, green or brownish green; young leaves usually glossy brownish red.

Seeds from 2 motherplants from different localities.

CASUARINACEAE¹

B. I: 3, II: 8; K. et V. X: 270; LUBB. II: 524; TROUP: III: 900

CASUARINA ADANS.

B. II: 9; K. et V. X: 270; LUBB. II: 525; TROUP III: 900

Hypocotyl epigeous, erect, straight, glabrous. *Cotyledons* epigeous, 2, rarely 3, equal, sessile; coriaceous, glabrous. *Epicotyl* very short. *Stem* erect, straight or slightly flexuous, lengthwise ridged, ridges decurrent from the centre of the leaves. *Phyllotaxy* in alternate whorls of 4–6. *Leaves* scale-shaped, narrowly 3-angular, \pm 1 mm long.

1 The conception: 'scales of a same whorl connate into a tube', sometimes given in the above mentioned bibliography, is not accepted here, because the branches are inserted in the axil near the base of the 'tops' or 'tips' of the scales (= leaves).

First whorls present

1. a. first whorls 5–6-foliate. *C. equisetifolia*
- b. first whorls 4-foliate. *C. junghuhniana*

***Casuarina equisetifolia* J.R. et G. FORST.**

B. II: 10; K. et V. X: 272; TROUP III: 900, fig. 332

In many languages: tjemara. *Mal.:* ru. *Bal.:* kaju merak. *Mak.:* kaju angin

Fig. 16

Size at 1st stage (± 15 leaf whorls only) 3–8½ cm, 1½–4 cm above collet, at 2nd stage (1st branches of 3rd order) 9–20 cm above collet. *Roots* dirty yellow turning whitish yellow; primary root very flexuous, slightly thicker than lateral ones; lateral roots moderate in number to very numerous, very flexuous, moderately to much branched. *Hypocotyl* epigeous, erect, straight, 11–21 mm; at 1st stage very slender, terete, smooth, a beautiful bright red, glabrous. *Cotyledons* epigeous, 2, rarely 3, equal, sessile; blade elliptic or oblong or oblong-obovate, with index 1½–2½, 2–3½ by 1–2 mm, coriaceous, having an obtuse top and a regularly narrowed semi-amplexicaul base, indistinctly nerved, entire, dull green above, dull light green beneath (TROUP: turning red), glabrous. *Epicotyl* very short. *Stem* erect, straight or slightly flexuous, lengthwise ridged; these ridges decurrent from the centre of the leaves. *Phyllotaxy* in alternate whorls of 5–6. *Leaves* scale-shaped, narrowly 3-angular, ± 1 mm, appressed turning

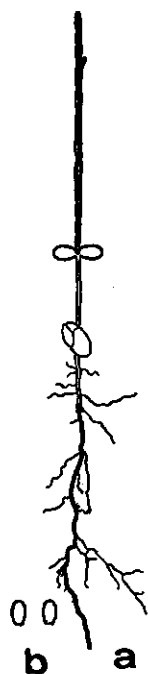


Fig. 16. *Casuarina equisetifolia* a. young seedling (seedrest near the collet), 1/1 \times ; b. cotyledons, 1/1 \times .

patent, green, glabrous. *Top of plant* glabrous, light green.

Seeds from 4 motherplants from different localities.

Casuarina junghuhniana MIQ. (*C. montana* JUNGH. ex MIQ.)

B. II: 10; K. et V. X: 273

Jav.: tjemara

Fig. 17

Size at 1st stage (10–22 leaf whorls only) 4½–12 cm, 3–9 cm above collet, often not yet free from remains of seed; at 2nd stage (1st branches of 3rd order) 17–20 cm above collet. *Roots* dirty yellow; primary root at 1st stage very flexuous, not thicker than lateral ones; lateral roots at 1st stage moderate in number, very flexuous, moderately branched. *Hypocotyl* epigeous, erect, straight, 10–20 mm; at 1st stage very slender, brownish red turning brown, white at base, glabrous. *Cotyledons* epigeous, 2, equal, sessile; blade elliptic or oblong, with index $\pm 1\frac{1}{2}$, $2\frac{1}{2}$ – $3\frac{1}{2}$ by $1\frac{1}{2}$ –2 mm, coriaceous, having an obtuse top and a regularly narrowed semi-amplexicaul base, indistinctly nerved, entire, dull dark green above turning red, red beneath, glabrous. *Epicotyl* very short. *Stem* erect, straight, sometimes slightly flexuous, with internodes ± 3 mm, longitudinal ridges decurrent from the centre of the leaves; branches somewhat regularly placed, on each leaf-whorl usually one branch only. *Phyllotaxy* first in whorls of 4, at 2nd stage up to 6, alternate. *Leaves* at 1st and 2nd stage scale-shaped, narrowly 3-angular, ± 1 mm long, appressed, green, glabrous. *Top of plant* light green, glabrous.

Seeds from 5 motherplants from different localities.

CELASTRACEAE

B. II: 53; K. et V. VII: 83; LUBB. I: 339; TROUP: I: 209

EUONYMUS L.

B. II: 53; K. et V. VII: 85; LUBB. I: 341

Euonymus javanicus BL.

B. II: 53; K. et V. VII: 86

Mal.: kumbang (*Palembang*). *Jav.*: pojongan

Fig. 18

Size at 1st stage (1st pair of leaves only) 18–27 cm, 2½–6 cm above collet; at 2nd stage (8–10 pairs) 27–29 cm above collet. *Roots* yellow turning bright yellow; tips white:

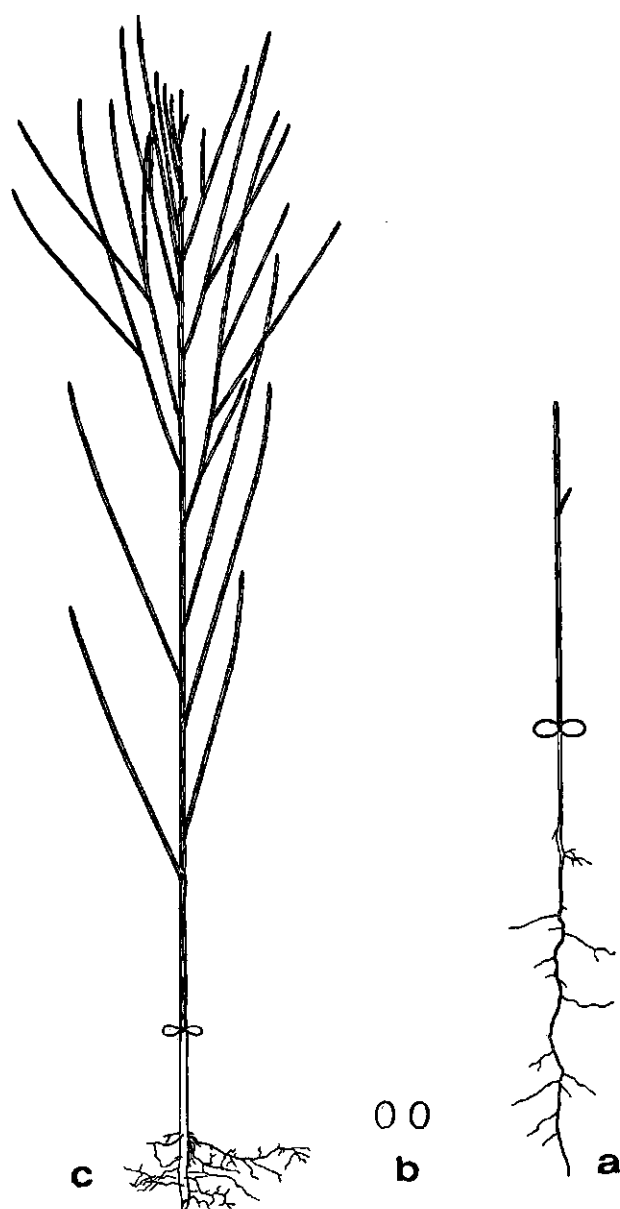


Fig. 17. *Casuarina junghuhniana* a. young seedling, $1/1\times$; b. cotyledons, $1/1\times$; c. older seedling, $1/1\times$.

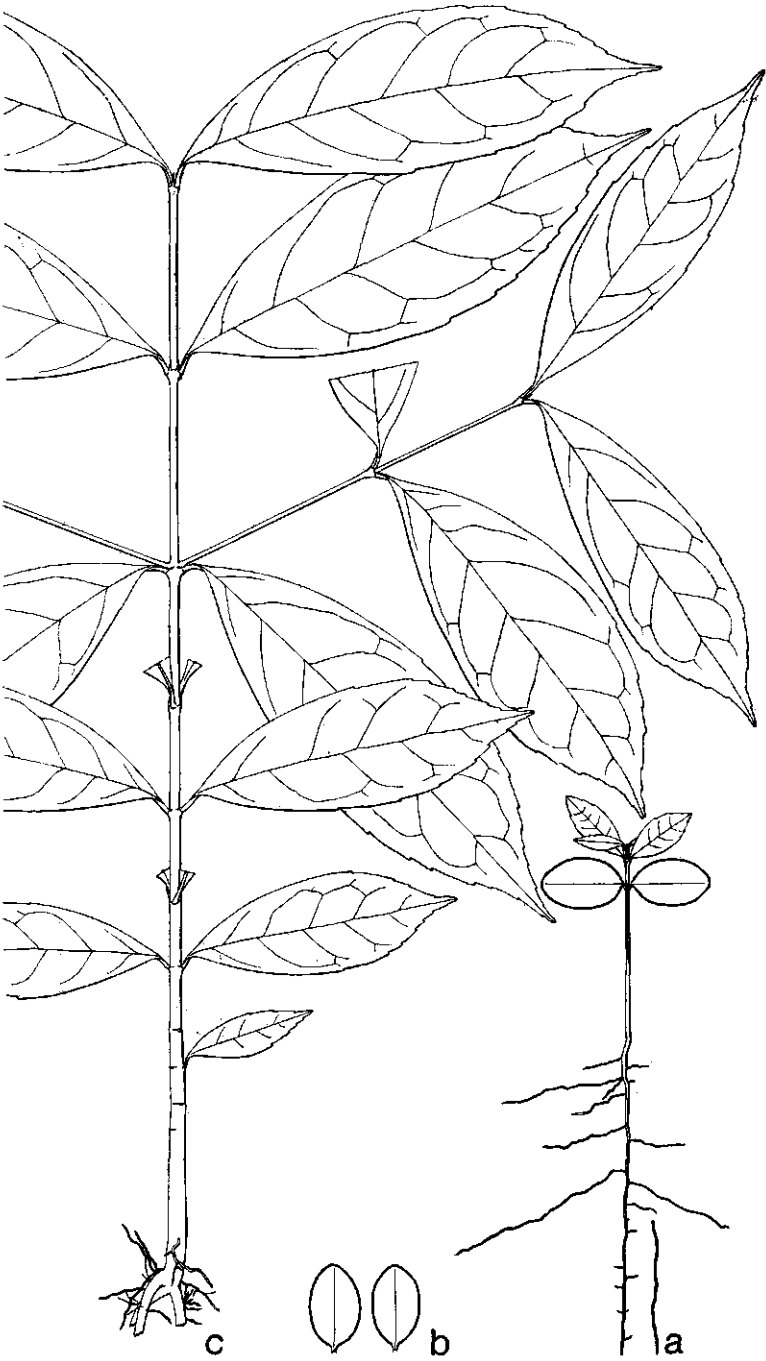


Fig. 18. *Euonymus javanicus* a. young seedling, $1/2 \times$; b. cotyledons, $1/2 \times$; c. older seedling, $1/2 \times$.

primary root at 1st stage slightly flexuous, moderately thicker than lateral ones; lateral roots at 1st stage few, moderately flexuous, sparsely or unbranched. *Hypocotyl* epigeous, erect, straight, 2–5 cm; at 1st stage 1 mm thick, 4-angular, green, white at base, glabrous. *Cotyledons* epigeous, 2, equal, stipulate, very shortly petiolate; stipules fimbriate; blade elliptic, with index $1\frac{1}{2}$ –2, 13–33 by 9–13 mm, thin-coriaceous, having a rounded obtuse top and a rounded base, pinninerved, entire, slightly revolute at margin, on both surfaces dull green, glabrous. *Epicotyl* 4–10 mm. *Stem* erect; at 2nd stage straight, terete, smooth, green, glabrous, with annulate stipular scars. *Phyllotaxy* along stem decussate, along branches distichous-opposite. *Leaves* stipulate, simple, petiolate; stipules 3-angular, green, margin membranous fimbriate brown; petiole green, glabrous; blade oblong or lanceolate, sometimes obovate, with a cuneate base narrowed into petiole, pinninerved and midrib prominent on both surfaces, near top sparsely serrate, glabrous. *1st Pair of leaves* petiole short, gradually passing into blade; blade thin, with index $2\frac{1}{2}$ –3, 2–3 cm by 8–10 mm, top acute, both surfaces dull light green. *Highest leaves* (2nd stage) petiole channelled, up to 1 cm; blade with index $2\frac{1}{4}$ – $2\frac{1}{2}$, up to $18\frac{1}{2}$ by 8 cm, coriaceous, having an acuminate acute and caducously mucronate top, prominently nerved on both surfaces, slightly glossy dark green above, dull light beneath. *Top of plant* covered with stipules.

Seeds from 2 motherplants from different localities.

CLUSIACEAE (GUTTIFERAE)

B. I: 383; K. et V. IX: 354; LUBB. I: 232; TROUP I: 20

Cotyledons whether or not developed; if developed: hypogeous, fleshy, their upper surfaces in close contact, together at side of stem, covered with testa. *Leaves* first ones scale-shaped or not developed; developed ones whether or not stipulate, simple, petiolate; blade pinninerved. *Plant* whether or not with gum-resin.

Cotyledons (if produced) and (or) developed 1st leaf and (or) higher leaves present.

1. a. cot. developed; hypocotyl undeveloped; developed leaves striately pinninerved, exstipulate; gum-resin *Calophyllum*
- b. cot. undeveloped; hypocotyl hypogeous, fleshy; developed leaves pinninerved but not striately, stipulate; no gum-resin *Garcinia parvifolia*

CALOPHYLLUM L.

B. I: 384, 385; K. et V. IX: 374; LUBB. I: 234; TROUP I: 21

Cotyledons hypogeous, covered with testa, their upper surfaces in close contact, together at side of stem, thick-fleshy. *Phyllotaxy* decussate but lowest leaves sometimes

spirally arranged, rarely in 3-foliate whorls. *Leaves* exstipulate, simple, striately pinninerved. *Plant* with gum-resin.

Cotyledons and (or) 1st developed leaf and (or) higher leaves present.

1. a. cot. covered with testa, together $\varnothing > 1\frac{1}{2}$ cm; developed leaves: midrib only prominent beneath; top of plant not with scaly hairs *C. inophyllum*
- b. cot. covered with testa, together $\varnothing < 1\frac{1}{2}$ cm; developed leaves: midrib prominent on both surfaces; top of plant brown scaly *C. soulattri*

***Calophyllum inophyllum* L.**

B. I: 386; K. et V. IX: 376; LUBB. I: 234, fig. 209; TROUP I: 21

Mal.: bintangur laut, penanga, p. laut, kapuraja, menaga, njamplung. *Sund.*: kapunan-tja, njamplung. *Jav.*: kapurantja, njamplung. *Mak.*: punanga. *Bug.*: pude

Fig. 19

Size at 1st stage (± 2 developed leaves only) ± 60 cm; at 2nd stage (± 9 developed leaves) ± 25 cm above collet. *Plant* with gum-resin. *Roots* yellowish brown turning brown; primary root at 1st stage slightly flexuous, much thicker than lateral ones; collet gradually and moderately thickened; lateral roots moderate in number, very flexuous, moderately branched. *Hypocotyl* hypogeous, very short. *Cotyledons* with greenish yellow gum-resin, hypogeous, 2, equal, together at side of stem, their upper surfaces in close contact, covered with testa, together $\varnothing > 1\frac{1}{2}$ cm, petiolate; petiole $\pm \frac{1}{2}$ cm; blade thick-fleshy, semiglobose, flat above, convex beneath, yellow. *Epicotyl* ± 4 cm. *Stem* erect, straight but sometimes curved at base; at 2nd stage terete but near top and base slightly laterally compressed, green, near base with very numerous small lengthwise linear and greenish yellow lenticels, near top simple very short glandular brown hairs. *Phyllotaxy* lowest leaves sometimes spirally arranged; succeeding ones decussate, sometimes subdecussate or 3 in whorl, sometimes grouped. *1st 1-6 Leaves* usually scale-shaped or undeveloped. *Developed leaves* exstipulate, simple, petiolate; petiole flattened above, convex beneath, up to $1\frac{1}{2}$ cm, green, glabrous; blade oblong to lanceolate, with index up to 4, up to ± 12 by 5 cm; coriaceous, having a rounded obtuse or feebly emarginate top and an acute base narrowed into petiole, striately pinninerved and midrib prominent beneath, entire, slightly glossy dark green above but yellowish green at midrib and dark green at nerves, slightly glossy yellowish green beneath, glabrous. *Top of plant* green or whitish.

Seeds from 2 motherplants from different localities.

***Calophyllum soulattri* BURM. f. (*C. spectabile* WILLD.)**

B. I: 386; K. et V. IX: 386

Mal.: bintangur bunut, malang-malang (*Bangka*), membalung (*Billiton*). *Sund.*: sulatri. *Jav.*: bintangur, slatri, sletri

Fig. 19

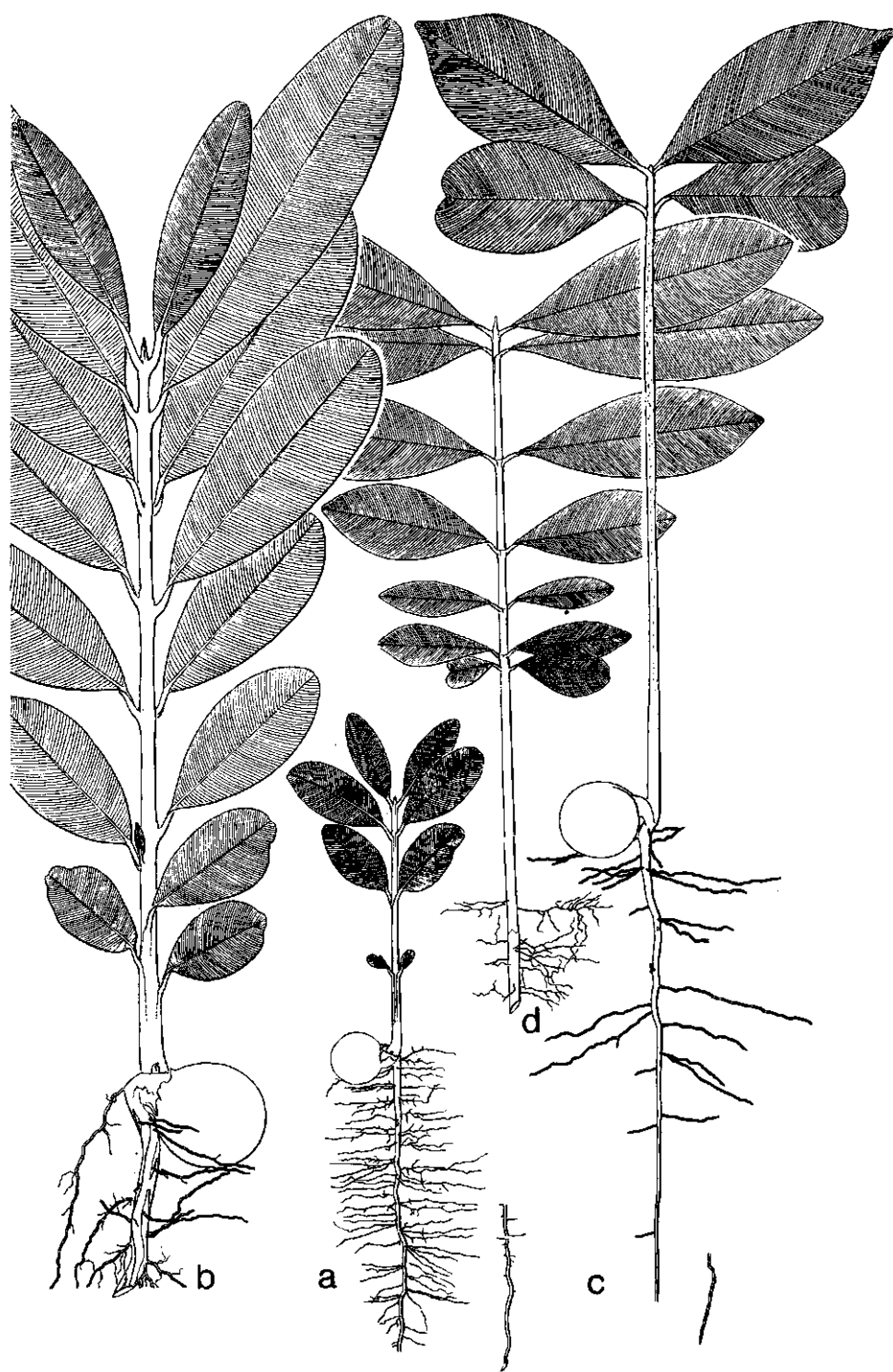


Fig. 19. *Calophyllum inophyllum* a. young seedling, $1/4\times$; b. older seedling, $1/2\times$. *Calophyllum soulattri* c. young seedling, $1/1\times$; d. older seedling, $1/2\times$.

Size at 1st stage (2 developed leaves only) 13–19 cm, 8–10 cm above collet; at 2nd stage (7–8 developed leaves) 17–18 cm above collet. *Plant* with white gum-resin. *Roots* brown or brownish yellow; tips white; primary root at 1st stage moderately flexuous, much thicker than lateral ones; collet gradually and moderately thickened; lateral roots at 1st stage moderate in number, very flexuous, not or moderately branched. *Hypocotyl* hypogeous, very short. *Cotyledons* hypogeous, 2, equal, together at side of stem, their upper surfaces in close contact, covered with testa, together $\varnothing < 1\frac{1}{4}$ cm, petiolate; petiole $\frac{1}{2}$ cm, broadened, white or pale green; blade semi-globose, flat above, convex beneath, thick-fleshy, ± 8 by 8 mm, in centre ± 4 mm thick, white, glabrous. *Epicotyl* very short. *Stem* erect; at 2nd stage straight, 4-angular in upper part, terete below, green. *Phyllotaxy* decussate but 1st 2 leaves slightly or more distinctly spirally arranged. *1st 2 Leaves* scale-shaped. *Developed ones* exstipulate, simple, petiolate; petiole channelled, green, glabrous; blade coriaceous, with a cuneate base narrowed into petiole, striately pinninerved and midrib prominent on both surfaces, entire, slightly glossy green above, dull light green beneath, glabrous. *1st Developed leaf* petiole 2–3 mm, blade elliptic or obcordiform or obovate, with index $1-1\frac{1}{2}$, $1-3\frac{1}{2}$ by $1-2\frac{1}{4}$ cm, top notched or obtuse. *Highest leaves* (2nd stage) petiole up to 6 mm, 1 mm thick, blade elliptic to lanceolate, sometimes obovate to obovate-lanceolate, having an obtuse or shortly acuminate obtuse top, with index up to 4, up to 9 by $2\frac{1}{2}$ cm. *Top of plant* with brown scaly hairs.

Seeds from 1 motherplant.

GARCINIA L.

B. I: 384, 386; K. et V. IX: 369

Garcinia parvifolia (Miq.) Miq. (*G. dioica* BL., non J.E. SMITH)

B. I: 387; K. et V. IX: 369

Sund.: tjeuri. *Jav.*: kemendjing, wadung

Fig. 20

Size at 1st stage (1st developed leaf only) ± 15 cm, up to 8 cm above collet; at 2nd stage (6–8 pairs of developed leaves) 12–17 cm above collet. *Roots* yellow; tips white; primary root usually less developed than the—only—adventitious root from top of hypocotyl; both at 1st stage slightly flexuous, much thicker than their lateral roots; these lateral roots very flexuous, sparsely branched. *Hypocotyl*¹ hypogeous, fleshy, filling the testa, half-moon-shaped, laterally compressed. *Cotyledons* undeveloped. *Stem* erect; at 2nd stage straight but sometimes curved at base, near top slightly

¹ According to LUBBOCK belonging to the root; analogous to description of it at the *Lecythidaceae* (*Barringtonia*), *Rhizophoraceae* (*Ceriops*, *Bruguiera*, *Rhizophora*) it is here called hypocotyl.

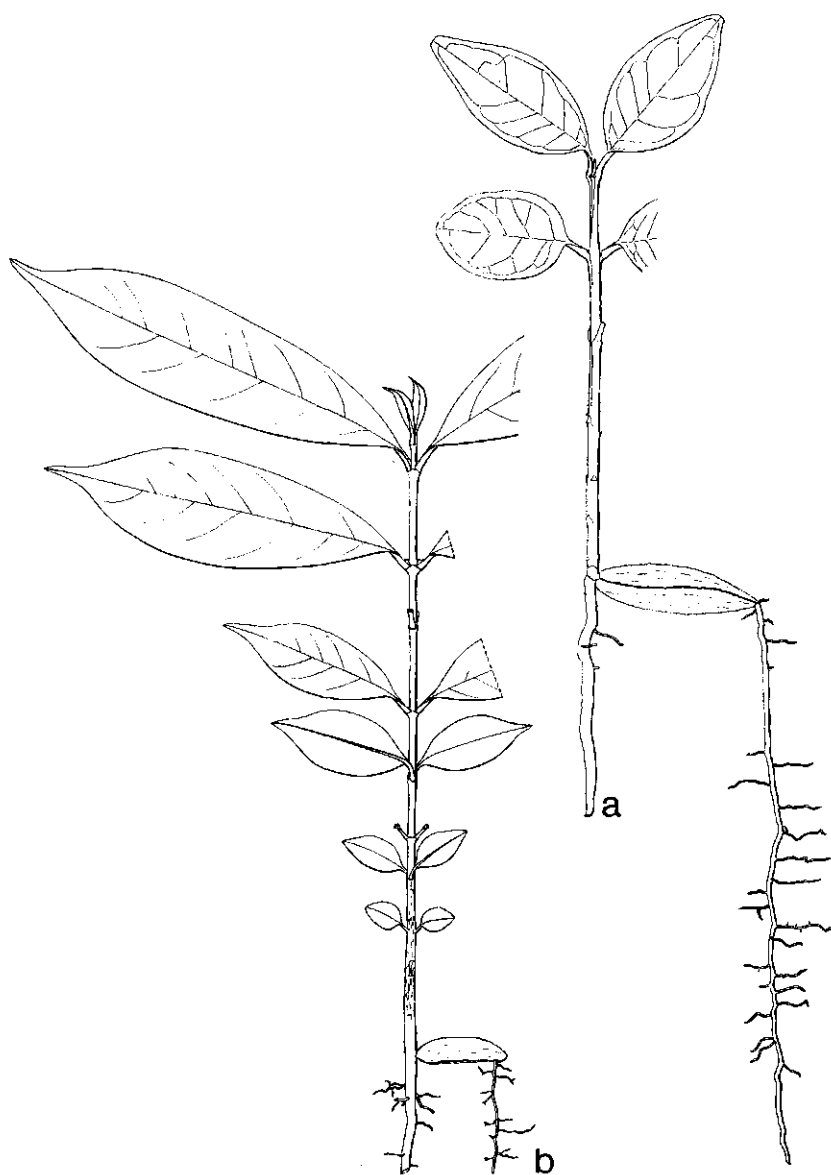


Fig. 20. *Garcinia parvifolia* a. young seedling, $1/1\times$; b. older seedling, $1/2\times$.

or more distinctly 4-angular, brownish, glabrous. *Phyllotaxy* decussate but lowest pair of leaves sub-opposite. *1st* ± 5 Pairs of leaves scale-shaped. *Developed leaves* stipulate, simple, petiolate; stipules very small, scale-shaped, brown; petiole flattened above, convex beneath, green, glabrous; blade thin, having an acuminate acute top and an acute base narrowed into petiole, pinninerved (midrib prominent beneath), dull green on both surfaces, glabrous. *1st Developed pair of leaves* petiole ± 4 mm; blade elliptic or ovate, with index $\pm 1-2$, ± 17 by 12 mm, considerably varying in size and dimensions. *Highest pair* (2nd stage) petiole up to 8 mm; blade oblong to lanceolate or ovate-oblong to ovate-lanceolate or obovate-oblong to obovate-lanceolate, with index up to $4\frac{1}{2}$, up to $11\frac{1}{2}$ by $3\frac{1}{2}$ cm. *Top of plant* glossy brownish green.

Seeds obtained from 3 motherplants from different localities.

COMBRETACEAE

B. I: 374; K. et V. IX: 15; LUBB. I: 522; TROUP II: 506

TERMINALIA L.

B. I: 374, 376; K. et V. IX: 16; TROUP II: 507

Hypocotyl epigeous, erect, sometimes curved at base. *Cotyledons* epigeous, 2, equal or unequal, petiolate; blade reniform. *Stem* hairy. *Phyllotaxy* spiral, sometimes first leaves opposite or subopposite. *Leaves* exstipulate, simple, petiolate; petiole hairy; blade elliptic or oblong or obovate or obovate-oblong or lanceolate or ovate-lanceolate or obovate-lanceolate, hairy. *Top of plant* hairy.

Cotyledons and (or) highest leaves present (2nd stage)

- a. cot. petiole 2-4 mm, glabrous; blade fleshy, $\pm 1-1\frac{1}{2}$ by $1-1\frac{3}{4}$ cm, glabrous; highest leaves (2nd stage) finely and transparently punctate *T. bellirica*
- b. cot. petiole 7-8 mm, hairy; blade coriaceous, $\pm 2-3\frac{1}{2}$ by $4-8\frac{1}{2}$ cm, hairy; leaves not transparently punctate *T. catappa*

***Terminalia bellirica* (GAERTN.) ROXB. (*T. belerica* ROXB.)**

B. I: 377; K. et V. IX: 17; TROUP II: 507, fig. 193

Jav.: djaha, dj. kebo, dj. sapi

Fig. 21

Size at 1st stage (1st 2 leaves only) 11-18 cm, $5\frac{1}{2}$ -10 cm above collet; at 2nd stage (12-21 leaves) 31-46 cm above collet. *Roots* off white turning brownish black; primary root at 1st stage slightly flexuous, much thicker than lateral ones; collet abruptly and slightly thickened at one side; lateral roots at 1st stage moderate in number to

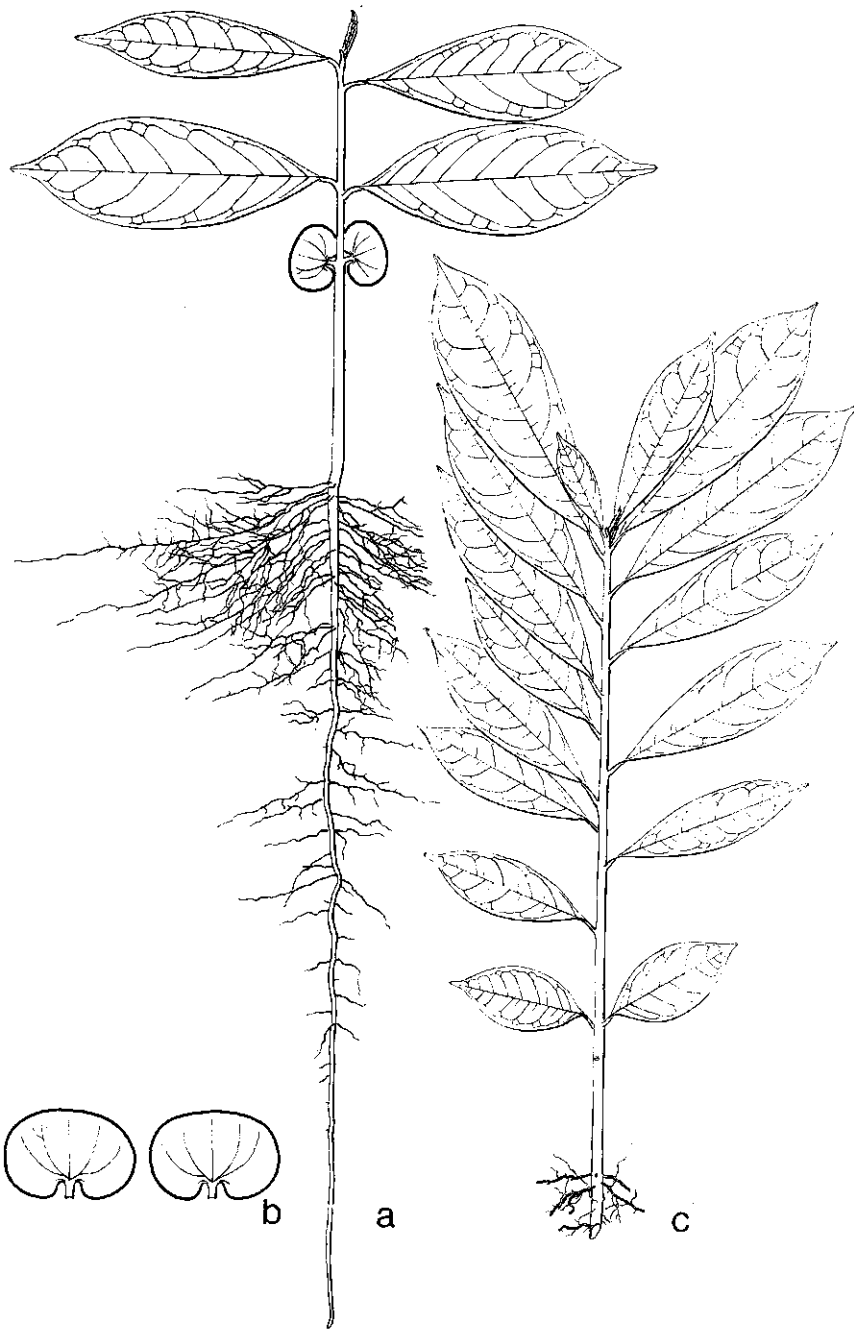


Fig. 21. *Terminalia bellirica* a. young seedling, $1/2\times$; b. cotyledons, $1/1\times$; c. older seedling, $1/4\times$.

very numerous, much branched. *Hypocotyl* epigeous (TROUP: hypogeous), erect, straight, $4\frac{1}{2}$ – $7\frac{1}{2}$ cm; at 1st stage $2\frac{1}{2}$ –4 mm thick, slightly tapering upwards, terete, smooth, green, pale green at base, glabrous. *Cotyledons* epigeous (TROUP: hypogeous), 2, unequal, usually asymmetrical, not one another's mirror image, first coiled round one another later slightly or more expanded but never entirely flat, petiolate; petiole 2–4 mm, 1 mm thick, slightly broadened, green, glabrous; blade reniform, usually asymmetrical, sometimes index only slightly <1 , ± 1 – $1\frac{1}{2}$ by 1 – $1\frac{3}{4}$ cm (measuring difficult because the blade is not flat), fleshy, having a rounded obtuse top and an asymmetrical acute base, entire, dull dark green above, dull light green beneath, glabrous. *Epicotyl* $1\frac{1}{2}$ –2 cm. *Stem* erect; at 2nd stage spiral owing to obtusangular connection of internodes, terete, smooth, green on upper part, brown below, with simple brown hairs especially near top. *Phyllotaxy* spiral but 1st 2 leaves subopposite. *Leaves* exstipulate, simple, petiolate; petiole flattened above, convex beneath, green, hairy like stem; blade having an acuminate acute top and an acuminate or taper-pointed base decurrent into petiole, pinninerved (midrib prominent on both surfaces), dull green above, dull light green beneath, midrib on both surfaces hairy like stem. *1st Leaf* petiole 7–10 mm, 1 mm thick; blade oblong or obovate-oblong, with index 2 – $2\frac{3}{4}$, $5\frac{1}{2}$ –8 by $2\frac{3}{4}$ – $3\frac{1}{2}$ cm, thin. *Highest leaves* (2nd stage) petiole up to 2 cm long, to ± 2 mm thick; blade ovate-lanceolate, with index up to 3, up to 17 by $5\frac{1}{2}$ cm, finely and transparently punctate (K. et V.: in sicco heightened punctate). *Top of plant* white turning reddish, hairy, green.

Seeds from 2 motherplants from different localities.

***Terminalia catappa* L.**

B. I: 377; K. et V. IX: 26; TROUP II: 534

Many languages: ketapang

Fig. 22

Size at 1st stage (1st 2 leaves only) 32–56 cm, 10–17 cm above collet; at 2nd stage (± 7 leaves) ± 30 cm above collet. *Roots* dirty yellow but white below turning slightly or more distinctly blackish brown; tips yellow; primary root at 1st stage moderately flexuous, much thicker than lateral ones; collet considerably thickened at one side; lateral roots at 1st stage very numerous, very flexuous, sparsely branched. *Hypocotyl* epigeous, erect, straight, often curved at base, $6\frac{1}{2}$ –11 cm; at 2nd stage $3\frac{1}{2}$ –5 mm thick, tapering upwards, considerably thickened at one side of base, terete, smooth, with simple brownish hairs. *Cotyledons* epigeous, 2, equal, asymmetrical, not one another's mirror image, petiolate, having 1 or 2 axillary buds situated above each other; petiole 7–8 mm, 2 mm thick, slightly channelled, green, hairy like hypocotyl; blade asymmetrical, reniform, with index ± 2 , 2 – $3\frac{1}{2}$ by 4 – $8\frac{1}{2}$ cm, coriaceous, possessing a broadly rounded and sometimes slightly or more distinctly emarginate top and an acute base narrowed into petiole, palmately 3–5-nerved, prominently nerved beneath, with irregularly undulate margin, dull dark green above, dull light green beneath, both

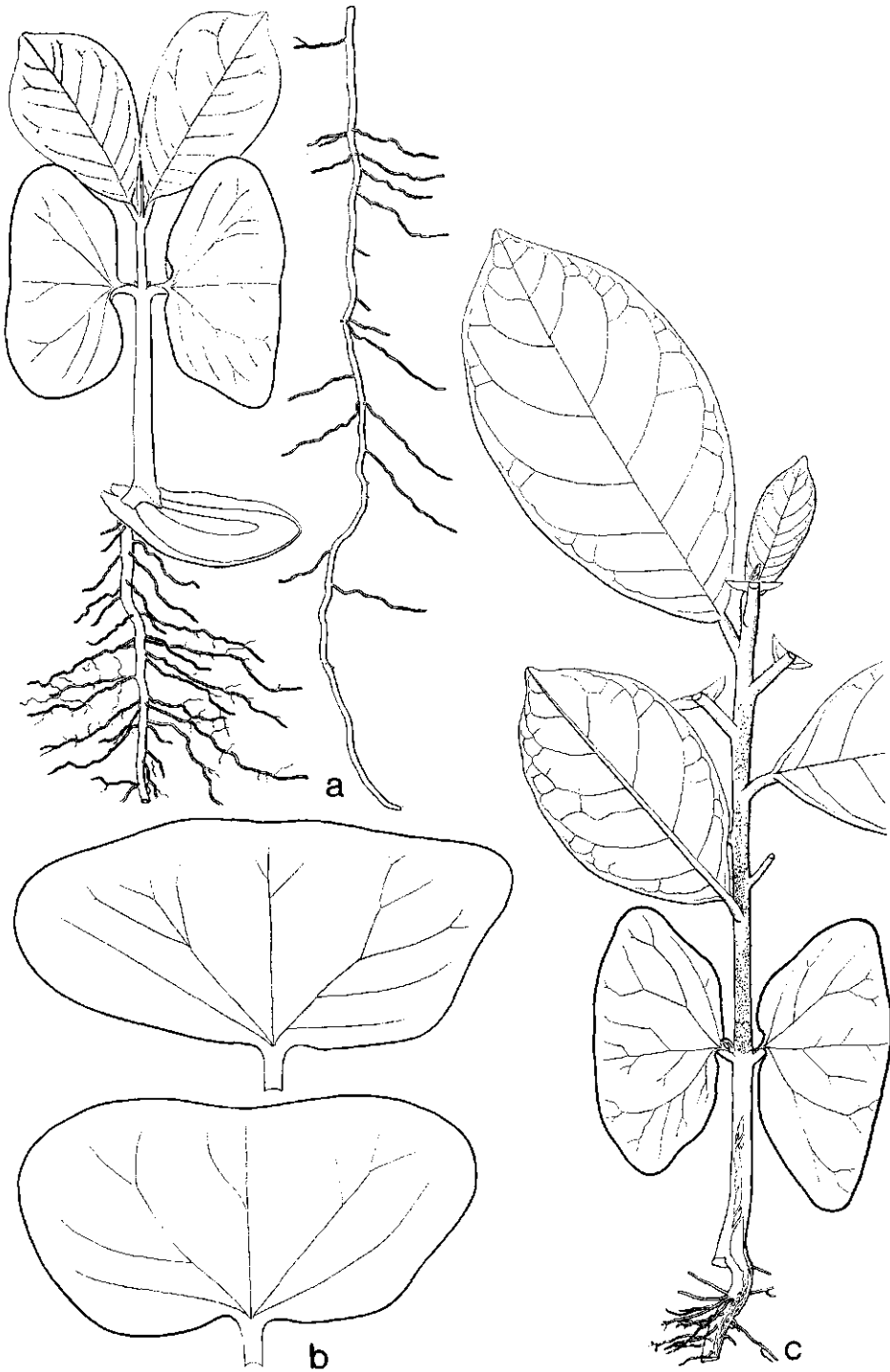


Fig. 22. *Terminalia catappa* a. young seedling, $1/2\times$; b. cotyledons, $1/1\times$; c. older seedling, $1/2\times$.

surfaces hairy like hypocotyl, near base whether or not ciliate with long red hairs. *Epicotyl* 1–3½ cm. *Stem* erect, straight; at 2nd stage terete, smooth, green, below grey and with many yellowish white lenticels, with simple short yellow hairs. *Phyllotaxy* spiral but 1st 2 leaves sometimes subopposite. *Leaves* exstipulate, simple, petiolate; petiole flattened above, convex beneath, green, with simple yellowish red hairs; blade obovate-oblong or obovate-lanceolate, having a mucronate acuminate acute or obtuse top and an acute or rounded base, pinninerved, prominently nerved beneath, entire, hairs on both surfaces especially on nerves and along margin simple and yellowish white or yellowish red, both surfaces dull green. *1st Leaf* usually irregular and often undeveloped; if developed and regular: petiole 4–10 mm; blade with index 1½–3, 4–6 by 1½–4½ cm, dull green above, dull light green beneath. *Highest leaves* (2nd stage) petiole up to 1 cm, 2½ mm thick; blade: top acuminate obtuse, base taperpointed rounded. *Top of plant* golden, hairy.

Seeds from 5 motherplants from different localities.

CORNACEAE

B. II: 158; K. et V. V: 65; LUBB. II: 43

NYSSA L.

B. II: 161; K. et V. V: 95

Nyssa javanica (BL.) WANG (*N. sessiliflora* HOOK f. et THOMS. ex B. et H.)

B. II: 161; K. et V. V: 96

Sund.: hirung, kapidengkung. *Jav.*: wuru gading. *Mad.*: dhuwak manting
Fig. 23

Size at 1st stage (1st leaf only) 11½–35 cm, 6½–7½ cm above collet; at 2nd stage (21–32 leaves) 27–34 cm above collet. *Roots* off white sometimes turning blackish brown; primary root slightly flexuous, a little thicker than lateral ones; collet gradually and slightly thickened; lateral roots few, slightly flexuous, whether or not sparsely branched. *Hypocotyl* epigeous, erect, straight, 6–8 cm; at 1st stage 1½–2½ mm thick, tapering upwards, terete, smooth, green, simple patent very short colourless hairs. *Cotyledons* epigeous, 2, equal, or asymmetrical and one another's mirror image, foliaceous, petiolate; petiole 3–4 mm, broadened, hairy like hypocotyl; blade ovate, sometimes asymmetrical, with index 1½–2, 2½–4 by 1½–2 cm, having an obtuse top and a rounded base, pinninerved, slightly prominently nerved on both surfaces, entire, slightly or more distinctly revolute at margin, dull green, glabrous. *Epicotyl* 3–6 mm. *Stem* erect; at 2nd stage straight, terete, smooth, green above, grey below, with simple colourless hairs. *Phyllotaxy* spiral. *Leaves* exstipulate, simple, petiolate; petiole

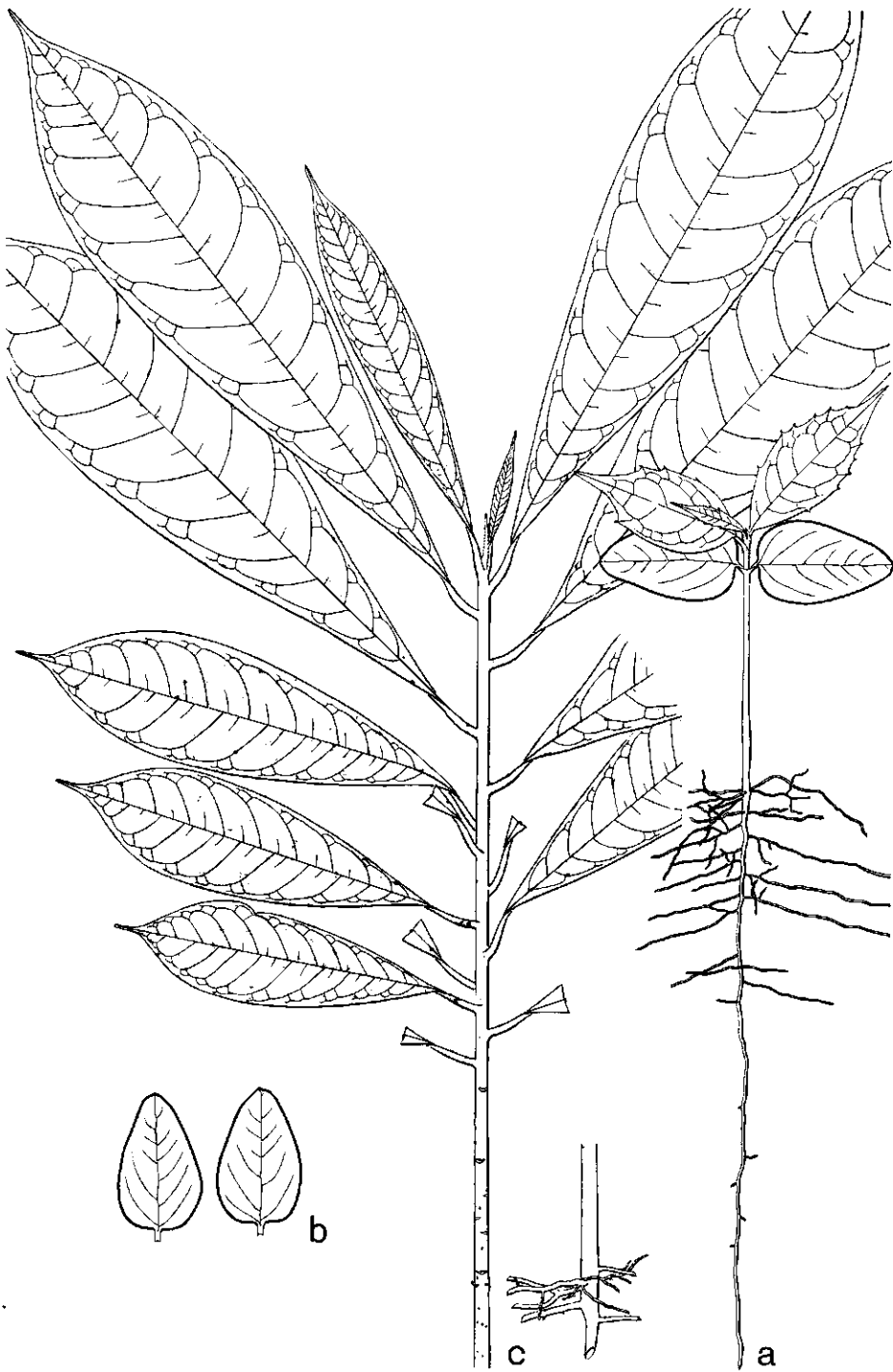


Fig. 23. *Nyssa javanica* a. young seedling, $1/2\times$; b. cotyledons, $1/2\times$; c. older seedling, $1/2\times$.

flattened above, convex beneath, green, hairy like stem; blade thin or thin-coriaceous, having an acuminate acute top and a base narrowed into petiole, pinninerved, nerves sunk above and prominent beneath, on both surfaces especially on nerves sparse hairs like those on stem. *1st Leaf* often incompletely developed; if developed: petiole 4–5 mm; blade elliptic or ovate or ovate-lanceolate, with index 2–3, 3–5 by $1\frac{1}{2}$ –2 cm, having a taperpointed base, sparsely dentate, dull green. *Highest leaves* (2nd stage) petiole up to 2 cm, up to 3 mm thick; blade obovate-lanceolate, with index \pm 3–5, up to 21 by $6\frac{1}{2}$ cm, having an abruptly acuminate top and a cuneate base, entire or very sparsely dentate with very small patent teeth, slightly glossy green above, glossy green beneath. *Top of plant* green, with white but later silvery hairs.

Seeds from 2 motherplants from different localities.

CUPRESSACEAE

B. I: 3, 91

CUPRESSUS L.

B. I: 91–92

Cupressus lusitanica MILL. (*C. benthami* Endl.)

B. I: 93

Fig. 24

Size at 1st stage (only 6–14 whorls on stem) 6–14 cm, 3–5 cm above collet; at 2nd stage (1–15 lateral branches) 7–16 cm above collet. *Roots* bluish white turning reddish brown; primary root at 1st stage very flexuous, not thicker than lateral ones, often replaced by a lateral root; collet gradually and moderately thickened; lateral roots at 1st stage few, very flexuous, sparsely branched. *Hypocotyl* at 1st stage epigeous, erect, straight, 2–3 cm, $\frac{1}{2}$ mm thick, angular with as many angles as there are cotyledons, red, white at base, at 2nd stage reddish brown, glabrous. *Cotyledons* epigeous, 3–5, equal, sessile; blade needle-shaped, 6–10 by $\frac{1}{2}$ –1 mm, fleshy, convex above, flattened or concave beneath, having an obtuse top, entire, dull green on both surfaces, glabrous, *Epicotyl* very short. *Stem* erect, straight; at 2nd stage ridged lengthwise, glaucously pruinose, glabrous. *Phyllotaxy* in decussate whorls, upwards slightly or more distinctly grading into a spiral arrangement; number of leaves in each whorl the same as number of cotyledons each specimen is bearing. *Leaves* exstipulate, simple, sessile; blade needle-shaped, with an acute top, glaucously pruinose, on both surfaces slightly irregularly punctate or punctate in irregular lines, glabrous, in 1st whorl 5–6 mm long, very narrow, in highest whorl up to 1 cm by $\frac{1}{2}$ mm, decurrent into ridge of stem, slightly convex above, convex beneath, lenticular in transverse section, entire;

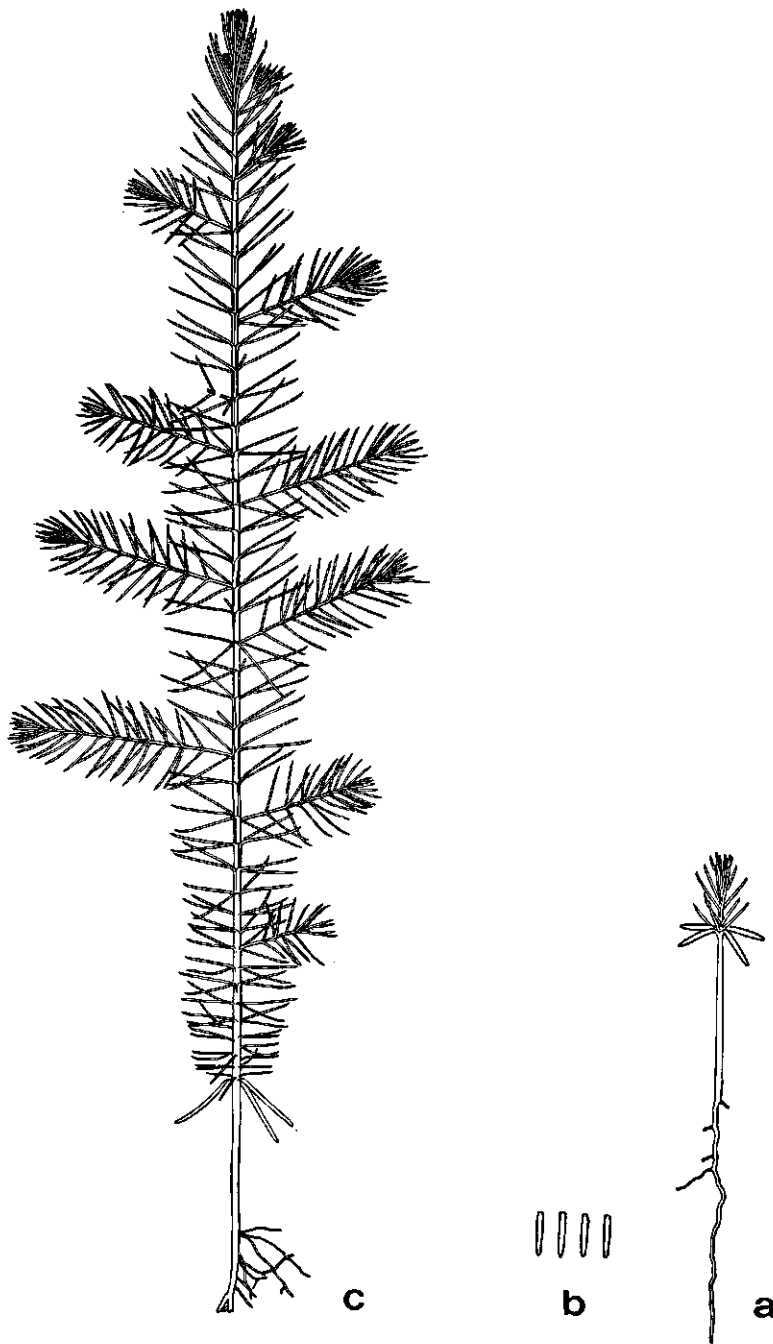


Fig. 24. *Cupressus lusitanica* a. young seedling, 1/1 × ; b. cotyledons, 1/1 × ; c. older seedling, 1/1 × .

branches in axils of leaves formed like stem but their leaves shorter. *Top of plant* glaucously pruinose.

Seeds from 2 motherplants from different localities.

DILLENACEAE

B. I: 276; K. et V. I: 159; LUBB. I: 99; TROUP I: 1

DILLENIA L.

B. I: 277, 278; K. et V. I: 162; TROUP I: 3

Dillenia pentagyna ROXB.

B. I: 279; K. et V. I: 162; TROUP I: 3

Sund.: djunti; *Jav.*: sempu, sompor

Fig. 25

Size at 1st stage (1st leaf only) 3–6 cm, 1–2 cm above collet; at 2nd stage (± 15 leaves) ± 25 cm above collet. *Roots* white turning reddish yellow; lateral roots white; tips yellow; primary root at 1st stage very flexuous, slightly thicker than lateral ones; collet gradually and considerably thickened sometimes only at one side; lateral roots at 1st stage moderate in number, moderately branched; at later stage primary root inconspicuous, usually not thicker than lateral ones; several thick lateral roots from collet or higher. *Hypocotyl* epigeous, erect, straight, 7–11 mm; at 1st stage $\pm 1\frac{1}{2}$ mm thick, not thickened at base, slightly laterally compressed, with 2 opposite longitudinal ridges, green at top, further white, glabrous, often with adventitious roots. *Cotyledons* epigeous, 2, equal, foliaceous, petiolate; petiole 2 mm, broadened, green, glabrous; blade ovate, with index $1-1\frac{1}{2}$, 7–9 by 5–9 mm, thin-coriaceous, having an acute top and a rounded base narrowed into petiole, palmately 3-curvinerved, prominently nerved beneath, entire, dull green above, dull light green beneath, glabrous. *Epicotyl* very short. *Stem* erect, straight, terete, smooth, with coarse simple stiff patent colourless hairs; at 2nd stage at nodes slightly contracted scars of leaves and often white 3-angular axillary buds. *Phyllotaxy* spiral; at 2nd stage leaves bundled at top of stem, lower ones very soon falling. *Leaves* exstipulate, simple, petiolate; petiole amplexicaul, channelled, green, hairy like stem; blade thin, having a shortly acuminate acute top and a taperpointed acute base narrowed into petiole, pinninerved, prominently nerved beneath, serrate or dentate, both surfaces dull green, hairy like stem on both surfaces, ciliate. *1st Leaf* blade elliptic, with index $1\frac{1}{2}-1\frac{3}{4}$, 9–15 by 6–9 mm, hispid. *Highest leaves* (2nd stage) blade obovate, with index $2\frac{1}{2}$, ± 19 by 8 cm. *Top of plant* hairy, green.

Seeds from 2 motherplants from different localities.

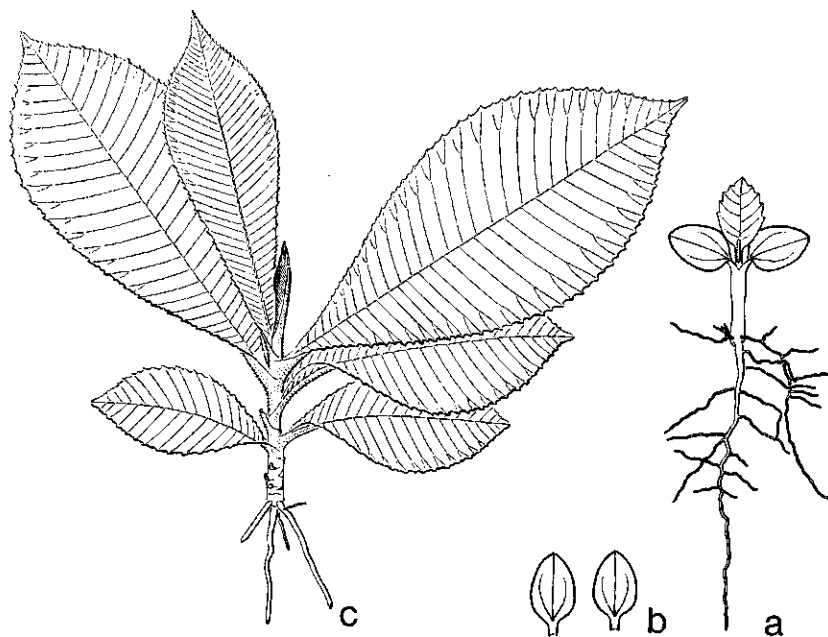


Fig. 25. *Dillenia pentagyna* a. young seedling, $1/1 \times$; b. cotyledons, $1/1 \times$; c. older seedling, $1/4 \times$.

EUPHORBIACEAE

B. I: 441, III: 648, 649; K. et V. XII: 9; TROUP III: 819

Cotyledons epigeous, foliaceous, petiolate. *Phyllotaxy* on main stem spiral, higher leaves sometimes distichous-alternate, on branches often distichous-alternate. *Leaves* stipulate (sometimes indistinctly), simple, petiolate, monomorphous or trimorphous; when trimorphous: developed leaves on main stem without branch in the axil, followed by scale-shaped leaves with an axillary branch, on branches developed leaves. *Plant* whether or not with latex.

1. A. cotyledons and(or) 1st leaf ¹ present 2
 - B. higher leaves present 12
2. a. cot. petiole $> 2\frac{1}{2}$ mm; 1st leaf: petiole 6 mm or more; blade palmately lobed, serrate, undulate or dentate. 3
 - b. cot. petiole not > 2 mm; 1st leaf: petiole < 5 mm; blade entire 7
3. a. cot. blade > 4 cm long; cot. and hypocotyl stellately hairy . . . *Aleurites*
 - b. cot. blade $< 3\frac{1}{2}$ cm long; cot. and hypocotyl not stellately hairy 4
4. a. cot. blade near base 2 small appendages; 1st leaf sparsely serrate or undulate *Baliospermum*
 - b. otherwise 5
5. a. cot. blade glabrous; 1st leaf: blade ovate, glabrous, base rounded or acute . . . *Bischofia*
 - b. cot. blade hairy; 1st leaf cordiform, hairy, base cordate 6
6. a. cot. blade obovate; 1st leaf: petiole ± 10 mm *Macaranga*
 - b. cot. blade ovate; 1st leaf: petiole > 20 mm *Melanolepis*
7. a. cot. blade obreniform *Bridelia*
 - b. otherwise 8
8. a. cot. blade palmately nerved or triplinerved 9
 - b. cot. blade pinninerved 10
9. a. hypocotyl brown or red, white at base; cot. petiole red, blade index 2-3; 1st developed leaves on main stem with red midrib . . . *Phyllanthus emblica*
 - b. hypocotyl green; white at base; cot. petiole green, blade index < 2 ; 1st developed leaves on main stem with a green midrib *Antidesma*
10. a. hypocotyl ± 1 cm; 1st leaf blade $\pm 2\frac{1}{2}$ by 2 mm . . . *Securinega virosa*
 - b. hypocotyl $1\frac{1}{4}$ - $4\frac{1}{4}$ cm; 1st leaf blade 5-25 mm long 11
11. a. cot. blade: index 2 or > 2 *Breynia*
 - b. cot. blade index 2 or < 2 *Glochidion*
12. a. topmost leaves compound *Bischofia*
 - b. topmost leaves simple 13
13. a. leaves monomorphous, on main stem never scale-shaped 14
 - b. leaves trimorphous, on main stem all topmost ones scale-shaped 19

1 In some genera the first leaf does not show enough differences.

14. a. leaves not peltate; blade palmately lobed, slightly or more distinctly cordiform 15
- b. leaves peltate *Macaranga*
- c. otherwise 16
15. a. blade considerably palmately 3-, rarely 5-lobed. *Aleurites*
- b. blade slightly palmately lobed *Melanolepis*
16. a. stipules wart-shaped *Baliospermum*
- b. otherwise 17
17. a. blade glabrous *Securinega*
- b. blade hairy 18
18. a. topmost leaves blade index no more than 2 *Bridelia*
- b. topmost leaves blade index > 2 *Antidesma*
19. a. highest developed leaves on main stem large, blade > 5 cm long *Glochidion*
- b. highest developed leaves on main stem small, blade < 3 cm long 20
20. a. leaves on branches: blade ovate or elliptic *Breynia*
- b. leaves on branches: blade lanceolate *Phyllanthus*

ALEURITES J.R. et G. FORST.

B. I: 443, 449, 477, III: 658; K. et V. XII: 550

***Aleurites moluccana* (L.) WILLD.**

B. I: 478, III: 648; K. et V. XII: 551

Baucolier, candlenut, Lichtnussbaum

Mal.: kemiri, with small derivations in many other local languages. *Sund.*: muntjang
Fig. 26

Size at 1st stage (2 leaves only) ± 85 cm, 8–36 cm above collet; at 2nd stage (13–20 leaves) 53–73 cm above collet. *Roots* off white turning brown; tips pure white; primary root at 1st stage moderately flexuous, moderately thicker than lateral ones; collet abruptly and very considerably thickened; lateral roots at 1st stage very numerous, considerably flexuous, moderately branched. *Hypocotyl* epigeous, erect, straight, 9–26 cm; at 1st stage $1\frac{1}{4}$ cm thick at base tapering upwards, terete, smooth, brownish green, white at base, numerous lengthwise linear lenticels, near top stellate much branched hairs. *Cotyledons* epigeous, 2, usually unequal, petiolate, petiole 1–2 cm, 4–5 mm broad, green, with sparse stellate much branched grey hairs; blade ovate sometimes elliptic, with index $1\frac{1}{2}$ –2, 6–9 by 4–5 $\frac{1}{2}$ cm, coriaceous, having an obtuse top and a rounded base narrowed into petiole, palmately 5-nerved, prominently nerved on both surfaces, entire, glabrous. *Stem* erect, straight; at 2nd stage gradually and considerably thickened at base, terete, near base possessing numerous brown lenticels, upper part green, lower part brown, near top mealy stellate much branched brownish yellow hairs, glabrous near base. *Phyllotaxy* spiral; 1st 2 leaves sometimes opposite. *Leaves* stipulate, simple, petiolate; stipules small, indistinct; petiole terete, smooth,

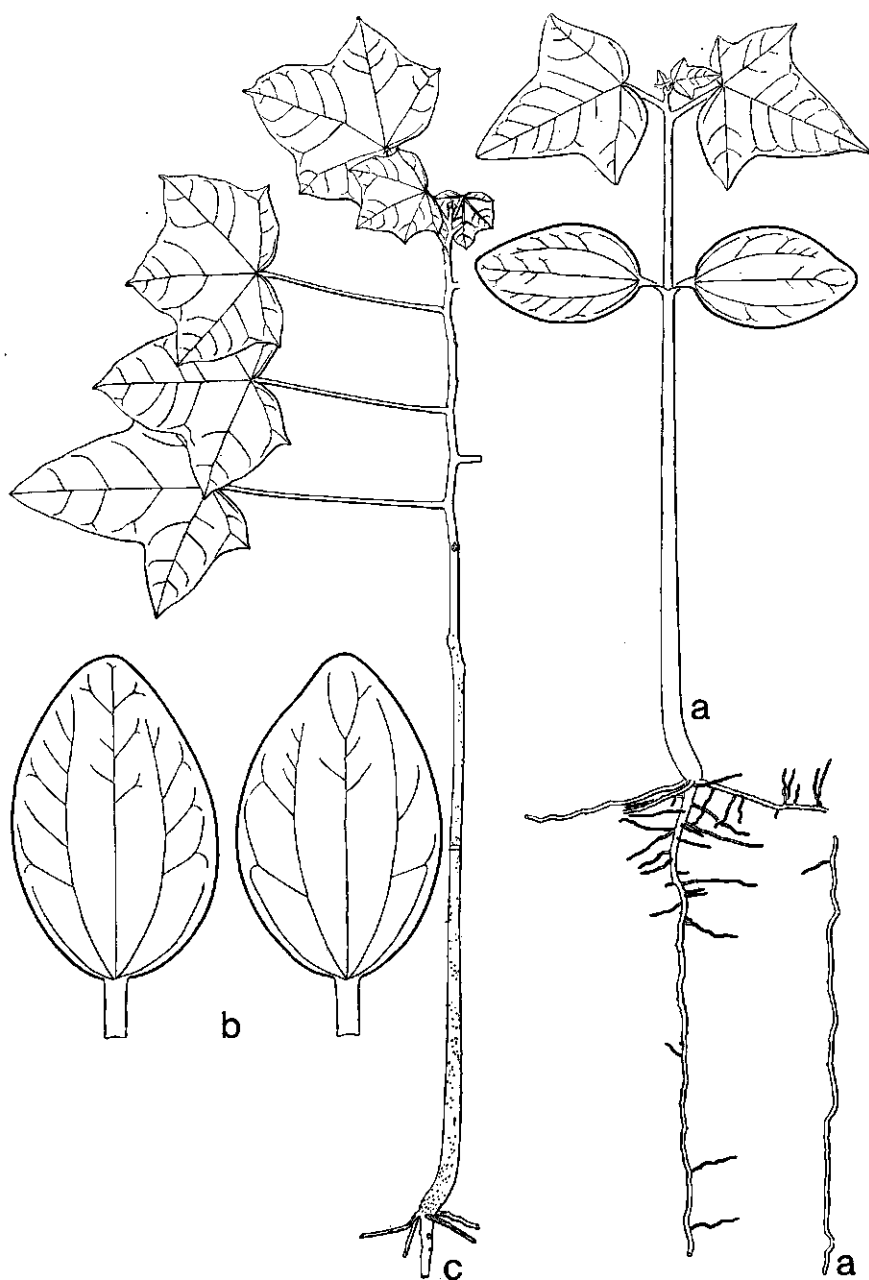


Fig. 26. *Aleurites moluccana* a. young seedling, $1/4 \times$; b. cotyledons, $1/2 \times$; c. older seedling, $1/4 \times$.

green, with mealy hairs like stem; blade considerably palmately lobed, hairy like stem. ± 10 – 11 th Leaf petiole 10–17 cm, 2–3 mm thick, thickened at base, near top 2 glands; blade palmately 3- rarely 5-nerved, with index a little <1 , $7\frac{1}{2}$ – $10\frac{1}{2}$ by $10\frac{1}{2}$ – $12\frac{1}{2}$ cm, acutely lobed, cordately based, thin, palmately and on both surfaces prominently nerved, slightly glossy green above, dull green beneath, both surfaces sparsely hairy like stem. *Top of plant* with dense white mealy stellate much branched hairs.

Seeds from 3 motherplants from different localities.

ANTIDESMA L.

B. I: 444, 447, 457; K. et V. XII: 258

Cotyledons epigeous, 2, foliaceous, palmately nerved or triplinerved. *Phyllotaxy* spiral but 1st 2 leaves sometimes opposite. *Leaves* stipulate, simple, petiolate; 1st 2 leaves at 2nd stage much smaller than highest ones.

a. higher leaves: stipules up to 5 mm long; leaf blade: thin, base not taperpointed, nerves not sunk above, ciliate; roots yellowish white turning dirty yellow

A. montanum

b. higher leaves: stipules up to 4 mm long; blade of leaves coriaceous, base not taperpointed, nerves not sunk above, not ciliate; roots white or off white, if white: turning off white *A. bunius*

c. higher leaves: stipules up to ± 5 mm long; leaf blade coriaceous, base long-taperpointed, with nerves sunk above, ciliate; roots white turning yellowish white *A. diandrum*

Antidesma bunius (L.) SPRENG.

B. I: 458, 460; K. et V. XII: 270

Mal.: buni. *Sund.*: huni, wuni. *Jav.*: wuni. *Mad.*: burneh

Fig. 27

Size at 1st stage (1st leaf only) 9–23 cm, $1\frac{1}{2}$ –5 cm above collet; at 2nd stage (± 15 leaves) ± 15 cm above collet. *Roots* white or off white, if white: turning off white; primary root at 1st stage very flexuous, slightly or moderately thicker than lateral ones; collet gradually and slightly thickened; lateral roots at 1st stage few, very flexuous, not or sparsely branched. *Hypocotyl* epigeous, erect, straight, sometimes curved at base, 12–45 mm; at 1st stage 1 – $1\frac{1}{2}$ mm thick, tapering upwards, terete, smooth, green, white at base, glabrous but rarely near top sparsely hairy, with simple colourless or brown hairs. *Cotyledons* epigeous, 2, equal but sometimes asymmetrical and one another's mirror image, petiolate; petiole 1–2 mm, green, glabrous or sparsely hairy; blade elliptic or obovate or ovate rarely asymmetrical, with index



Fig. 27. *Antidesma bunius* a. young seedling, 1/1 × ; b. cotyledons, 1/1 × ; c. older seedling, 1/2 × .

1¼–nearly 2, 9–13 by 5–9 mm, thin or thin-coriaceous, having a rounded obtuse top and an acute or rounded base narrowed into petiole, palmately 3–5-nerved or triplinerved, entire, glabrous. *Epicotyl* 1–9 mm. *Stem* erect, straight, hairy. *Phyllotaxy* spiral but 1st 2 leaves sometimes subopposite. *Leaves* stipulate, simple, petiolate; petiole flattened above, convex beneath, green, hairy; blade coriaceous, mucronate, pinninerved, entire. *1st Leaf* stipules very small; petiole 1–3 mm; blade obovate or elliptic, with index 1¼–2, 11–25 by 8–15 mm, having an obtuse top and an acute base, prominently nerved beneath, slightly glossy green above, dull green beneath, both surfaces hairy especially on midrib. *Highest leaves* (2nd stage) stipules linear, up to 4 mm long, green; petiole up to 4 mm long and 2 mm thick; blade oblong sometimes obovate-oblong, having a shortly acuminate obtuse or slightly or more distinctly acute mucronate top and a rounded or acute base, with midrib prominent beneath and not sunk above, entire, hairy beneath especially on midrib. *Top of plant* glossy green, hairy.

Seeds from 4 motherplants from different localities.

Antidesma diandrum (ROXB.) ROTH. *forma javanicum* J.J.S.

B. I: 458, 460; K. et V. XII: 274

Jav.: konjam, ande-ande

Fig. 28

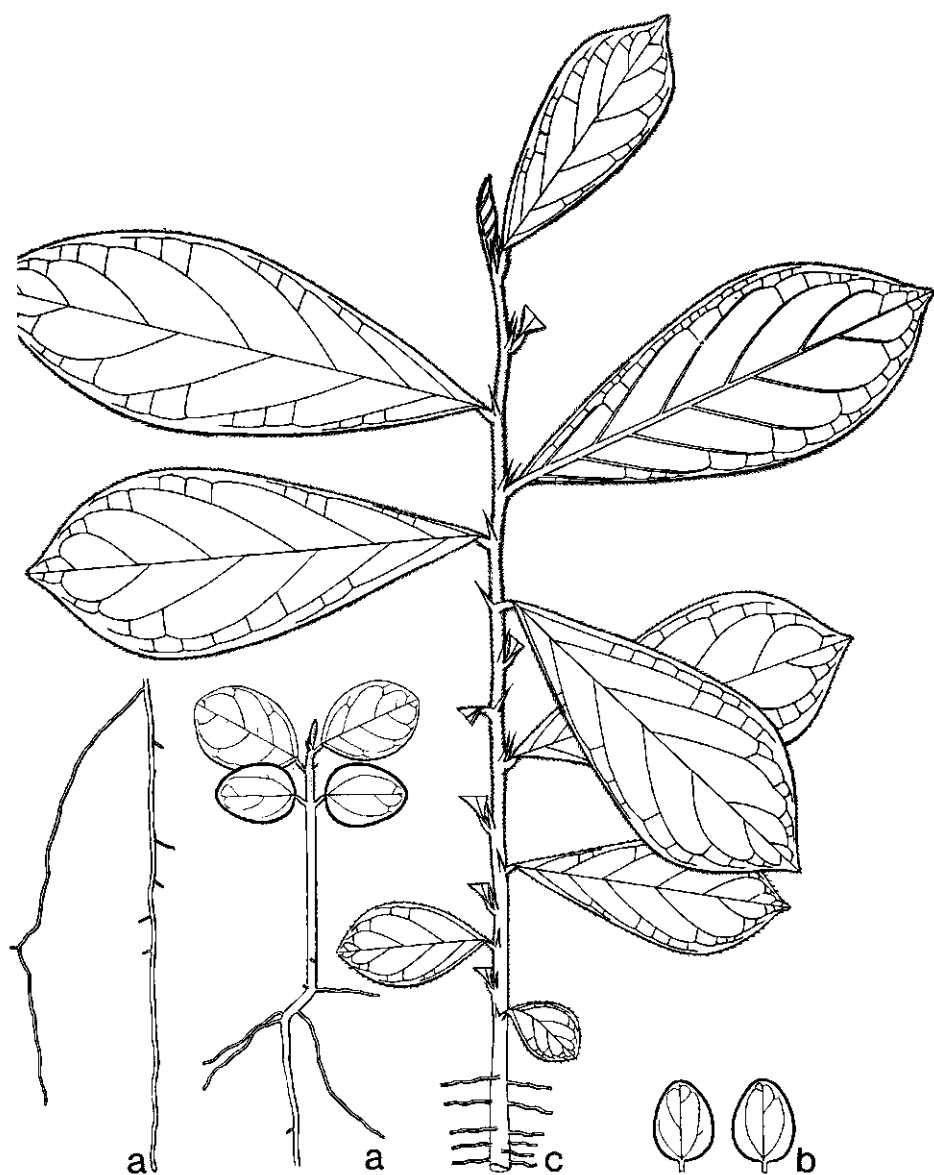


Fig. 28. *Antidesma diandrum forma javanicum* a. young seedling, $1/1\times$; b. cotyledons, $1/1\times$; c. older seedling, $1/2\times$.

Size at 1st stage (1st leaf only) 7–16 cm, $2\frac{1}{2}$ –4 cm above collet; at 2nd stage (12–18 leaves) 11–22 cm above collet. *Roots* white turning yellowish white; primary root at 1st stage moderately or very flexuous, moderately thicker than lateral ones; collet gradually and slightly or moderately thickened; lateral roots at 1st stage few, moderately flexuous, whether or not sparsely branched. *Hypocotyl* epigeous, erect, straight, $1\frac{3}{4}$ –4 cm; at 1st stage 1– $1\frac{1}{2}$ mm thick, terete, smooth, green, white at base, with simple patent very short colourless hairs. *Cotyledons* epigeous, 2, equal, petiolate; petiole 1–2 mm, green, hairy like hypocotyl; blade ovate sometimes elliptic, with index $1\frac{1}{2}$ – $1\frac{1}{2}$, 10–13 by 8–10 mm, thin, having a rounded obtuse top and a rounded base narrowed into petiole, palmately 3–5-nerved, prominently nerved beneath, entire, dull green above, dull light green beneath, glabrous. *Epicotyl* 3–5 mm. *Stem* erect; at 2nd stage spiral owing to obtusangular connection of internodes, terete, smooth, green, with simple patent colourless hairs. *Phyllotaxy* spiral. *Leaves* stipulate, simple, petiolate; stipules green, hairy; petiole green, hairy like stem; blade pinninerved, with nerves prominent beneath and sunk above, entire, glabrous above. *1st Leaf* stipules $1\frac{1}{2}$ mm long, linear; petiole 2 mm; blade obovate or elliptic or rhomboid, with index $1\frac{1}{2}$ – $1\frac{1}{2}$, 13–22 by 10–15 mm, having an obtuse or acute top and an acute base, thin, on both surfaces dull green, hairy like stem especially on nerves beneath, ciliate. *Highest leaves* stipules up to $\pm\frac{1}{2}$ cm long, ovate-lanceolate, acute; petiole up to $\pm\frac{1}{2}$ cm; blade obovate-oblong, with index 2–3, up to 13 by $5\frac{1}{2}$ cm, coriaceous, having a shortly acuminate and sharply acute mucronate top and a long-taperpointed acute or obtuse base, hairy like stem especially on nerves beneath, ciliate. *Top of plant* hairy, green, young leaves glossy above.

Seeds from 4 motherplants from different localities.

***Antidesma montanum* BL.**

B. I: 458. 460; K. et V. XII: 276 (*A. teysmannianum* PAX et HOFFM.)

Mal.: buni menir (vulgar). *Sund.*: ki senkeur, ki senkeur gunung. *Jav.*: ande ande ani, ande ande, hande hande, ande ande lumut, ande ande dedek, konjam pasir, wunen, wuni ande ande, wuni liris, wuni niris

Fig. 29

Size at 1st stage (1st leaf only) ± 11 cm, 3 cm above collet; at 2nd stage (9–14 leaves) 10–28 cm above collet. *Roots* yellowish white turning dirty yellow; primary root at 1st stage very flexuous, moderately thicker than lateral ones; lateral roots at 1st stage moderate in number, very flexuous. *Hypocotyl* epigeous, erect, straight, 1– $2\frac{1}{2}$ cm; at 1st stage 1 mm thick, tapering upwards, terete, green, white near base, glabrous. *Cotyledons* epigeous, 2, equal, petiolate; petiole 1 mm, green, glabrous; blade orbicular or elliptic or ovate or obovate, with index slightly > 1 , 7–13 by $5\frac{1}{2}$ –8 mm, thin, having an obtuse top and a rounded base, palmately 5-nerved, entire, dark green above, light green beneath, glabrous. *Epicotyl* 1–2 mm. *Stem* erect, straight, sometimes feather-shaped with a sideward bend, sometimes spiral owing to obtusangular con-

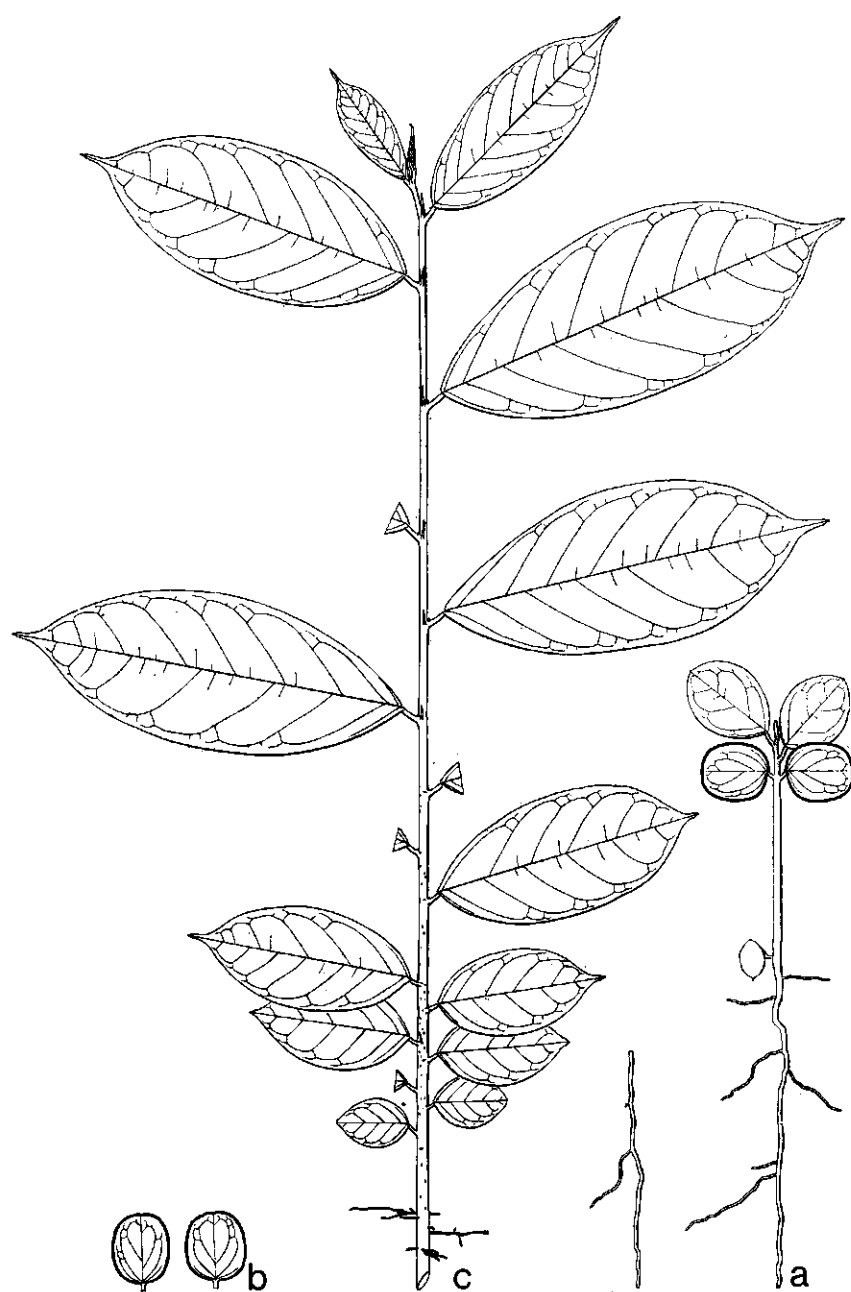


Fig. 29. *Antidesma montanum* a. young seedling, $1/1 \times$; b. cotyledons, $1/1 \times$; c. older seedling, $1/2 \times$.

nection of internodes, terete, smooth, green near top, brownish green near base, with orbicular or longitudinally elliptic and white or yellow lenticels, with simple very short colourless hairs. *Phyllotaxy* spiral but higher leaves alternate. *Leaves* stipulate, simple, petiolate; blade mucronate, pinninerved, entire. *1st Leaf* petiole $1\frac{1}{2}$ –4 mm, hairy; blade elliptic or obovate, with index $1\frac{1}{4}$ –2, 10–20 by 7–13 mm, thin, base acuminate narrowed into petiole, midrib prominent beneath and hairy on both surfaces. *Highest leaves* (2nd stage) stipules up to 5 mm long, linear; petiole up to 1 cm, hairy; blade obovate-lanceolate or lanceolate, with index $3\frac{1}{2}$, up to $17\frac{1}{2}$ by 5 cm, thin, having an acuminate obtuse or acute top and an acute base, pinninerved, entire sometimes slightly crenate, green, ciliate, on both surfaces simple short colourless hairs. *Top of plant* hairy, green.

Seeds from 5 motherplants from different localities.

BALIOSPERMUM BL.

B. I: 452, 497; K. et V. XII: 599

***Baliospermum montanum* (WILLD.) M.A.**

B. I: 497; K. et V. XII: 600

Sund.: kasingsat. *Jav.*: adal-adal, srintil

Fig. 30

Size at 1st stage (1st leaf only) 30–59 cm, $6\frac{1}{2}$ –8 cm above collet; at 2nd stage (6–8 leaves) 31–50 cm above collet. *Roots* white turning off white; primary root at 1st stage very flexuous, much thicker than lateral ones; collet gradually and considerably thickened; lateral roots at 1st stage moderate in number, very flexuous, moderately branched. *Hypocotyl* epigeous, erect, straight, 2–3 cm; at 1st stage 2–3 mm thick, tapering upwards, terete, smooth, pale green, white at base, near top sometimes simple curved colourless hairs, sometimes glabrous. *Cotyledons* epigeous, 2, equal, petiolate, petiole $1\frac{1}{2}$ – $2\frac{1}{2}$ cm, channelled, having a semi-amplexicaul base, pale green, hairy like hypocotyl; blade ovate, sometimes elliptic, with index 1 – $1\frac{1}{2}$, 14–33 by 13–28 mm, thin, having a rounded obtuse top and a rounded or exculptate base narrowed into petiole and at base on upper surface 2 very small green appendices, palmately 3–5-nerved, slightly prominently nerved on both surfaces, entire, dull green above, dull light green beneath, near base hairy above like hypocotyl. *Epicotyl* $1\frac{1}{2}$ – $5\frac{1}{2}$ cm. *Stem* erect, straight; at 2nd stage terete, smooth, with simple colourless hairs. *Phyllotaxy* spiral. *Leaves* stipulate, simple, petiolate; stipules very small; petiole green, hairy like stem; blade thin, with an acute top, pinninerved, prominently nerved on both surfaces. *1st Leaf* petiole 12–23 mm, channelled; blade ovate or elliptic, with index $1\frac{1}{2}$ –2, having a rounded or acute base, sparsely serrate or repand, sparsely hairy like stem especially on nerves beneath, hispid above with stiff straight simple colourless hairs. *Highest leaves* (2nd stage) stipules wart-shaped; petiole up to 4 cm, flattened

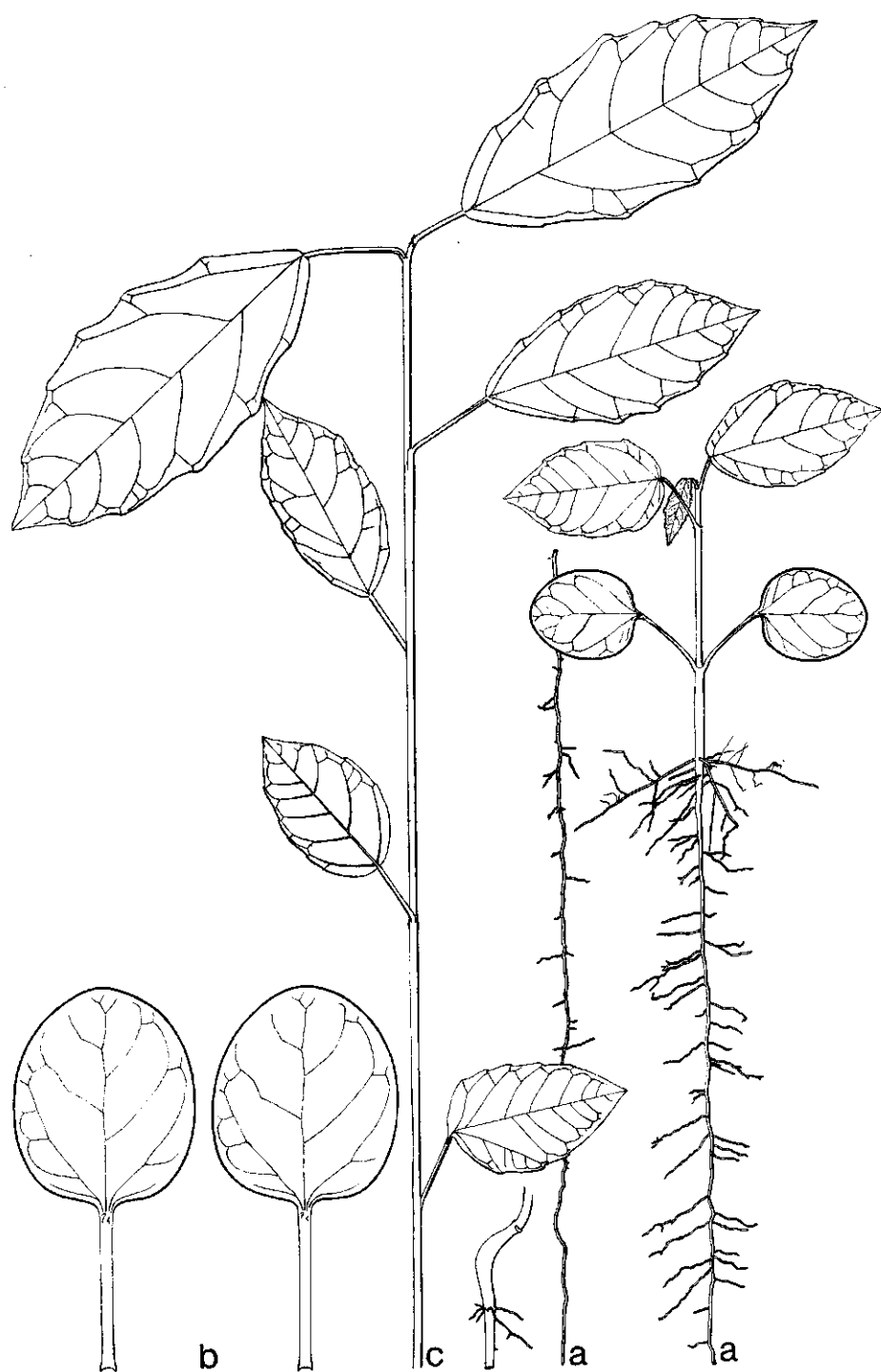


Fig. 30. *Baliospermum montanum* a. young seedling, $1/2\times$; b. cotyledons, $1/1\times$; c. older seedling, $1/2\times$.

above, convex beneath; blade ovate or elliptic or oblong, up to 14 by 5½ cm, having an acute or rounded sometimes slightly cordate base and a repand or dentate margin, dull dark green above, dull green beneath, very sparsely hairy beneath but more densely above like stem. *Top of plant* hairy, green.

Seeds from 1 motherplant.

BISCHOFIA BL.

B. I: 442, 473; K. et V. XII: 290; TROUP III: 820

***Bischofia javanica* BL.**

B. I: 474; K. et V. XII: 291; TROUP III: 820, fig. 305

Mal.: bintungan (*Minangk.*), gerondjing, kerindjing, tjingkam. *Sund.*: gadog, ki mahung. *Jav.*: gentung, gintung, gintungan. *Alf. Minah.*: kajawu, marintek
Fig. 31

Size at 1st stage (1st leaf only) ± 15 –18 cm, ± 4 cm above collet; at 2nd stage (± 10 –14 leaves) ± 9 –16 cm above collet. *Roots* white turning off white; primary root at 1st stage moderately flexuous, slightly thicker than lateral ones; collet gradually and slightly thickened; lateral roots at 1st stage moderate in number, moderately flexuous. *Hypocotyl* epigeous, erect, straight, $\pm 2\frac{1}{4}$ –3 cm; at 1st stage 1½ mm thick, 4-angular, white (TROUP: green), glabrous. *Cotyledons* epigeous, 2, equal, petiolate; petiole 3 mm, 1½ mm broad, pale green, glabrous or sparsely ciliate, with simple very short colourless hairs; blade orbicular or obovate, $\varnothing \pm 1\frac{1}{4}$ –1½ cm, having an obtuse or notched or acute top and an acute base narrowed into petiole, palmately 3-nerved (midrib prominent above), entire, dull green above, slightly glossy light green beneath, glabrous. *Epicotyl* ± 4 –8 mm. *Stem* erect, straight; at 2nd stage slightly or more distinctly 4-angular near top. *Phyllotaxy* spiral. *Leaves* stipulate; stipules 3-angular (TROUP: linear, acuminate, slightly falcate, caducous); 1st leaf and some next ones simple, petiolate, successive ones 1-foliolate, as from 9th or 14th one 3-foliolate. *1st Leaf* stipules ± 5 mm long, membranous, pale green; petiole 6–15 mm, 1 mm thick, channelled, pale green, glabrous; blade ovate, with index 1–1½, 17–35 by 15 mm, thin (TROUP: subcoriaceous), having an acuminate acute top and a rounded or acute base narrowed into petiole, pinninerved, prominently nerved on both surfaces, serrate or dentate (TROUP: serrate to crenate), dull (TROUP: shining) green above, dull greyish green beneath, glabrous. *Trifoliate leaves* stipules ± 1 cm long; rachis sometimes with very small stipels at the top, 3–11 cm long, 2½–3 mm thick, channelled, green, glabrous; leaflets petiolulate; petiolules of lateral leaflets 4–15 mm in terminal leaflet longer, with very small stipels at their top; blades like those in 1st leaf but in lateral leaflets ovate and in terminal leaflet elliptic, index 1½–2, size of terminal leaflet largest and up to 16 by 9 cm. *Top of plant* glabrous, glossy.

Seeds from 1 motherplant.

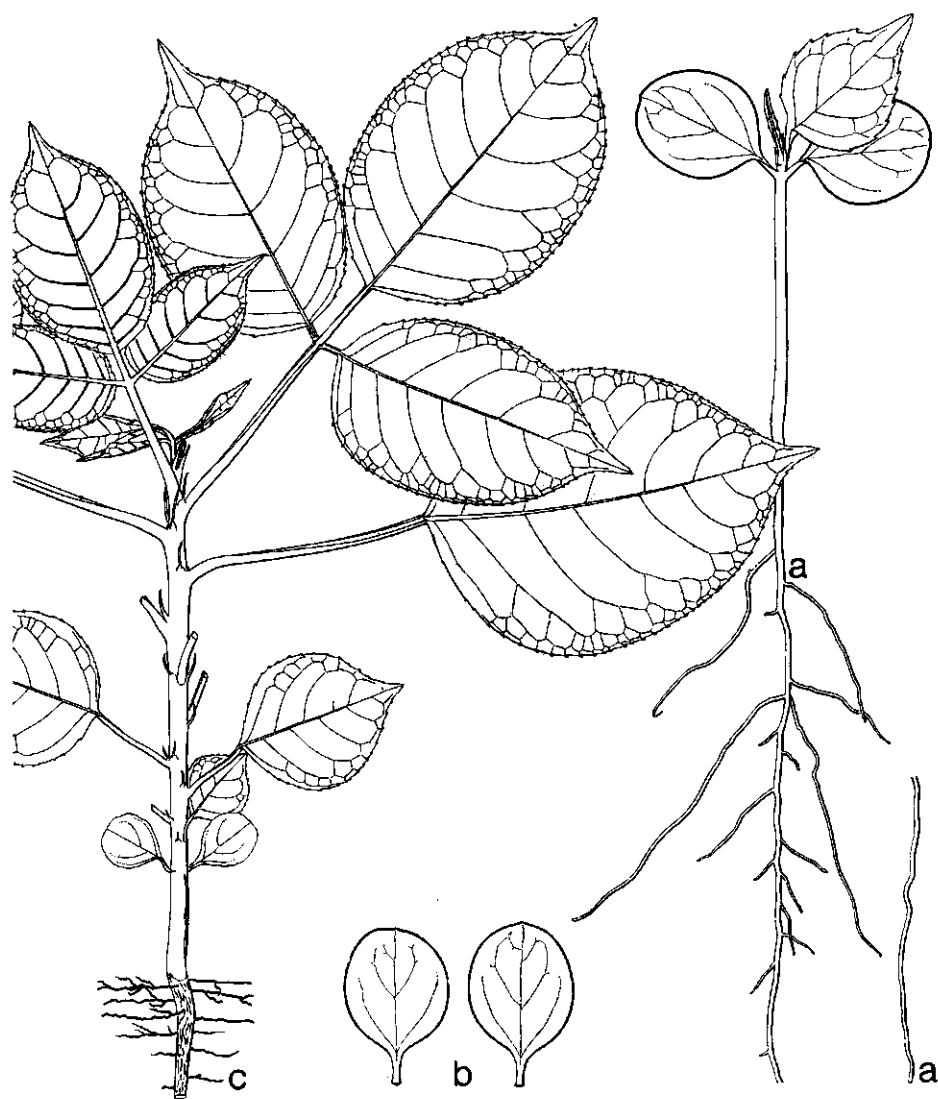


Fig. 31. *Bischofia javanica* a. young seedling, $1/1\times$; b. cotyledons, $1/1\times$; c. older seedling, $1/2\times$.

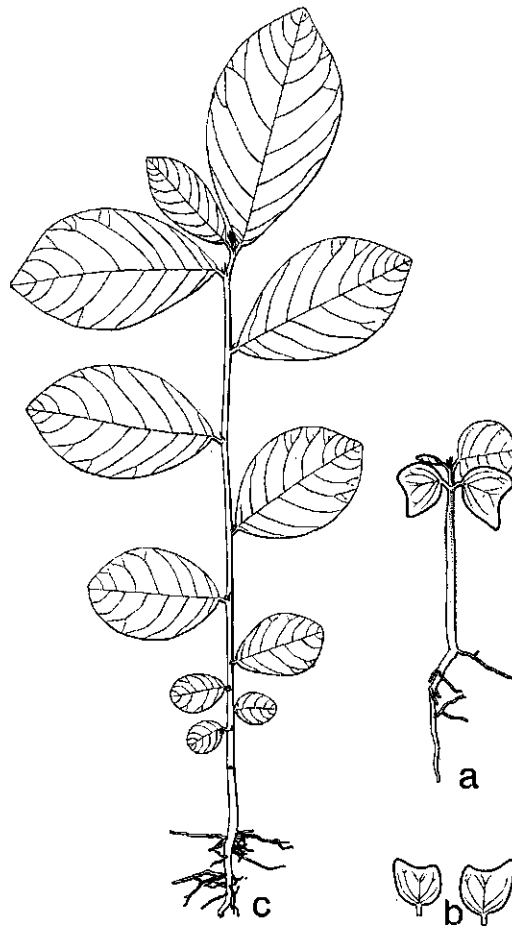


Fig. 33. *Bridelia monoica* a. young seedling, $1/1 \times$; b. cotyledons, $1/1 \times$; c. older seedling, $1/2 \times$.

ledons epigeous, 2, equal, or asymmetrical and one another's mirror image, petiolate; petiole 1–2 mm, green, hairy like hypocotyl; blade obreniform, sometimes asymmetrical, with index < 1 , ± 4 –10 by 6–12 mm, having a broadly exculptate top and a rounded base, pinninerved but almost palmately 5-nerved, entire, on both surfaces light dull green, glabrous. *Epicotyl* ± 2 –5 mm. *Stem* erect, feather-shaped with a sideward bend, zigzag, red, with simple yellow or colourless hairs. *Phyllotaxy* distichous-alternate, the plain in which the leaves are situated sometimes twisted abruptly. *Leaves* stipulate, simple, petiolate. *Highest leaves* (2nd stage) stipules 3-angular, 5 by 2 mm, green; petiole 3 mm long, $1\frac{1}{2}$ mm thick, green, with simple yellow hairs; blade obovate, with index ± 2 , $\pm 8\frac{1}{2}$ by $4\frac{1}{2}$ cm, thin, having an acuminate or not acuminate acute or obtuse top and an acute base, pinninerved, entire, dull green above, dull light greyish green beneath, on both surfaces simple short colourless hairs, ciliate.

Seeds from 2 motherplants from different localities.

GLOCHIDION J.R. et G. FORST.

B. I: 445, 448, 460; K. et V. XII: 103

Cotyledons epigeous, foliaceous. *Phyllotaxy* along main stem spiral, along branches alternate. *Leaves* stipulate, trimorphous, on main stem first developed ones without axillary branch, followed by scale-shaped ones with an axillary branch; on branches developed leaves shaped differently from the developed ones on the main stem.

- | | |
|--|--------------------|
| 1. A. cotyledons present | 2 |
| B. leaves on stem and (or) on branches present | 3 |
| 2. a. cot. glabrous | <i>G. obscurum</i> |
| b. cot. hairy | <i>G. molle</i> |
| | <i>G. rubrum</i> |
| 3. a. leaf stipules 3-angular, top not subulate; utmost developed leaves on stem:
blade obovate up to 6½ cm long | <i>G. obscurum</i> |
| b. leaf stipules subulate, base slightly broadened; utmost developed leaves
on stem: blade obovate-oblong up to 12½ cm long | <i>G. molle</i> |
| c. leaf stipules ovate, top subulate; utmost developed leaves on stem: blade
obovate-lanceolate up to 16 cm long | <i>G. rubrum</i> |

Glochidion molle BL.

B. I: 464; K. et V. XII: 136

Mal.: kedong kai. *Sund.:* ki hu-ut, ki hurang, ki pare. *Jav.:* dempul, gimer, ketumbel, lamer, lelet, pari. *Mak.:* ipoh

Fig. 34

Size at 1st stage (1st 2 leaves only) 11–22 cm, $2\frac{1}{2}$ –4 cm above collet; at 2nd stage (± 12 –21 developed and 1–9 scale-shaped leaves on main stem) 17–38 cm above collet. **Roots** off white turning dirty yellow; primary root at 1st stage very flexuous, moderately thicker than lateral ones; collet gradually and slightly thickened; lateral roots at 1st stage moderate in number, very flexuous, moderately branched. **Hypocotyl** epigeous, erect, straight, $2\frac{1}{4}$ –3 cm; at 1st stage $\frac{1}{2}$ –1 mm thick, terete, smooth, pale green, white at base, with simple patent very short colourless hairs. **Cotyledons** epigeous, 2, equal, shortly petiolate; blade elliptic, with index $1\frac{1}{2}$ –2, 10–11 by 6–8 mm, thin, having an acute top and a rounded base, pinninerved, entire, dull green, near base above and on midrib beneath hairy like hypocotyl. **Epicotyl** 1–2 mm. **Stem** erect, straight; at 2nd stage terete, smooth, green, hairy like hypocotyl. **Phyllotaxy** spiral, but along branches almost pure distichous-alternate. **Leaves** stipulate, simple; on main stem ± 12 –21 developed ones without axillary branches followed by scale-shaped ones with an axillary branch, on branches developed leaves; stipules subulate, base slightly broadened. **1st Leaf** shortly petiolate; blade obovate, with index $1\frac{1}{2}$, 12–25 by 8–17 mm, thin, having an acute or rounded top and an acuminate acute base, pinninerved, prominently nerved beneath, entire, dull green above, dull greyish

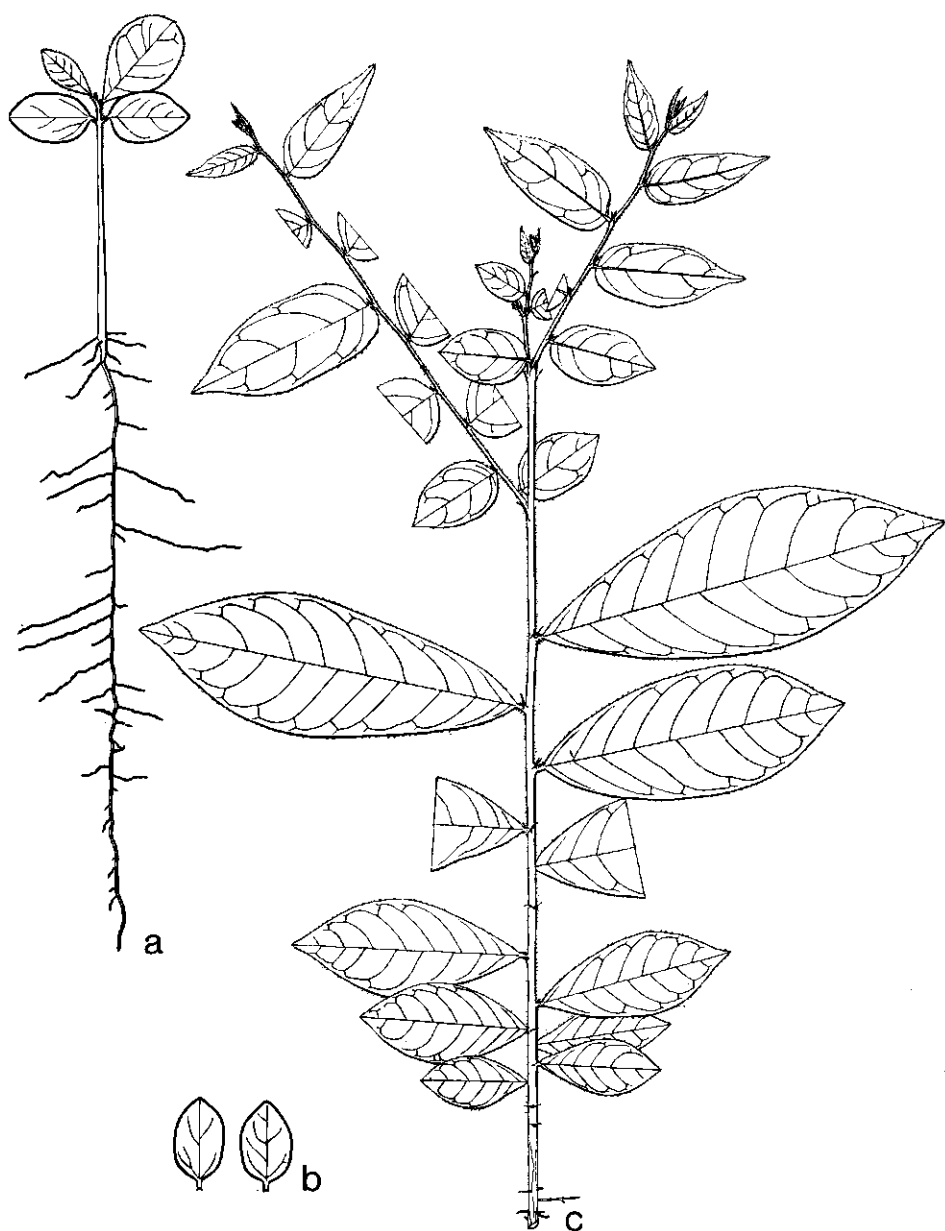


Fig. 34. *Glochidion molle* a. young seedling, $1/1 \times$; b. cotyledons, $1/1 \times$; c. older seedling, $1/2 \times$.

green beneath, on both surfaces simple patent colourless hairs. *Highest developed leaves on main stem* (2nd stage), stipules up to $\frac{1}{2}$ cm long, green, hairy; petiole up to 3 mm, smooth, green, hairy; blade obovate-oblong, with index 3, up to $12\frac{1}{2}$ by $4\frac{1}{2}$ cm, having a shortly acuminate acute mucronate top and a taperpointed acute base, pinninerved, prominently nerved on both surfaces, entire, coloured like 1st leaf on stem, on both surfaces hairy like hypocotyl. *Scale-shaped leaves on main stem* base adnate to branch, other characters usually like those of stipules. *Leaves on branches* usually like developed leaves on main stem, but lowest leaves on branches much smaller than highest leaves on main stem; petiole up to 2 mm; blade ovate or ovate-oblong sometimes oblong or obovate-oblong, with index 2–3, up to 9 by 3 cm; base asymmetrically rounded, sometimes slightly cordate, broader at posterior side. *Top of plant* hairy, green.

Seeds from 2 motherplants from different localities.

***Glochidion obscurum* (WILLD.) BL.** (*G. rufoglaucum* (M.A.) BOERL., ? *G. flavidum* KURZ. ex T. et B., ? *G. ornatum* KURZ.)

B. I: 461; K. et V. XII: 122

Mal.: dulang-dulang (?). *Sund.*: ki pare, ki pare lalaki. *Jav.*: dempul, uris-urisan, tjabuk

Fig. 35

Size at 1st stage (1st leaf only) ± 3 –7 cm, $\pm 1\frac{1}{2}$ – $1\frac{3}{4}$ cm above collet; at 2nd stage (± 15 leaves on main stem) ± 14 –20 cm above collet. *Roots* permanently off white; primary root at 1st stage slightly thicker than lateral ones; collet gradually and slightly thickened; lateral roots at 1st stage few, sparsely branched. *Hypocotyl* epigeous, erect, straight, ± 14 –30 mm; at 1st stage $\frac{1}{2}$ mm thick, terete, smooth, green or red, white at base, glabrous or sometimes with simple patent short colourless hairs at top. *Cotyledons* epigeous, 2, equal, petiolate; petiole ± 1 mm, green; blade elliptic, with index $1\frac{1}{2}$ –2, 6–12 by 4–7 mm, thin, having a rounded obtuse top and a rounded base, pinninerved, entire, dull green, glabrous. *Epicotyl* 2–5 mm. *Stem* erect, straight; at 2nd stage hairy near top. *Phyllotaxy* spiral, along branches alternate. *Leaves* stipulate, simple; on main stem ± 13 developed ones without axillary branches, followed by scale-shaped ones with an axillary branch; leaves on branches developed; stipules 3-angular. *Developed leaves on main stem and on branches* shortly petiolate; blade thin, pinninerved, entire. *1st Leaf* blade obovate, with index $\pm 1\frac{1}{2}$, ± 10 –15 by ± 7 –11 mm, top obtuse or obtusangular, dull green, base acuminate decurrent, nerves prominent beneath, margin and nerves beneath glabrous or sparsely hairy. *Highest developed leaves on main stem* (2nd stage) blade obovate, with index 2, up to $6\frac{1}{2}$ by $3\frac{1}{2}$ cm, having a rounded or shortly acuminate obtuse or acute mucronate top and a cuneate taperpointed base, prominently nerved on both surfaces, dark dull green above, dull greyish green beneath, glabrous or sparsely hairy near base. *Scale shaped leaves on main stem* not > stipules. *Leaves on branches* almost like those on main stem,

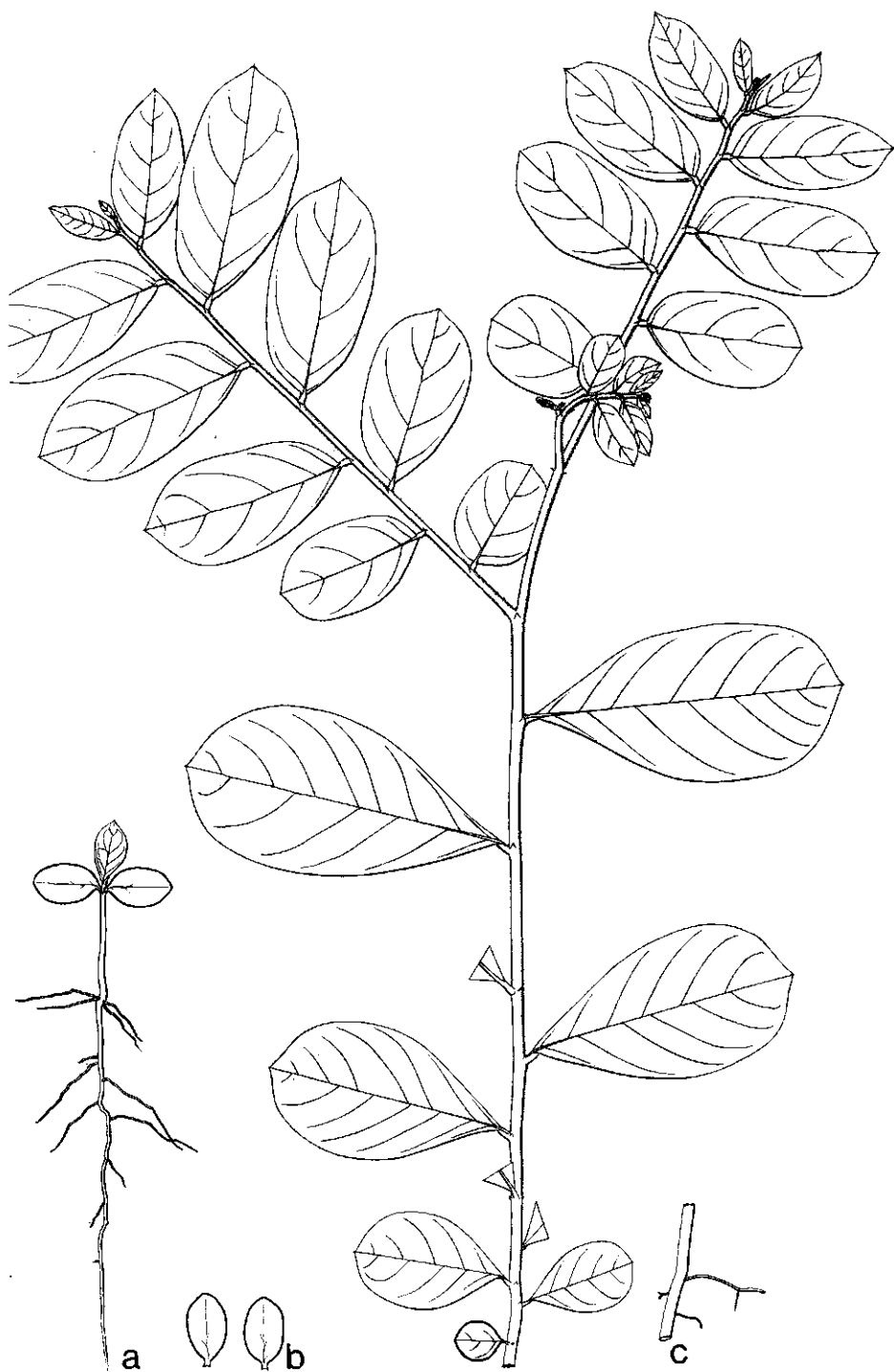


Fig. 35. *Glochidion obscurum* a. young seedling, $1/1\times$; b. cotyledons, $1/1\times$; c. older seedling, $1/1\times$.

but stipules $1\frac{1}{2}$ mm long, green; petiole short, densely hairy; blade asymmetrical-oblong, with index 2-3, $2-4\frac{1}{2}$ by $1\frac{1}{4}-1\frac{3}{4}$ cm, having an acute mucronate top and an asymmetrically rounded or at posterior side acute and at anterior side rounded base, midrib hairy on both surfaces. *Top of plant* hairy, green.

Seeds from 5 motherplants from different localities.

***Glochidion rubrum* BL.**

B. I: 464; K. et V. XII: 149

Mal.: gambiran. *Sund.*: ki pare, ki timbul, mareme. *Jav.*: dempul, lamer. *Mad.*: kelemung, lamer, tjilik, landak, loket, mer, metjermean

Fig. 36

Size at 1st stage (1 leaf only) 4-10 cm, $2\frac{1}{2}-4\frac{1}{2}$ cm above collet; at 2nd stage (18-20 developed leaves and 2-6 scale-shaped ones) 27-53 cm above collet. *Roots* off white turning yellowish white; primary root at 1st stage very flexuous, moderately thicker than lateral ones; collet gradually and slightly thickened; lateral roots at 1st stage moderate in number, very flexuous, sparsely or unbranched. *Hypocotyl* epigeous, erect, straight, $2\frac{1}{4}-4\frac{1}{4}$ cm; at 1st stage 1 mm thick, tapering upwards, terete, smooth, green above, white near base, with simple very short patent colourless hairs. *Cotyledons* epigeous, 2, equal, petiolate; petiole 1 mm, green, hairy like hypocotyl; blade elliptic, sometimes ovate; with index $1\frac{1}{2}-2$, 8-14 by 5-8 mm, thin, having an acute or obtuse top and an acute base, pinninerved, entire, midrib near base on both surfaces hairy like hypocotyl. *Epicotyl* 0-3 mm. *Stem* erect; at 2nd stage spiral owing to obtusangular connection of internodes, terete, green or red, lower part with numerous orbicular or transversely elliptic lenticels, glabrous or very sparsely hairy; branches hairy like hypocotyl. *Phyllotaxy* along main stem spiral, along branches alternate. *Leaves* stipulate, simple, shortly petiolate; on main stem lowest 18-20 ones developed without axillary branches followed by scale-shaped ones with an axillary branch, on branches only developed leaves; stipules small, ovate, top subulate. *1st Leaf* blade obovate, with index $1\frac{1}{2}-1\frac{3}{2}$, 13-22 by 8-13 mm, thin, having a shortly acuminate mucronate top and an acuminate acute base, pinninerved, prominently nerved beneath, entire, dull green above, dull greyish green beneath, glabrous. *Highest developed leaves on main stem* (2nd stage) blade obovate-oblong or obovate-lanceolate, with index 3-3 $\frac{1}{2}$, up to 16 by $5\frac{3}{4}$ cm, thin-coriaceous, having a shortly acuminate acute mucronate top and an acuminate or taperpointed acute or obtuse base, pinninerved, prominently nerved on both surfaces, entire, slightly glossy dark green above, dull green beneath, both surfaces glabrous or very sparsely hairy. *Scale-shaped leaves on main stem* adnate to branch, free top shaped like stipules, stipules sometimes inserted unequally high. *Leaves on branches* blade oblong, sometimes obovate-oblong, with index ± 2 , up to 10 by $4\frac{1}{2}$ cm, base taperpointed obtuse, other characters almost like those of developed leaves on main stem. *Top of plant* hairy, green or red.

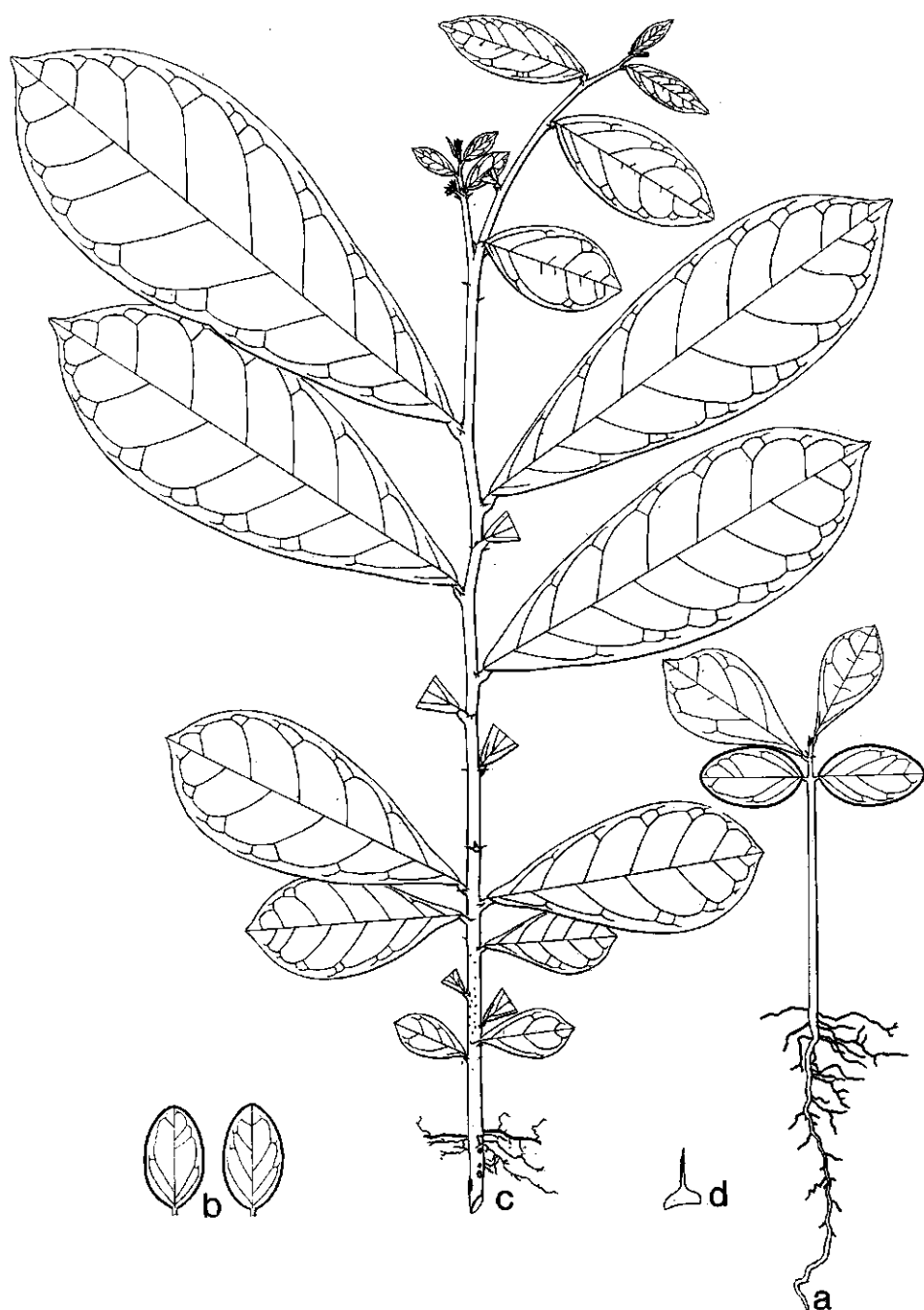


Fig. 36. *Glochidion rubrum* a. young seedling, $1/1\times$; b. cotyledons, $1/1\times$; c. older seedling, $1/2\times$; d. stipula, $2/1\times$.

Seeds obtained from 1 motherplant.

MACARANGA THOU.

B. I: 443, 453, 487; K. et V. XII: 479; TROUP III: 847

***Macaranga tanarius* (L.) M. A.**

B. I: 488; K. et V. XII: 496; TROUP III: 847

Mal.: madau (*Lamp.*), same (*Mol.*). *Sund.*: mara. *Jav.*: karahan, tutup, tutup antjur.

Mad.: totop lakek. *Alf. Minah.*: dahan. *Amb.*: hanuwa, hinan, lama

Fig. 37

Size at 1st stage (1 leaf only) 9–32 cm, 3–5½ cm above collet; at 2nd stage (11–19 leaves) 32–53 cm above collet. *Plant* in young parts of the stem a sticky colourless latex. *Roots* permanently off white, tips pure white; primary root at 1st stage very flexuous, slightly thicker than lateral ones; collet gradually thickened; lateral roots at 1st stage moderate in number to very numerous, very flexuous, sparsely branched. *Hypocotyl* epigeous, erect, straight or curved at base, 3–5 cm; at 1st stage 1½ mm thick tapering upwards, terete, smooth, green or red, white at base, with simple patent or decurved colourless hairs. *Cotyledons* epigeous, 2, equal, or asymmetrical and one another's mirror image, petiolate; petiole 3–8 mm, 1 mm broad, flattened above, convex beneath, green or red, with numerous small orbicular white glands, hairy like hypocotyl; blade obovate, with index 1–1½, 12–18 by 9–14 mm, thin, hispid to touch, having a rounded obtuse top and an acute or rounded or exculptate base, palmately 3–5-nerved, prominently red or green nerved above (middle nerve thickest), entire, dull green, both surfaces glandular and hairy like petiole. *Epicotyl* 2 mm. *Stem* erect, straight; at 2nd stage terete, smooth, green, grey-pruinose, with simple colourless hairs. *Phyllotaxy* spiral. *Leaves* stipulate, simple, petiolate. *1st Leaf* stipules small, green; petiole 10 mm; blade cordiform, with index $\pm 1\frac{1}{2}$, 23–26 by 15–17 mm, having an acute top and a cordate base, thin, hispid to touch, palmately 5-nerved, slightly prominently nerved above and considerably so beneath, dentate, dull green above, dull greyish green and white-punctate beneath, hairy like hypocotyl. $\pm 10th$ *Leaf* petiole up to 13 cm, terete, smooth, green, hairy like stem, with small orbicular colourless glands; blade peltate, ovate, with index slightly > 1 , up to ± 11 by ± 10 cm, with an acuminate acute top, possessing a repand and near insertion of petiole slightly exculptate margin, dull green above, dull greyish green beneath, on both surfaces simple patent colourless hairs, finely grey-scaly beneath. *Top of plant* with hairs turning dense and felty; green.

Seeds from 5 motherplants from different localities.

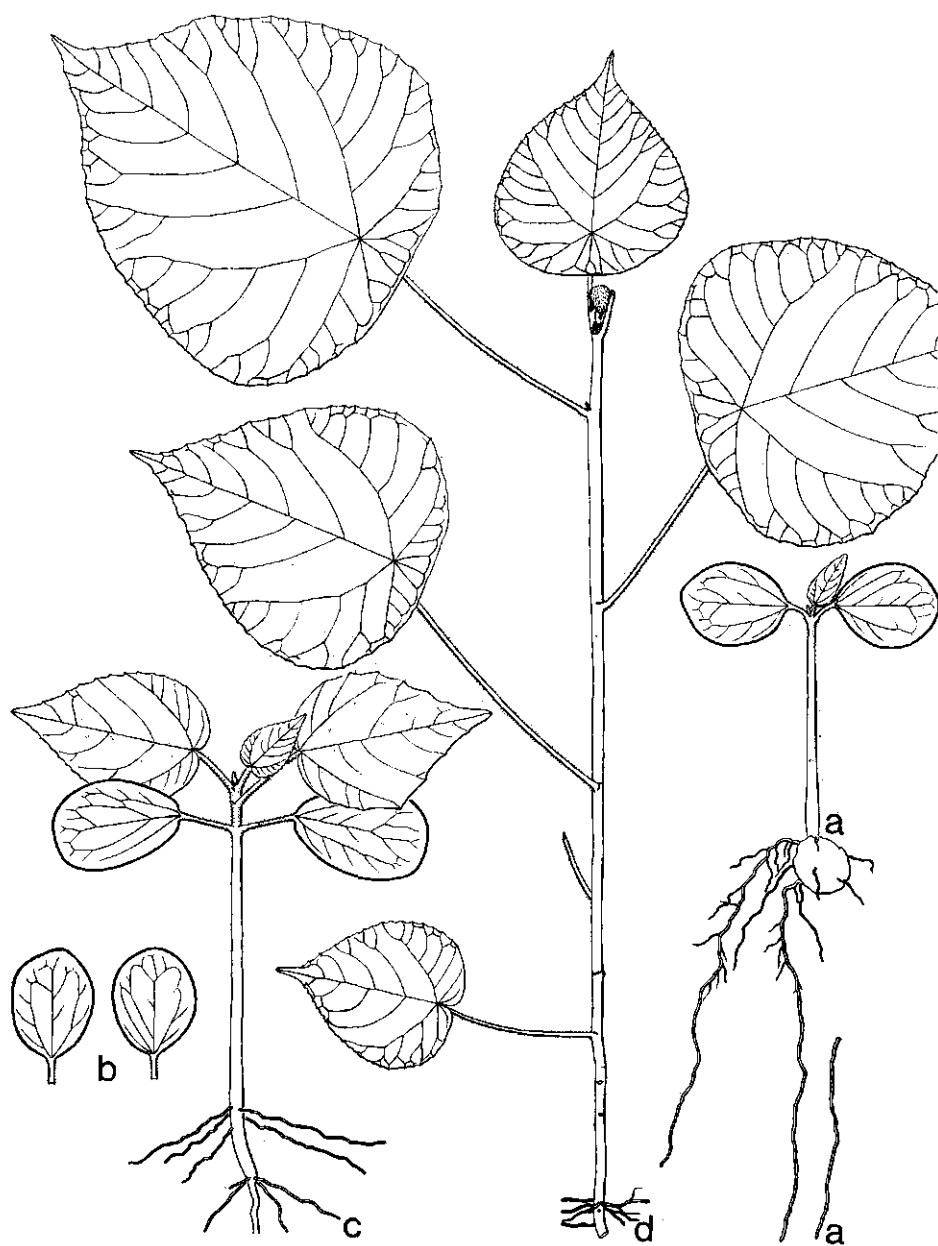


Fig. 37. *Macaranga tanarius* a. young seedling, $1/1\times$; b. cotyledons, $1/1\times$; c. seedling with developed 1st leaf, $1/1\times$; d. older seedling, $1/2\times$.

MELANOLEPIS RCHB. f. et ZOLL.

B. I: 481; K. et V. XII: 394; TROUP III: 837

Melanolepis multiglandulosa (BL.) RCHB. f. et ZOLL. (*Mallotus moluccanus* Auct. non (L.) M.A.) B. I: 481 K. et V. XII: 400*Mal.*: daun kapur (*Mol.*), kaju bulet angin (*Lamp.*), nangang (*S.W.C.*). *Jav.*: teter, tutup, tutup awu, tutup putih. *Mad.*: padang. *Alf. Amb.*: ti a-ur, tatome a-ur. *Ternate*: dopal madoro, hate sika-sika ngadu. *Ulias.*: luha, ruha

Fig. 38

Size at 1st stage (2 leaves only) 17–22 cm, $3\frac{1}{2}$ –7 cm above collet; at 2nd stage (10–12 leaves) 15–35 cm above collet. *Roots* white turning yellowish white; primary root at 1st stage slightly thicker than lateral ones; collet gradually and moderately thickened. *Hypocotyl* epigeous, erect, straight but sometimes curved at base, 3–5½ cm long, 1½ mm thick at base, tapering upwards, terete, green, white at base, with dense simple patent colourless hairs. *Cotyledons* epigeous, 2, equal but sometimes slightly asymmetrical and one another's mirror image, petiolate; petiole channelled, ± 4 –6 mm, green, hairy like hypocotyl; blade ovate, with index ± 1 , 16–19 by 15–20 mm, thin, having a rounded obtuse top and an exculptate base narrowed into petiole, palmately 3–5-nerved, with midrib bifurcate at $\frac{3}{4}$ – $\frac{3}{4}$ length, prominently nerved on both surfaces, entire, dull green above, glossy green beneath, on both surfaces especially on nerves hairy like hypocotyl, ciliate. *Epicotyl* 2–13 mm. *Stem* erect, straight; at 2nd stage spiral owing to obtusangular connection of internodes, terete, smooth, green, with white stellate much branched hairs. *Phyllotaxy* spiral. *Leaves* simple, petiolate; stipules indistinct; petiole terete, smooth, green, hairy like stem; blade cordiform, slightly palmately lobed, with index 1–1¼, thin, felty or mealy to touch, having an acuminate acute top and a cordate base, palmately 7-nerved, coarsely dentate, dull light green, both surfaces especially on nerves hairy like stem. *1st Leaf* petiole shorter than blade; blade 23–32 by 20–25 mm. ± 10 th *Leaf* petiole longer than blade, up to 9½ cm, with thick-mealy caducous hairs; blade up to 10 by 10 cm, mealy to touch. *Top of plant* with dense white mealy stellate much branched hairs.

Seeds from 3 motherplants from different localities.**PHYLLANTHUS** L.

B. I: 445, 448; K. et V. XII: 55; LUBB. II: 481; TROUP III: 830, fig. 308

Phyllanthus emblica L.

B. I: 468; K. et V. XII: 70; TROUP III: 830, fig. 308

Mal.: malaka. *Jav.*: kemlaka. *Mad.*: mlaka

Fig. 39

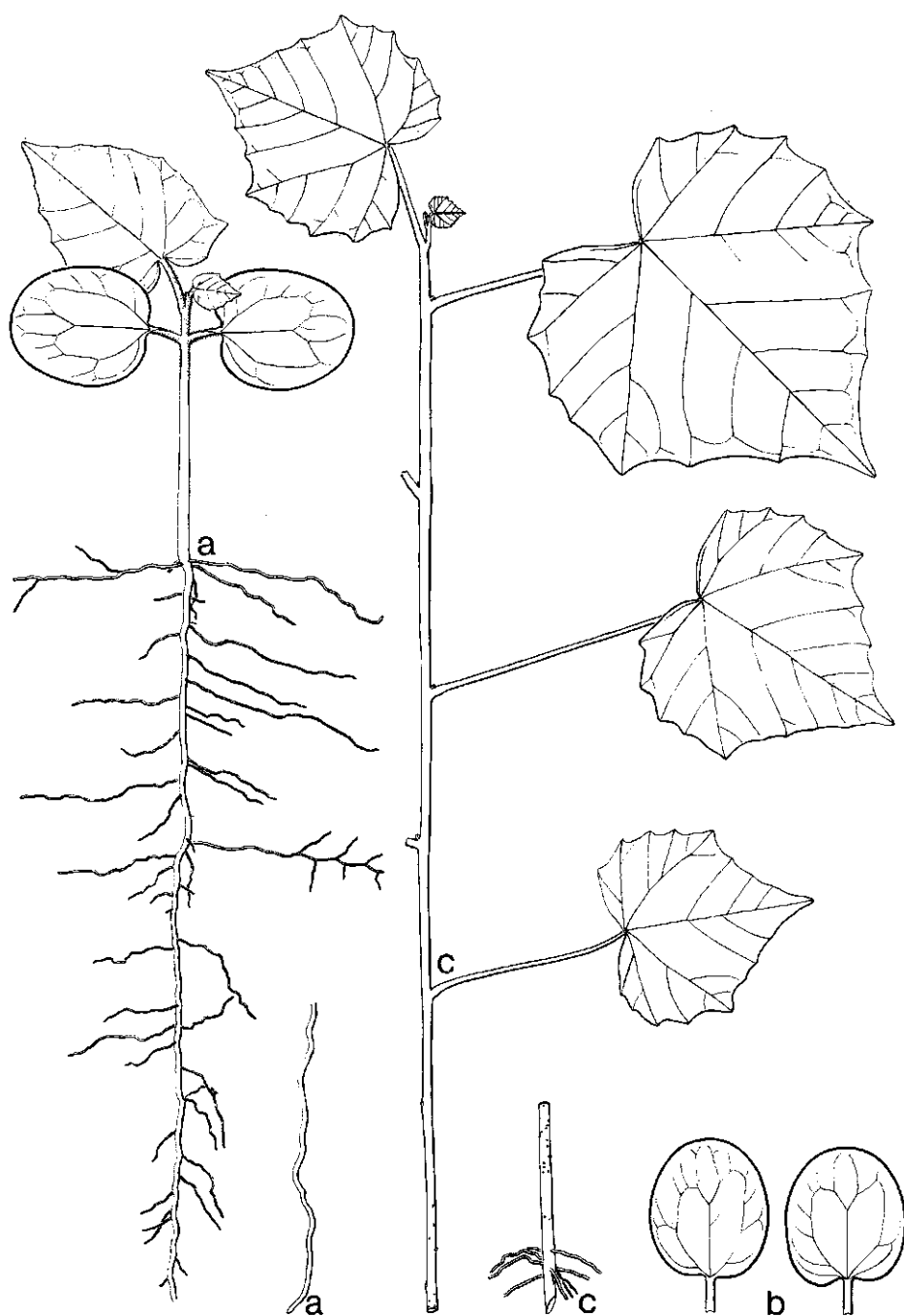


Fig. 38. *Melanolepis multiglandulosa* a. young seedling, $1/1 \times$; b. cotyledons, $1/1 \times$; c. older seedling, $1/2 \times$.

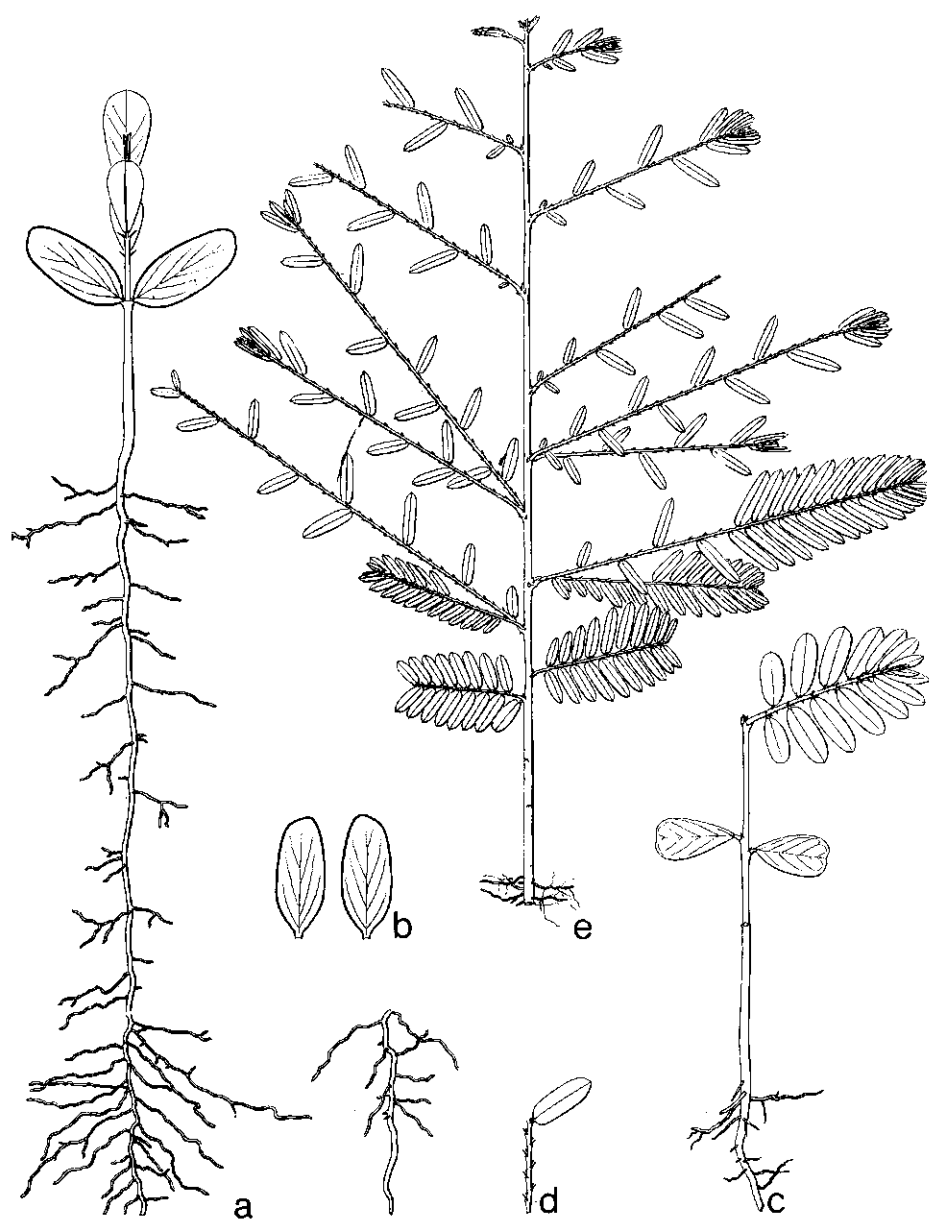


Fig. 39. *Phyllanthus emblica* a. young seedling, $1/1 \times$; b. cotyledons, $1/1 \times$; c. seedling with developed first and second leaves and first branch, $1/1 \times$; d. leaf on branch, $1/1 \times$; e. older seedling, $1/2 \times$.

Size at 1st stage (3–4 leaves only) up to ± 16 cm, $2\frac{1}{2}$ – $3\frac{1}{2}$ cm above collet; at 2nd stage (5–8 leaves) ± 8 – 14 cm above collet. *Roots* white turning off white or reddish yellow or brown; primary root at 1st stage very flexuous, moderately thicker than lateral ones; collet not thickened. *Hypocotyl* epigeous, erect, straight, $1\frac{3}{4}$ – $5\frac{1}{2}$ cm; at 1st stage $\frac{3}{4}$ – 1 mm thick tapering upwards, terete, smooth, brown or red, white at base, with simple short thick colourless hairs or glabrous. *Cotyledons* epigeous, 2, equal, petiolate; petiole 1 mm, red, glabrous; blade oblong or ovate-oblong or obovate-oblong, with index 2–3, 11–21 by 5–9 mm, thin-coriaceous, having a rounded obtuse top and a base narrowed into petiole, palmately 3-nerved, entire, dark dull glaucous above, light dull green beneath, glabrous. *Epicotyl* 3–20 mm. *Stem* erect, feather-shaped with a sideward bend, slightly zigzag, hairy near top. *Phyllotaxy* 1st 2 or 3 leaves spirally arranged, 1st 2 ones sometimes subopposite, succeeding ones distichous-alternate, along branches distichous-alternate. *Leaves* stipulate, simple, 1st to 2nd or 6th on main stem developed, shortly petiolate, without axillary branches, succeeding ones scale-shaped and with axillary branches, sometimes transitions between developed and scale-shaped ones; leaves on branches developed, very shortly petiolate; stipules 3-angular (TROUP: linear falcate), ± 1 mm long, membranous, fimbriate. *Developed leaves on main stem* blade obovate or obcordiform or obovate-oblong or obcordiform-oblong (TROUP: oblong), with index $1\frac{1}{2}$ – $2\frac{1}{2}$, in 1st leaf 8–14 by 5– $7\frac{1}{2}$ mm, in higher ones slightly larger or smaller, thin, having an acute or obtuse or notched mucronate top and a cuneate base, pinninerved (midrib prominent beneath), entire, dull greyish green beneath, red at midrib and sometimes red at margin, glabrous. *Leaves on branches* blade lanceolate (TROUP: linear oblong), with index 3–6, 4–12 by 1– $3\frac{1}{2}$ mm, having an acute top and a rounded base, thin, pinninerved, with a slightly revolute margin, entire, dull green above, light greyish green beneath, red at margin, glabrous. *Top of plant* hairy, red or green.

Seeds from 4 motherplants from different localities.

SECURINEGA JUSS.

B. I: 448, 465; K. et V. XII: 50 (*Flueggia*)

Securinega virosa (WILLD.) PAX et HOFFM. (*Flueggia virosa* (WILLD.) BAILL.)

B. I: 466; K. et V. XII: 51).

Mal.: temeos (*Atjeh*). *Sund.*: simpeureum. *Jav.*: imer, latiam, prembilutan, sigar djalak, tjungbilut, trembilutan)

Fig. 40

Size at 1st stage (1st leaf only) up to $\pm 7\frac{1}{2}$ cm, ± 8 mm above collet; at 2nd stage (± 27 leaves) ± 20 cm above collet. *Roots* permanently yellowish white; primary root at 1st stage collet gradually and slightly thickened. *Hypocotyl* epigeous, erect, straight, ± 1 cm; at 1st stage $\frac{1}{2}$ mm thick, terete, smooth; brownish red near top, white near

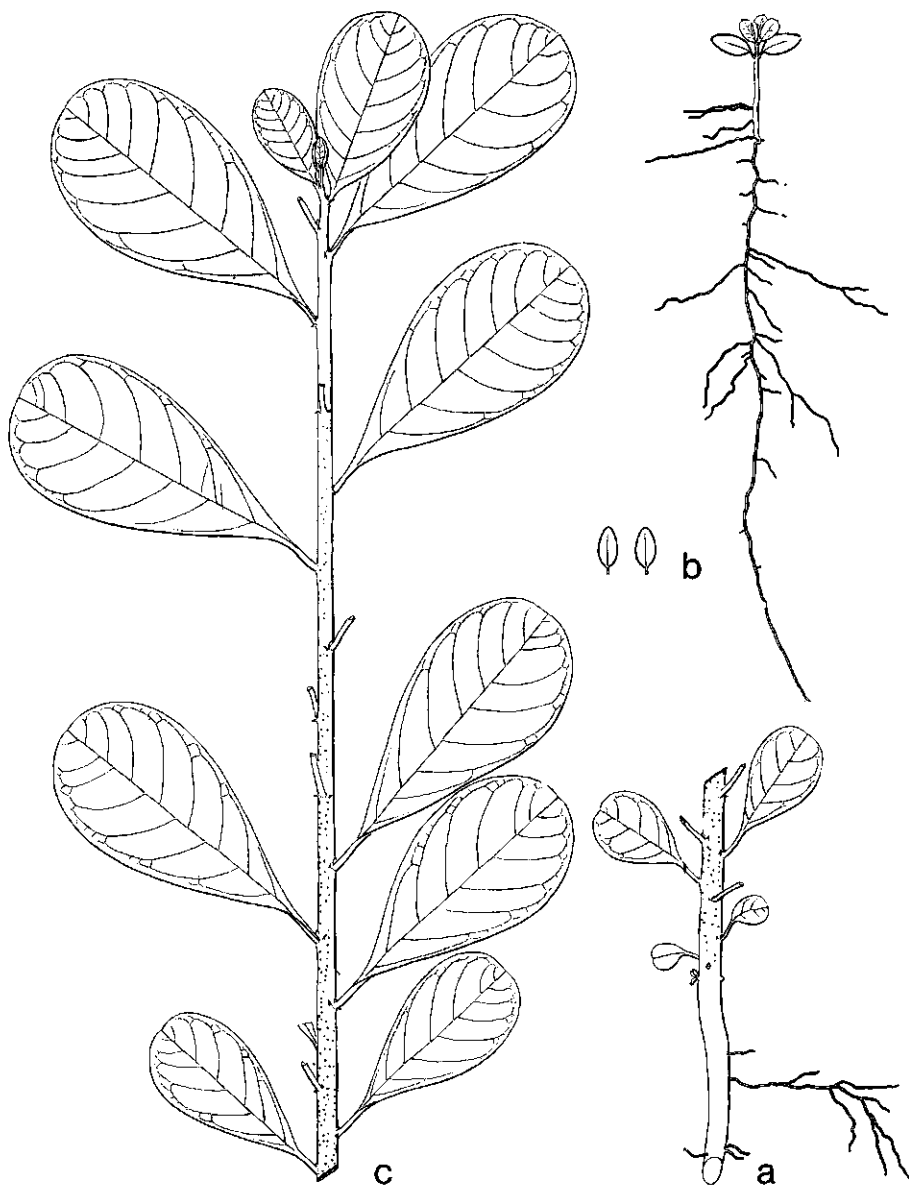


Fig. 40. *Securinega virosa* a. young seedling, $1/1\times$; b. cotyledons, $1/1\times$; c. older seedling, $1/1\times$.

base, glabrous. *Cotyledons* epigeous, 2, equal, petiolate; petiole 1 mm long, $\frac{1}{2}$ mm broad, green, glabrous; blade elliptic or oblong, with index ± 2 , $5\frac{1}{2}$ by $2\frac{1}{2}$ mm, having an obtuse top and a base narrowed into petiole, pinninerved, entire, dull green, glabrous. *Stem* erect, straight; at 2nd stage 4-angular near top, dark red, glabrous. *Phyllotaxy* spiral. *Leaves* stipulate, simple, petiolate; stipules 3-angular, up to $1\frac{1}{2}$ mm long, membranous; petiole green; blade obovate, thin, having an obtuse top and an acute narrowed base, pinninerved, entire, dull green above, light dull green beneath, glabrous. *1st Leaf* petiole $1\frac{1}{2}$ mm; blade with index $\pm 1\frac{1}{4}$, $\pm 2\frac{1}{2}$ by 2 mm, midrib slightly prominent beneath. *Highest leaves* (2nd stage) petiole up to $\frac{1}{2}$ cm, channelled above; blade with index ± 2 , up to $4\frac{1}{2}$ by 2 cm.

Seeds from 1 motherplant.

FAGACEAE

B. II: 3; K. et V. X: 1; LUBB. II: 526, *Cupuliferae*; TROUP III: 913

Cotyledons hypogeous, 2, their upper surfaces in close contact, together at side of stem, covered with testa, petiolate, fleshy. *Phyllotaxy* spiral, but rarely 1st 2 leaves opposite. *Leaves* stipulate, simple, petiolate, 1st leaves usually scale-shaped.

First developed leaves present

1. a. blade of developed leaves dentate, with simple yellow hairs *Quercus*
 - b. blade of developed leaves entire, not with simple yellow hairs 2
2. a. primary root whether or not partly fusiformly thickened; if not: leaves sparsely ciliate *Castanopsis*
 - b. primary root not partly fusiformly thickened, leaves not sparsely ciliate *Lithocarpus*

CASTANOPSIS SPACH

B. II: 4; K. et V. X: 3; LUBB. II: 528; TROUP III: 950

Primary root of *C. argentea* and *C. tungurut* fusiformly thickened, of *C. javanica* not. *Cotyledons* hypogeous, 2, their upper surfaces in close contact, together at side of stem, covered with testa, petiolate, fleshy. *Phyllotaxy* spiral. *Leaves* stipulate, simple, petiolate; 1st leaves scale-shaped; developed leaves slightly or more distinctly silver-coloured, with appressed stellate hairs beneath.

Cotyledons and (or) 1st developed leaf and (or) higher leaves present.

1. a. primary root partly fusiformly thickened; leaves: midrib prominent on both surfaces 2

- b. primary root not thickened; leaves: midrib only prominent beneath . . .

C. javanica

2. a. primary root thickened from immediately below collet downwards; higher leaves: blade with index up to 4, glabrous above; stem not scaly . . . *C. argentea*

- b. primary root thickened from some centimeters below collet downwards; higher leaves: blade with index up to 3, sometimes with sparse stellate hairs above; stem scaly *C. tungurut*

***Castanopsis argentea* (BL.) DC. (*Castanea argentea* BL.)**

B. II: 4; K. et V. X: 5

Mal.: berangan dangkal (*Bill.*). *Sund.*: saninten. *Jav.*: sarangan

Size at 1st stage (1st almost developed leaf only) 28–68 cm, 4½–11 cm above collet; at 2nd stage (6–15 developed leaves) 9–12½ cm above collet. *Roots* brownish black turning reddish brown, tips white; primary root at 1st stage moderately flexuous, much thicker than lateral ones, from collet downwards over ± 10 cm considerably and fusiformly thickened; lateral roots at 1st stage under thickened part of primary root very numerous, much branched; typical expansion of primary root still very distinct at 2nd stage. *Hypocotyl* hypogeous, very short. *Cotyledons* hypogeous, 2, their upper surfaces in close contact, covered with testa, petiolate, fleshy, very soon falling. *Epicotyl* erect, straight, 0–6 cm, rather difficult to observe owing to presence of adventitious roots. *Stem* at 1st and 2nd stage erect, straight, terete, smooth, green or brown, with simple colourless hairs. *Phyllotaxy* spiral. *Leaves* stipulate, simple, 1st 6–9 leaves scale-shaped; next ones developed, petiolate; stipules narrowly 3-angular, green, hairy like stem. *Developed leaves* petiole up to ± 4 mm, flattened above, convex beneath, hairy like stem; blade in lowest developed leaves elliptic or oblong, in next ones lanceolate, rarely obovate-lanceolate, with index up to 4, up to 13 by 3 cm (in lowest developed leaf 1–8 by 1–2½ cm), thin-coriaceous, in lowest developed leaf having an acuminate but in higher leaves a long-acuminate acute and rarely caudate often mucronate top and a cuneate or taper-pointed or acuminate acute base, pinninerved and midrib prominent on both surfaces but lateral nerves prominent beneath, entire but sometimes in higher leaves shallowly repand and often waving up and down at margin, green, slightly glossy above but lower leaves sometimes with a dull silvery shine or a leaden shine, greyish green or yellowish green beneath, glabrous above or near base sparsely hairy like stem, with appressed tangled stellate hairs with a silvery shine and especially on nerves hairy like stem. *Top of plant* green or red, with dense yellowish hairs; leaves red or green when young.

Seeds from 2 motherplants from different localities.

***Castanopsis javanica* (BL.) DC. (*Castanea javanica* BL.)**

B. II: 4; K. et V. X: 9

Mal.: berangan, duri, berangan hadji. *Sund.*: kali morot, ki hijux, k. rijung, rijung anak, rijung gunung

Size at 1st stage (1st developed leaf only) ± 25 –49 cm, 9–11 cm above collet; at 2nd stage (4–8 developed leaves) 10–12 cm above collet. *Roots* brown or brownish black turning off white; primary root at 1st stage moderately flexuous, much thicker than lateral ones; collet gradually and slightly thickened but not fusiformly; lateral roots moderate in number, very flexuous, moderately to much branched. *Hypocotyl* hypogeous, very short. *Cotyledons* hypogeous, 2, together at side of stem, their upper surfaces in close contact, covered with testa, petiolate, thick-fleshy. *Epicotyl* at 1st stage erect, straight, brown; with simple brownish yellow hairs. *Stem* erect, straight, terete, smooth, red or green near top, on lower parts brown or blackish brown, hairy like epicotyl; at 2nd stage scaly near top. *Phyllotaxy* spiral. *Leaves* stipulate, simple; 1st 6–13 leaves scale-shaped, next ones developed, petiolate; stipules of lower leaves linear, 3 mm long, of higher leaves ovate-lanceolate up to 5 mm long, acute, green or brownish green or red, hairy like epicotyl. *Developed 1st 4–8 leaves* petiole up to 3 mm, flattened above, convex beneath, green or red or brown, hairy like epicotyl; blade oblong or lanceolate, with index ± 3 , up to $7\frac{1}{2}$ by $2\frac{1}{2}$ cm, thin or thin-coriaceous, having an acuminate (rarely caudate) acute or obtuse mucronate top and a shortly-acuminate base narrowed into petiole, pinninerved, prominently nerved beneath only, entire, dull green or slightly glossy dark or plain green above, dull yellowish or greyish green rarely with a silvery shine beneath, sparsely ciliate, glabrous above, especially on nerves hairy beneath, between these hairs appressed stellate ones with a faint silvery shine. *Top of plant* hairy, green or red.

Seeds from 2 motherplants from different localities.

***Castanopsis tungurut* (BL.) DC. (*Castanea tungurut* BL.)**

B. II: 4; K. et V. X: 7

Sund.: kalimborot, kalimorot, tanggogo, tunggeureuh, tunggurut

Fig. 41

Size at 1st stage (1st developed leaf only) up to ± 67 cm, ± 15 cm above collet; at 2nd stage (± 8 –11 developed leaves) 15–24 cm above collet. *Roots* blackish brown turning reddish brown, tips white; primary root at 1st stage slightly flexuous, much thicker than lateral ones, from 5–10 cm below collet downwards considerably and fusiformly thickened over ± 10 –12 cm, on thickened part many lenticels; collet gradually and slightly thickened; lateral roots few, very flexuous, much branched. *Hypocotyl* hypogeous, very short. *Cotyledons* hypogeous, their upper surfaces in close contact, together at side of stem, covered with testa, fleshy, petiolate, soon falling. *Epicotyl* erect, straight, terete, brown, with simple colourless hairs. *Stem* at

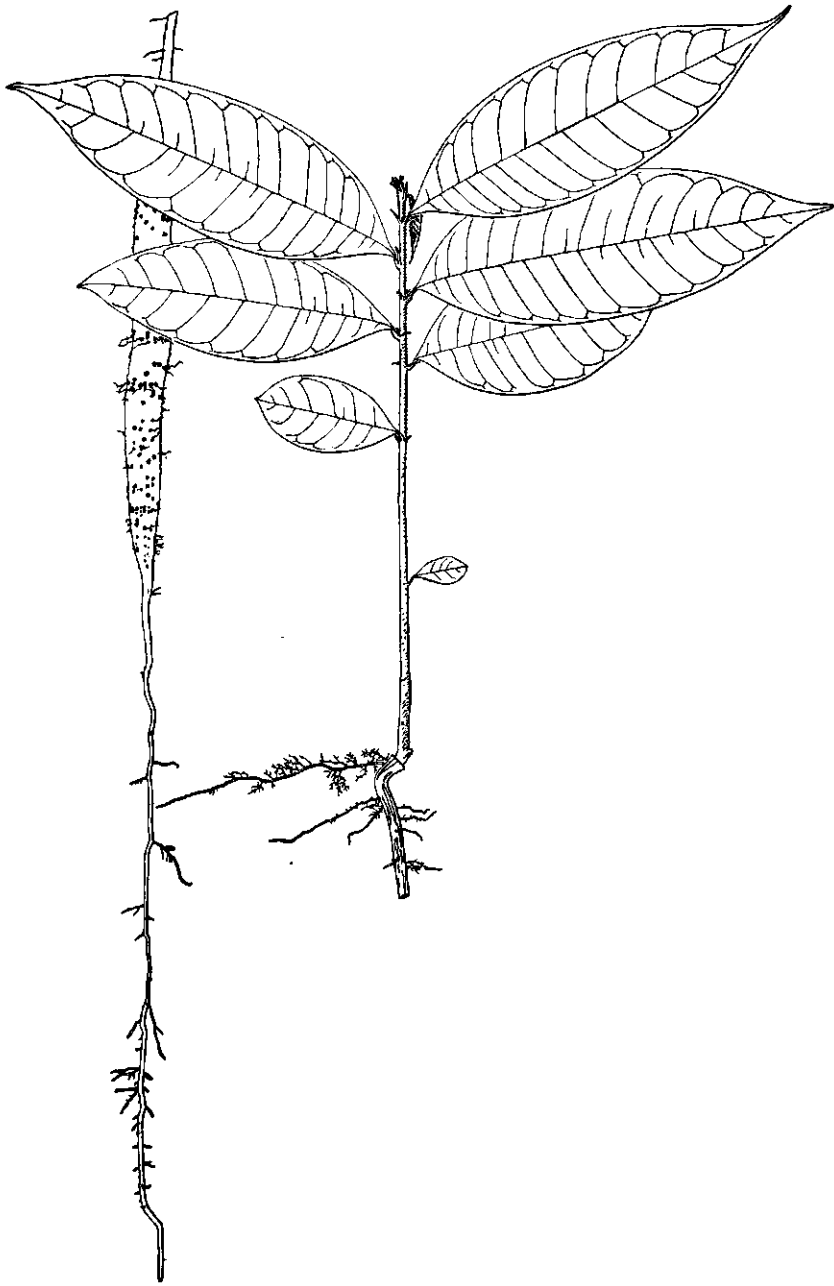


Fig. 41. *Castanopsis tungurut* older seedling, $1/2\times$.

1st and 2nd stage erect, straight, slightly furrowed near top, terete near base, with simple colourless hairs and between these especially near top sparse reddish brown scales. *Phyllotaxy* spiral. *Leaves* stipulate, simple; 1st leaves scale-shaped, next ones developed and petiolate; stipules narrow-3-angular or ovate-lanceolate, up to 1 cm long, having an acute top, green, hairy and scaly like stem. *Developed 8–11 leaves* petiole up to 1 cm, thickened, flattened above, convex beneath, green, hairy and scaly like stem; blade of lowest developed leaves elliptic or obovate or oblong or obovate-oblong, with index up to 3 but in 1st developed leaf $1\frac{1}{2}$ – $2\frac{1}{2}$, 17–34 by 7–20 mm, in higher leaves $19\frac{1}{2}$ by $7\frac{1}{4}$ cm; blade thin-coriaceous, in lower leaves with acute top and base, in higher ones with a shortly acuminate mucronate top and a shortly acuminate or shortly cuneate base narrowed into petiole, pinninerved and midrib prominent on both surfaces but lateral nerves prominent beneath, entire, midrib near base with simple colourless hairs or glabrous, with sparse colourless stellate very small sparsely branched hairs above, especially on nerves beneath simple colourless hairs, besides these, appressed dense thin and felty stellate hairs beneath with a silvery shine. *Top of plant* hairy, green.

Seeds from 1 motherplant.

LITHOCARPUS BL. (*Quercus* L.)

B. II: 3, 4, *Quercus*, III: 651; K. et V. X: 12, *Quercus*; LUBB. II: 534, *Quercus*; TROUP III: 913, *Quercus*

Primary root considerably thicker than lateral ones. *Hypocotyl* hypogeous, very short. *Cotyledons* hypogeous, 2, their upper surfaces in close contact, together at side of stem, covered with testa, thick-fleshy, petiolate. *Stem* erect. *Phyllotaxy* spiral but 1st 2 leaves sometimes opposite. *Leaves* lowest ones scale-shaped; higher ones developed, stipulate, simple, petiolate; stipules oblong-linear or narrow-3-angular, often very soon falling; blade entire, often having a caudate top and a base narrowed into petiole, with index 2–5, thin-coriaceous to coriaceous, pinninerved.

One or some more developed leaves present

1. a. stipules up to 6 mm long, glabrous *L. teysmannii*
 - b. stipules <4 mm or ± 4 mm long, glabrous or scaly 2
2. a. stipules glabrous. 3
 - b. stipules scaly 4
3. a. stipules linear or narrow-3-angular; developed leaves spirally arranged but placed in groups *L. elegans*
 - b. stipules linear; developed leaves not placed in groups . . . *L. kostermansii*
4. a. stipules 2 mm long, linear *L. indutus*
 - b. stipules 3 or ± 4 mm long 5

5. a. stipules 3 mm long *L. sundaicus*
 b. stipules ± 4 mm long *L. platycarpus*

***Lithocarpus elegans* (BL.) HATUS EX SOEPADMO, comb. nov. ined. (*Quercus spicata* J.E. SMITH, *Q. elegans* BL.)**

B. II: 7, *Q. elegans* BL., B. III: 652, *L. elegans* (s. above); K. et V. X: 39, *Q. spicata* SMITH; TROUP III: 949, *Q. spicata* SM.

Mal.: kabul hitam (*Banka*), pasang hendak (*Lamp.*), p. urai (*Palemb.*), p. pasang ketjil (*Palemb.*); on *Jav.*: pasang (with many local second names)

Size at 1st stage (1st developed leaf only) 56–64 cm, 19–24 cm above collet, at 2nd stage (4–11 developed leaves) 12–26 cm above collet. *Roots* brownish black, tips white; primary root at 1st stage moderately flexuous, much thicker than lateral ones; collet gradually and slightly thickened; lateral roots moderate in number, very flexuous, much branched. *Hypocotyl* hypogeous, very short. *Cotyledons* hypogeous, 2, together at side of stem, their upper surfaces in close contact, covered with testa, shortly petiolate, thick-fleshy. *Stem* erect, straight, near top spiral owing to obtusangular connection of internodes, slightly furrowed and green near top, terete, near base brown and with lengthwise-elliptic small lenticels, glabrous. *Phyllotaxy* spiral; leaves placed in groups. *Leaves* stipulate, simple; \pm 1st 4–7 leaves scale-shaped; groups of developed leaves sometimes alternating with scale-shaped ones; stipules linear or narrow-3-angular, up to 3 mm long, green, glabrous. *Developed leaves* petiolate; petiole up to 4 mm long, flattened above, convex beneath, green, glabrous; blade usually oblanceolate, rarely lanceolate, with index 4, in 1st developed leaf $4\frac{1}{2}$ – $12\frac{1}{2}$ by $1\frac{1}{4}$ –4 cm, coriaceous, having an acuminate caudate sometimes 1 cm long obtuse top and a taperpointed acute base narrowed into petiole; in higher (4th–11th) leaves with a long-acuminate base narrowed into petiole; pinninerved, in 1st developed leaf prominently nerved on both surfaces, in higher ones midrib prominent on both surfaces and lateral nerves prominent beneath, entire, dull dark green above, slightly glossy green beneath, glabrous. *Top of plant* brown scaly or glabrous, brownish green or green or reddish.

Seeds from 1 motherplant.

***Lithocarpus indutus* (BL.) REHD. (*Quercus induta* BL.)**

B. II: 7, *Q. induta* BL., III: 652, *L. indutus* (s. above); K. et V. X: 37, *Q. induta* BL.

Sund.: baturuwa, pasang batu, p. bodas, p. gede, p. kajang, p. tanggogo. *Jav.*: pasang balung, p. sungu, p. wrahas. *Alf. Minah.*: lojang putih, 1. sela

Size at 1st stage (1st developed leaf only) 34–51 cm, 18–28 cm above collet; at 2nd stage (4–7 developed leaves) 21–30 cm above collet. *Roots* brownish black turning brown; primary root at 1st stage moderately flexuous, much thicker than lateral ones; collet gradually and moderately thickened; lateral roots at 1st stage moderate

in number, patent, much branched. *Hypocotyl* hypogeous, very short. *Cotyledons* hypogeous, 2, equal, their upper surfaces in close contact, together at side of stem, covered with testa, petiolate; petiole thick-fleshy, $\frac{1}{2}$ –1 cm; blade semi-globose, flat above, $1\frac{1}{2}$ by $1\frac{1}{2}$ –2 cm, thick-fleshy, having an emarginate top and a base gradually narrowed into petiole, irregularly lengthwise grooved beneath, yellow, glabrous. *Epicotyl* erect, straight, $\frac{1}{2}$ – $2\frac{1}{2}$ cm, brown. *Stem* erect, straight but turning spiral owing to obtusangular connection of internodes, sometimes slightly angular near top, terete near base, green or brownish green near top, brown near base, glabrous. *Phyllotaxy* spiral. *Leaves* stipulate, simple; 1st 6–10 ones scale-shaped, next ones developed, petiolate; stipules usually very soon falling, linear, up to 2 mm long, brown scaly. *Developed leaves* petiole in 1st developed leaf $\frac{1}{2}$ –1 cm, in higher ones (4th–7th) up to $\pm\frac{1}{2}$ cm, flattened above, convex beneath, green or brownish green, glabrous; blade oblong or lanceolate or ovate-oblong or ovate-lanceolate, in 1st developed leaf oblong or ovate-oblong with index 2– $2\frac{1}{2}$, $2\frac{1}{2}$ –10 by 1–5 cm, in higher leaves index $3\frac{1}{2}$, up to 14 by $5\frac{1}{2}$ cm, coriaceous, lowest developed leaves having an acuminate acute top, higher ones an acuminate caudate (sometimes up to 2 cm long) obtuse or acute top, lower ones having an acute base, higher ones an acuminate base narrowed into petiole, pinninerved and midrib prominent on both surfaces but lateral nerves prominent beneath, entire, slightly glossy green above, greyish green with a leaden shine beneath, glabrous. *Top of plant* green or brownish green or bluish green, glabrous.

Seeds from 3 motherplants from different localities.

Lithocarpus kostermansii SOEPADMO, spec. nov. ined. (*Quercus blumeana* KORTH.)

B. II: 6, *Q. blumeana* KORTH., III: 652, *L. kostermansii* (s. above); K. et V. X: 57, *Q. blumeana* KORTH.

Sund.: pasang

Fig. 42

Size at 1st stage (1st developed leaf only) 37–45 cm, 11–16 cm above collet; at 2nd stage (4–9 developed leaves) 11–22 cm above collet. *Roots* persistently brown, tips yellowish white; primary root at 1st stage slightly flexuous, much thicker than lateral ones; collet gradually and moderately thickened; lateral roots at 1st stage very numerous, very flexuous, patent, much branched. *Hypocotyl* hypogeous, very short. *Cotyledons* hypogeous, 2, equal, their upper surfaces in close contact, together at side of stem, covered with testa, petiolate; petiole $\pm\frac{1}{2}$ cm, breadth > thickness, brown; blade obreniform, with index $\pm 1\frac{1}{2}$, $\pm 1\frac{1}{4}$ by $1\frac{1}{2}$ cm, in centre ± 1 cm thick, thick-fleshy, flattened above, convex beneath. *Epicotyl* very short. *Stem* erect, terete, angular or sometimes furrowed near top, greyish green or blackish green, glabrous; at 2nd stage straight, or spiral owing to irregular obtusangular connection of internodes, near base brownish black and with some orbicular yellowish brown lenticels; main stem often replaced by a branch. *Phyllotaxy* spiral. *Leaves* 1st 7–9 leaves scale-

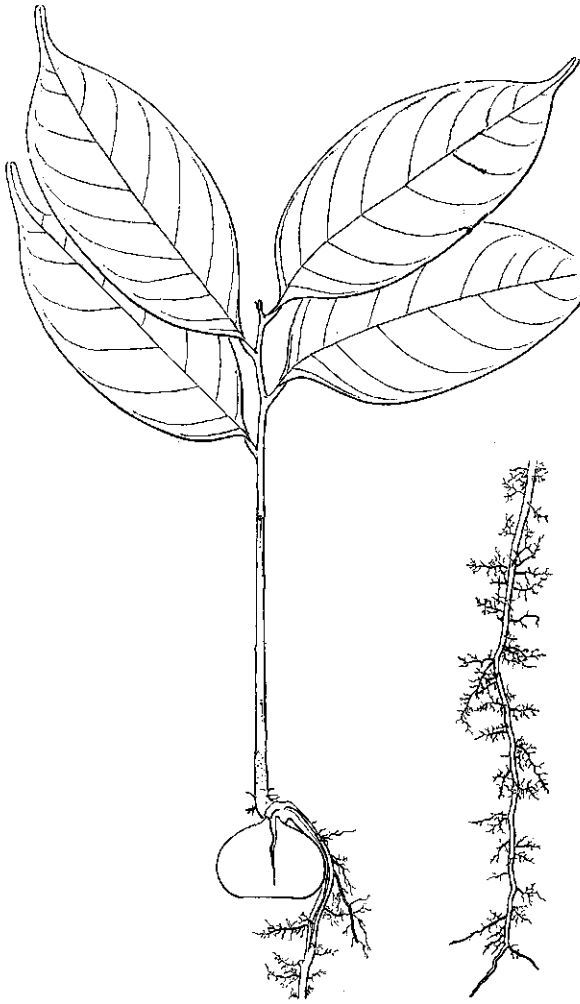


Fig. 42. *Lithocarpus kostermansii* older seedling, $1/2\times$.

shaped; next ones developed, stipulate, petiolate, sometimes alternating with some scale-shaped ones; stipules fugacious, small, linear, glabrous. *Developed leaves* petiole up to $\pm \frac{1}{2}$ cm, flattened above, convex beneath, green but in higher leaves greyish green, glabrous; blade of 1st developed leaf ovate-oblong or oblong, in higher (4th–9th) leaves oblong with index ± 2 (caudate top excluded), in 1st developed leaf $5\frac{1}{2}$ –11 by 2–5 cm, in higher ones up to $13\frac{1}{2}$ cm ($1\frac{1}{2}$ –2 cm caudate top included) by $5\frac{1}{2}$ cm, coriaceous, having a caudate ($1\frac{1}{2}$ –2 cm long) obtuse or notched top sometimes slightly broadened at the end, and in 1st developed leaf an acute but in higher leaves a shortly acuminate acute base narrowed into petiole, pinninerved (midrib prominent on both surfaces and lateral nerves only prominent beneath, in higher leaves lateral nerves prominent on both surfaces), entire, slightly glossy dark green above, greyish green with a leaden shine beneath, glabrous. *Top of plant* glabrous, green or blackish green, sometimes slightly red.

Seeds from 1 motherplant.

Lithocarpus platycarpus (BL.) REHD. (*Quercus platycarpa* BL.)

B. II: 7, *Q. platycarpa* BL., III: 652, *L. platycarpus* (s. above); K. et V. X: 53, *Q. platycarpa* BL.

Jav.: pasang

Fig. 43

Size at 1st stage (1st developed leaf only) 41–56 cm, 18–27 cm above collet; at 2nd stage (6–8 developed leaves) 19–31 cm above collet. *Roots* persistently brown; primary root at 1st stage moderately flexuous, much thicker than lateral ones; collet gradually and considerably thickened; lateral roots very numerous, very flexuous, much branched. *Hypocotyl* hypogeous, very short. *Cotyledons* hypogeous, 2, their upper surfaces in close contact, together at side of stem, covered with testa, petiolate, thick-fleshy. *Stem* erect, straight, sometimes spiral owing to obtusangular connection of internodes, furrowed near top, terete near base, green or dark brownish green near top, near base brownish black turning light brown and with numerous small orbicular yellow lenticels, glabrous. *Phyllotaxy* spiral. *Leaves* stipulate, simple; 1st 6–10 ones scale-shaped, higher ones developed and petiolate; stipules linear to ± 4 mm long, scaly. *Developed leaves* petiole up to $\pm \frac{1}{2}$ cm, flattened but sometimes channelled above, convex beneath, brownish green; blade lanceolate, in 1st developed leaf sometimes irregular and with index up to 5, 2–11 by $\frac{3}{4}$ –3 cm, in higher (6th–8th) ones up to $15\frac{1}{2}$ by 4 cm, thin-coriaceous, in 1st developed leaf with a taper-pointed or acuminate acute or obtuse top, in higher ones a long-acuminate caudate (sometimes up to $1\frac{1}{2}$ cm long) obtuse top and an acuminate acute base narrowed into petiole, pinninerved, in 1st developed leaf nerves prominent beneath but in higher ones prominent on both surfaces, entire; 1st developed leaf slightly glossy dark green above and green with a leaden shine beneath; higher ones dull green above and slightly glossy light green beneath, oldest leaves sometimes with a leaden shine beneath,

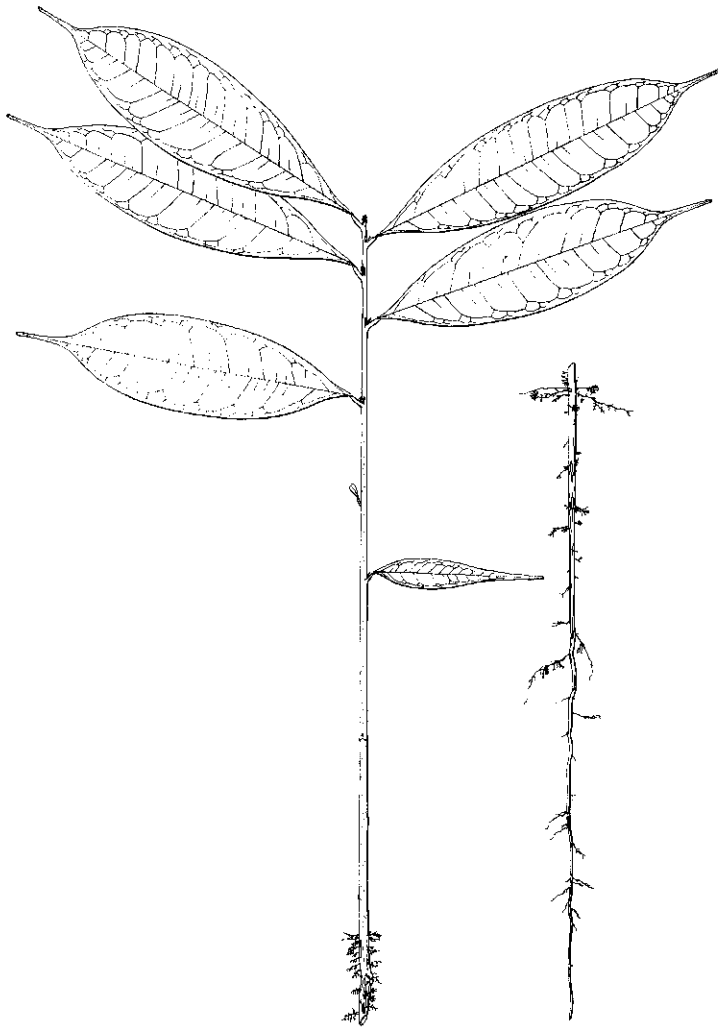


Fig. 43. *Lithocarpus platycarpus* older seedling, $1/3 \times$.

glabrous. *Top of plant* scaly, grey or green or brownish green or blackish green, glabrous; younger leaves often red.

Seeds from 1 motherplant.

***Lithocarpus sundaicus* (BL.) REHD. (*Quercus sundaica* BL.)**

B. II: 8, *Q. sundaica*, III: 652, *Q. sundaicus* (s. above); K. et V. X: 31, *Q. sundaica* BL. *Jav.*: pasang. *Mad.*: kasang usually in combination with a second name

Size at 1st stage (1st developed leaf but sometimes 2 opposite leaves only) 32–42 cm, 12–16 cm above collet; at 2nd stage (5–12 developed leaves) 14–24 cm above collet, with a tendency to build lateral branches taking the place of the main stem. *Roots* blackish brown turning brown; tips white; primary root at 1st stage moderately to very flexuous, much thicker than lateral ones; collet gradually and slightly thickened; lateral roots at 1st stage very numerous, very flexuous, patent, much branched. *Hypocotyl* hypogeous, very short. *Cotyledons* hypogeous, 2, their upper surfaces in close contact, together at side of stem, covered with testa, thick-fleshy, petiolate. *Stem* erect, straight; at 2nd stage spiral owing to obtusangular connection of internodes, angular and furrowed near top, green, scaly, terete, smooth brown or blackish grey near base. *Phyllotaxy* spiral, lowest leaves sometimes opposite. *Leaves* stipulate, simple, lowest ones (± 7 –10) scale-shaped; next ones developed, petiolate, sometimes alternating with some scale-shaped ones; stipules up to 3 mm long, oblong or narrow-3-angular, dark green, scaly like stem. *Developed leaves* petiole up to $\frac{1}{2}$ cm, flattened or channelled above, convex beneath, green; blade oblong, sometimes obovate-oblong, in 1st developed leaf sometimes ovate-oblong, with index up to 3, 2–8 by 1–3 cm, in higher ones up to $11\frac{1}{2}$ by 4 cm, thin-coriaceous or coriaceous, having an acuminate sometimes shortly caudate obtuse top often with a sideward bend and an acute base narrowed into petiole, pinninerved, prominently nerved on both surfaces, entire, dull green above, greyish green with a slightly leaden shine beneath, in higher leaves greyish green and slightly lead-coloured, glabrous but nerves beneath scaly like stem. *Top of plant* grey scaly; youngest leaves red or green, strikingly lead-coloured beneath.

Seeds from 3 motherplants from different localities

***Lithocarpus teysmannii* (BL.) REHD. (*Quercus Teysmannii* BL. more recent *L. korthalsii* (ENDL.) SOEPADMO)**

B. II: 7, *Q. teysmannii* BL., III: 652, *L. teysmannii* (s. above); K. et V. X: 52, *Q. Teysmannii* BL.

Sund.: pasang, tanggogo

Size at 1st stage (1st developed leaf only) ± 25 cm above collet; at 2nd stage (6–12 developed leaves) 21–30 cm above collet. *Roots* at 1st stage brown; primary root at

1st stage slightly flexuous, much thicker than lateral ones; lateral roots at 1st stage much branched. *Hypocotyl* hypogeous, very short. *Cotyledons* hypogeous, 2, their upper surfaces in close contact, together at side of stem, covered with testa, petiolate; petiole $\pm \frac{1}{2}$ cm, breadth > thickness; blade obovate, with index slightly > 1, $\pm 2\frac{1}{2}$ by 3 cm, flattened above, irregularly convex beneath, together semiglobose, having an applanate top and an acute narrowed base. *Epicotyl* at 1st stage erect, straight, sometimes curved at base, ± 1 cm, terete, smooth, brown, glabrous. *Stem* erect, straight, grey. *Phyllotaxy* spiral. *Leaves* stipulate, simple, petiolate; 1st ± 5 leaves scale-shaped; next ones developed, stipules linear, up to 6 mm long, brownish black or blackish green or greyish green, glabrous. *Developed leaves* petiole $\pm \frac{1}{2}$ cm, curved, pruinose, glabrous, at 2nd stage channelled above; blade lanceolate, with index > 3, in higher (6th–12th) ones index 4 and more. *1st Developed leaf* blade ± 10 by 3 cm, thin-coriaceous, having an acuminate caudate up to $1\frac{1}{2}$ cm long obtuse top and an acute base narrowed into petiole, pinninerved (midrib prominent on both surfaces and lateral nerves prominent beneath), entire, dull green above but dark green on nerves, glabrous. *Higher leaves* with a leaden shine beneath, glabrous. *Leaves on branches* much larger. *Top of plant* dark purple; young leaves dark purplish red, drooping, glossy.

Seeds from 2 motherplants from different localities.

QUERCUS L.

B. II: 3, 4; K. et V. X: 12; LUBB. II: 530; TROUP III: 913

Quercus lineata BL.

B. II: 5; K. et V. X: 20; TROUP III: 949

Sund.: pasang. *Jav.*: pasang. *Sund.*: pasang batu, butaruwa. *Jav.*: pasang emprit, p. djambe

Fig. 44a and b

Size at 1st stage (1st 2 developed leaves only) up to ± 70 cm, 18 cm above collet; at 2nd stage (± 9 developed leaves) ± 20 cm above collet. *Roots* dark reddish brown; tips white; primary root at 1st stage slightly flexuous, much thicker than lateral ones; lateral roots at 1st stage much branched. *Hypocotyl* hypogeous, erect, straight or curved, 1 cm long, 4 mm thick, terete, smooth, dark reddish brown, with numerous small lengthwise-oblong yellow lenticels and simple rather long yellowish white hairs. *Cotyledons* hypogeous, 2, equal, their upper surfaces in close contact, together at side of stem, covered with testa, petiolate; petiole 1 cm by 3 mm, channelled above, bright red especially near top, dirty yellow or red near base, woolly with simple rather long yellow hairs; blade oblong, $3\frac{1}{2}$ by $1\frac{1}{2}$ cm, in centre $\frac{3}{4}$ cm thick, thick-fleshy, having an obtuse top and an arrow-shaped acutely lobed base, entire, lengthwise furrowed beneath, yellow on both surfaces, glabrous. *Epicotyl* at 1st stage erect, straight, 13 cm, terete, smooth, hairy like petiole of cotyledons turning glabrous or almost

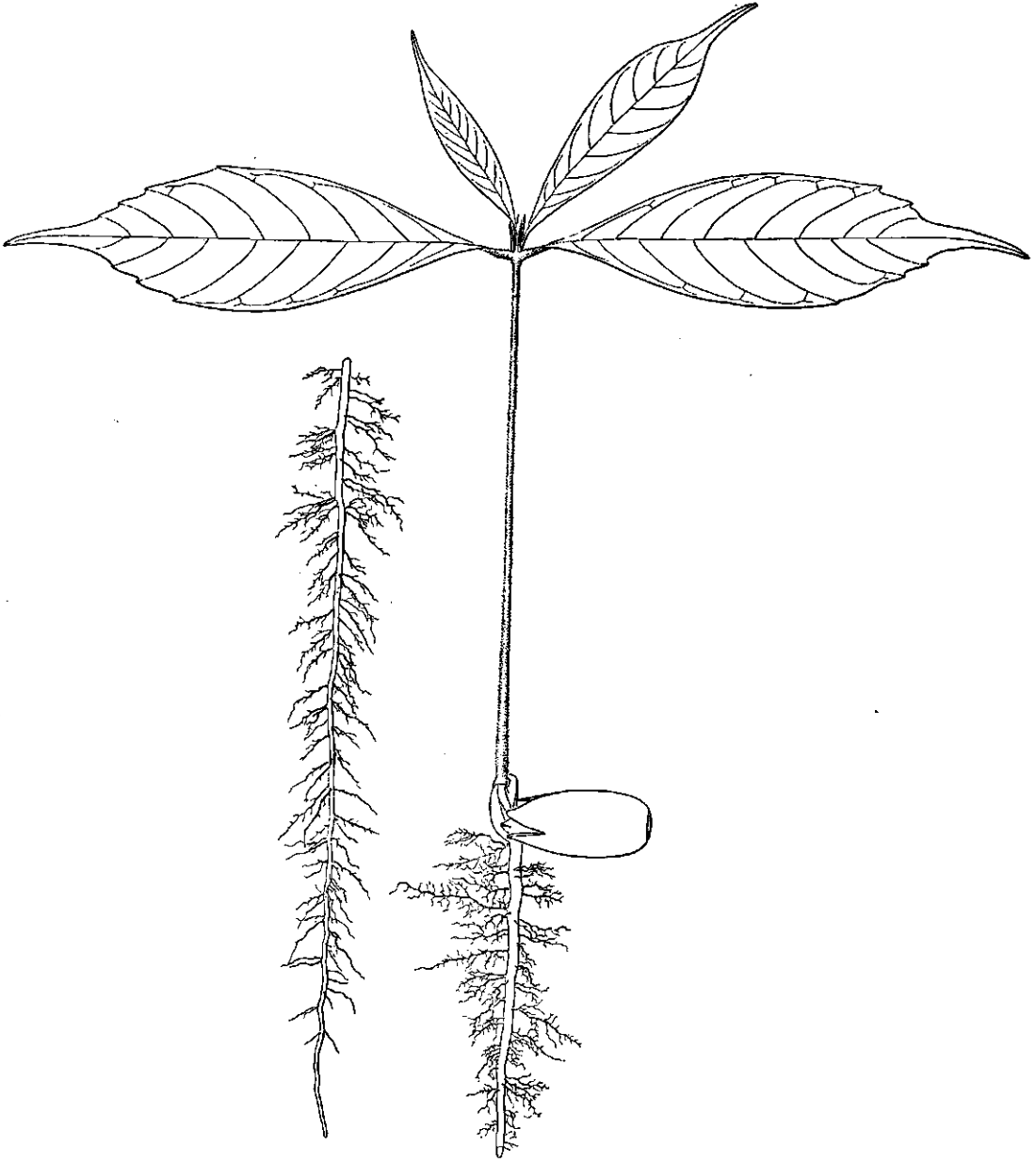


Fig. 44a. *Quercus lineata* young seedling, $1/2\times$.

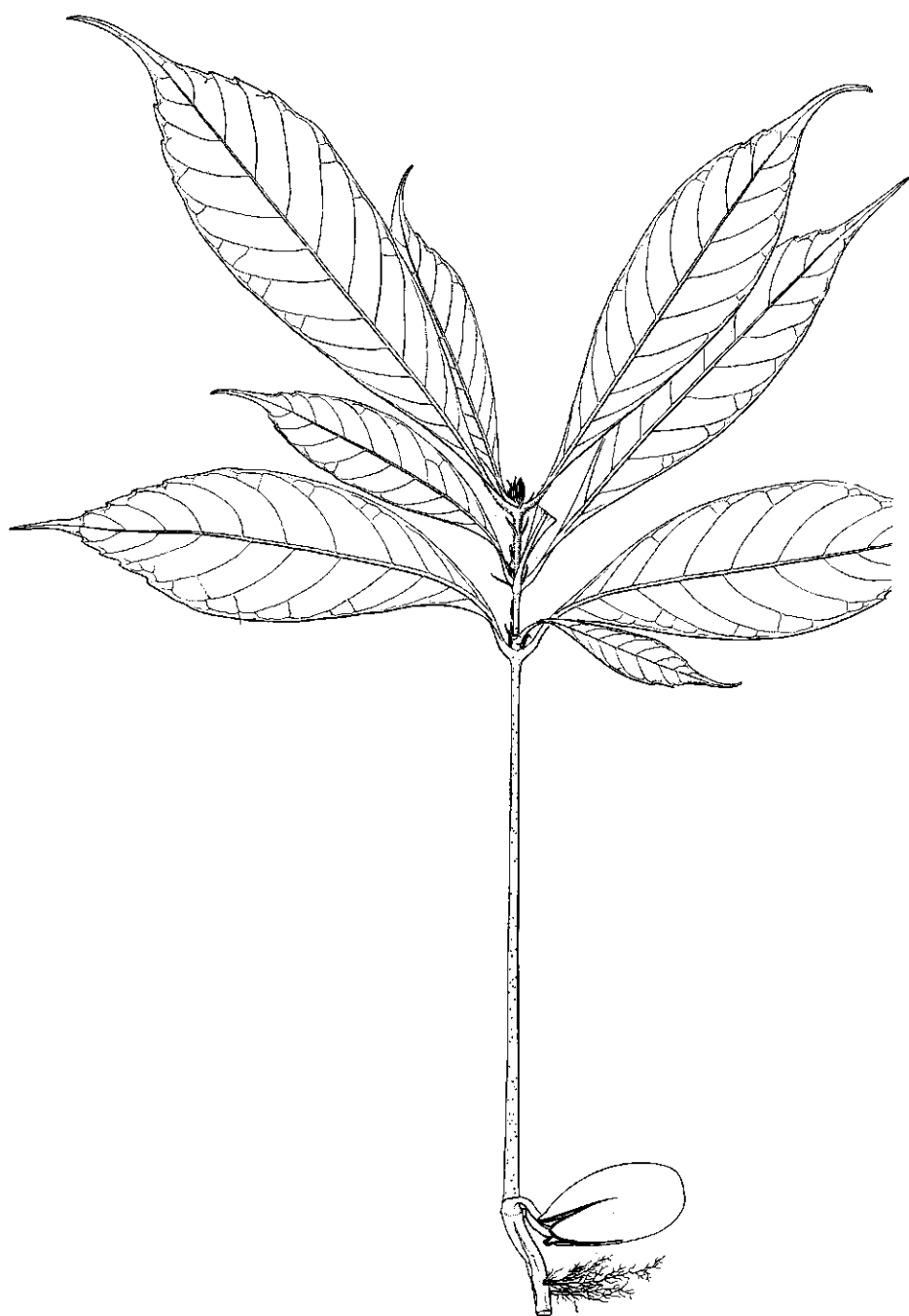


Fig. 44b. *Quercus lineata* older seedling, $1/2\times$.

glabrous. *Stem* erect, straight, near top caducously woolly like petiole of cotyledons; at 2nd stage with numerous longitudinally-elliptic grey lenticels near base. *Phyllotaxy* 1st 2 leaves opposite, next ones spirally arranged and in groups. *Leaves* stipulate, simple; groups of developed leaves alternating with scale-shaped ones; stipules linear, ± 7 mm long, with simple yellow hairs. *Developed leaves* petiolate; petiole $\pm \frac{1}{2}$ cm long and in centre $2\frac{1}{2}$ mm thick, flattened above, convex beneath, smooth, green, hairy like petiole of cotyledons; blade oblong, with index $2\frac{1}{2}$, up to $\pm 13\frac{1}{2}$ by 4 cm, thin, having a long-acuminate acute top and an acute base narrowed into petiole, pinninerved, dentate near top, especially on midrib hairy like petioles of cotyledons. *Top of plant* hairy like petiole of cotyledons; youngest leaves usually a beautiful bright red.

Seeds from 1 motherplant.

FLACOURTIACEAE

B. I: 282; K. et V. I: 171, *Samydaceae*, V: 1, *Bixaceae*; TROUP I: 12, *Bixaceae*, II: 611, *Samydaceae*

Cotyledons epigeous or hypogeous, 2, equal, petiolate, foliaceous; hypocotyl epigeous. *Phyllotaxy* spiral but sometimes higher leaves distichous-alternate. *Leaves* whether or not stipulate, simple, petiolate; blade thin, pinnately or palmately nerved. *1st Leaf* whether or not undeveloped; higher leaves sometimes having an axillary spine.

Cotyledons and(or) 1st leaf and(or) higher leaves present

1. a. cot. hypogeous or epigeous, partly covered with testa; 1st leaf blade undeveloped, or developed and cordiform; higher leaves blade cordiform or cordiformly 3-lobed; no spines *Pangium edule*
 b. cot. epigeous, not covered with testa; 1st leaf blade elliptic or ovate-oblong or ovate-lanceolate; higher leaves blade different; plant whether or not spinous 2
2. a. cot. blade 5–7 mm long; 1st leaf blade ± 6 mm long; higher leaves blade obovate or obovate-oblong; no spines *Homalium tomentosum*
 b. cot. blade 8–18 mm long; 1st leaf blade 10–30 mm long; higher leaves blade ovate-rhomboid or elliptic to lanceolate, with axillary spine *Flacourtia*

FLACOURTIA L'HÉRIT.

B. I: 283, 285; K. et V. V: 18; TROUP I: 12

Cotyledons epigeous, 2, equal, petiolate, foliaceous. *Phyllotaxy* spiral, but higher leaves sometimes distichous-alternate. *Leaves* whether or not stipulate, simple,

petiolate; stipules if present very small and difficult to observe, simple, petiolate; blade thin or thin-coriaceous. *Higher leaves* with an axillary spine.

Cotyledons and(or) 1st leaf and(or) higher leaves present

1. a. cot. blade 8–10 mm long; 1st leaf blade elliptic 10–15 mm long; higher leaves blade ovate-rhomboid, with index up to 2, in ± 15 th leaf ± 3 cm long . . .

F. indica

- b. cot. blade 12–18 mm long; 1st leaf blade ovate-oblong or ovate-lanceolate, 17–30 mm long; higher leaves blade elliptic to lanceolate, with index 3, in ± 15 th leaf ± 12 cm long *F. rukam*

Flacourtia indica (BURM. f.) MERR. (*F. ramontchi* L'HÉRIT.)

B. I: 285; K. et V. V: 19; TROUP I: 12

Sund.: saradan. *Jav.*: бага, rirukem, rukem, saradan

Fig. 45

Size at 1st stage (1st 2 leaves only) 5–15 cm, 3–5 cm above collet; at 2nd stage (14–19 leaves) 9–13 cm above collet. *Roots* at 1st and 2nd stage off white; tips white; primary root at 1st stage very flexuous, moderately thicker than lateral ones; collet gradually and slightly thickened; lateral roots at 1st stage moderate in number, very flexuous, much branched. *Hypocotyl* epigeous, erect, straight, 2–3½ cm; at 1st stage ½–1 mm thick tapering upwards, terete, smooth, green, white at base, with patent very short colourless hairs. *Cotyledons* epigeous, 2, equal, petiolate; petiole $\pm 1\frac{1}{2}$ mm, green, hairy like hypocotyl; blade orbicular or elliptic or ovate, with index ± 1 , 8–10 by 7–10 mm, thin, having a rounded obtuse or slightly emarginate top and a rounded base narrowed into petiole; palmately 3–5-nerved, prominently nerved beneath, entire, dull green on both surfaces, near base especially on midrib hairy like hypocotyl. *Epicotyl* 2–10 mm. *Stem* erect; at 2nd stage feather-shaped with a sideward bend, zigzag, terete, red on upper part, green below, with simple colourless hairs. *Phyllotaxy* spiral but higher leaves distichous-alternate or almost so. *Leaves* exstipulate, simple, shortly petiolate; blade thin, pinninerved, both surfaces on midrib hairy like stem. *1st Leaf* petiole 1–3 mm, red, hairy like stem; blade elliptic, with index $1\frac{1}{2}$ –2, 10–15 by 5–8 mm, having a notched top and an acute base, with midrib prominent beneath, crenate towards top, dull or slightly glossy green above, dull light green beneath. *Highest leaves* (2nd stage) in the axil a lateral red spine up to 7 mm long; blade ovate-rhomboid, with index up to 2, up to 3 by 2 cm, having an acute or obtuse top and a cuneate base, prominently nerved beneath, serrate, slightly glossy green above, dull green beneath.

Seeds from 3 motherplants from different localities.

Flacourtia rukam Z. et M.

B. I: 285; K. et V. V: 22

Jav.: rukem, saradan. *Sund.*: kupa landak. *Mad.*: landak

Fig. 45

Size at 1st stage (1st 2 leaves only) 7–28 cm, $4\frac{1}{2}$ –8 cm above collet; at 2nd stage (± 15 leaves) ± 20 cm above collet. *Roots* off white turning dirty yellow; primary root very flexuous, moderately or much thicker than lateral ones; collet whether or not gradually and slightly thickened; lateral roots very numerous, very flexuous, much branched. *Hypocotyl* epigeous, erect, straight, $2\frac{1}{2}$ – $5\frac{1}{2}$ cm; at 1st stage 1 mm thick, terete, smooth, green but white turning brown at base, with simple very short colourless hairs. *Cotyledons* epigeous, 2, equal, petiolate; petiole 2–3 mm, green, hairy like hypocotyl; blade elliptic or orbicular or ovate, with index $1-1\frac{1}{2}$, 12–18 by 11–17 mm, thin, having a usually slightly emarginate sometimes obtuse top and an exculptate or rounded base narrowed into petiole, palmately 3–5-nerved, entire but margin waving up and down, dull green on both surfaces, hairy beneath especially on midrib like hypocotyl. *Epicotyl* 2–10 mm. *Stem* erect; at 2nd stage spiral owing to obtusangular connection of internodes, terete, smooth, green, with simple patent very short colourless hairs. *Phyllotaxy* spiral. *Leaves* stipulate, simple, petiolate; stipules very small, often difficult to observe; petiole hairy like stem; blade thin-coriaceous, having an acute base, pinninerved, prominently nerved on both surfaces, crenate, both surfaces especially on nerves hairy like stem. *1st Leaf* petiole $2\frac{1}{2}$ –4 mm, flattened above, convex beneath, green; blade ovate-oblong or ovate-lanceolate, with index 2–5, sometimes irregular, 17–30 by 4–11 mm, with an acuminate or taperpointed obtuse or acute top, dull green above, dull greyish green beneath. *Highest leaves* (2nd stage) with an axillary spine; petiole slightly channelled, red or green; blade elliptic to lanceolate, ± 12 by 4 cm, having an acuminate obtuse top, slightly glossy green above, dull green beneath. *Top of plant* hairy, red or green.

Seeds from 2 motherplants from different localities.

HOMALIUM JACQ.

B. I: 282, 286; K. et V. I: 182; TROUP II: 611.

Homalium tomentosum (VENT.) BTH.

B. I: 286; K. et V. I: 182; TROUP II: 611

Sund.: ki bodas. *Jav.*: dalisem, dlingsem, estri. *Mad.*: abu

Fig. 46

Size at 1st stage (1st leaf only) ± 10 cm, $\pm 1\frac{1}{2}$ cm above collet; at 2nd stage (± 16 leaves) ± 40 cm above collet. *Roots* white turning off white; collet at 1st stage not thickened. *Hypocotyl* epigeous, erect, straight, $\frac{1}{2}$ –1 cm; at 1st stage $\frac{3}{4}$ mm thick,

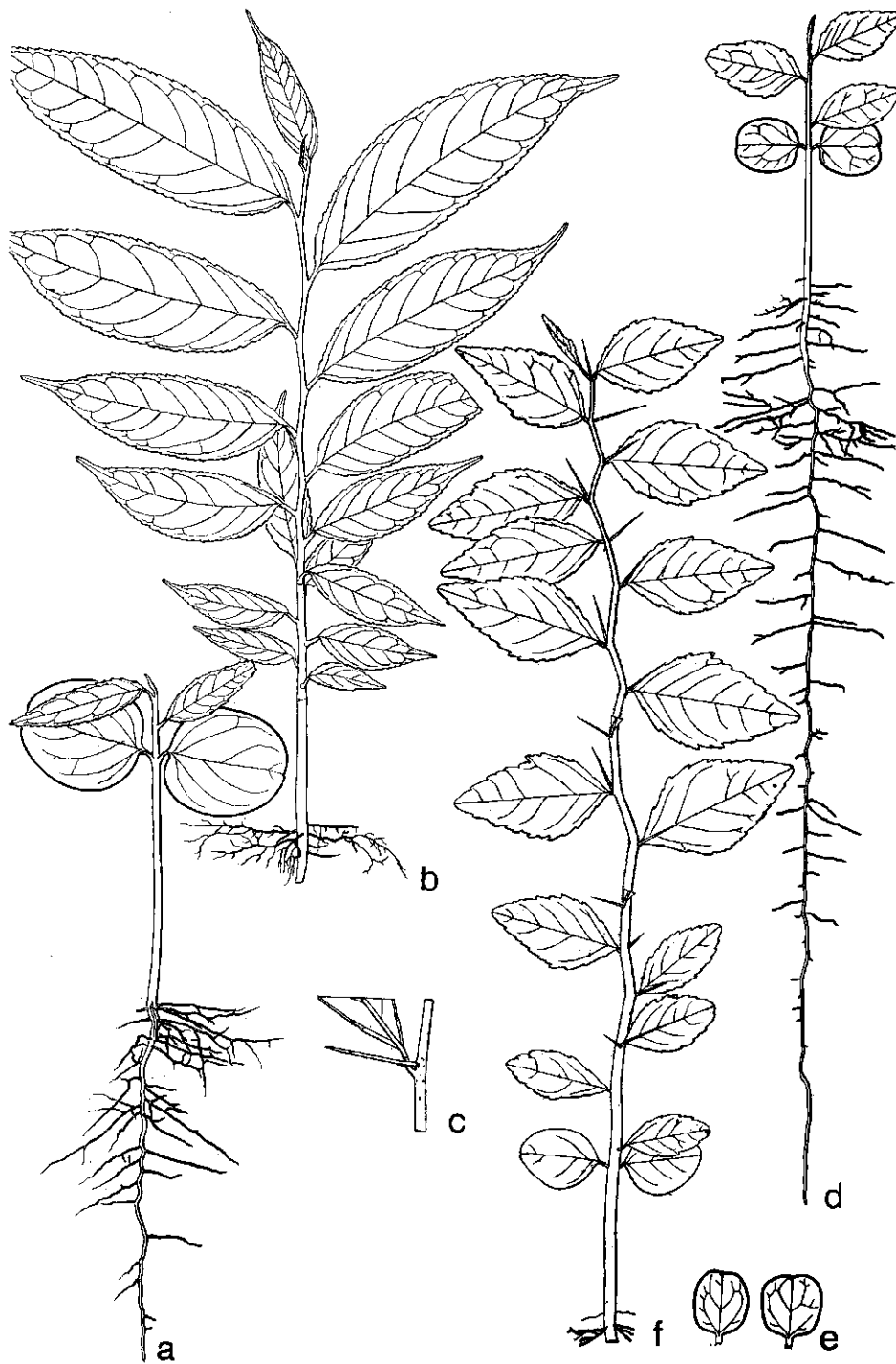


Fig. 45. *Flacourtia rukam* a. young seedling, 1/1 \times ; b. older seedling, 1/2 \times ; c. spine, 1/1 \times . *Flacourtia indica* d. young seedling, 1/1 \times ; e. cotyledons, 1/1 \times ; f. older seedling, 1/1 \times .

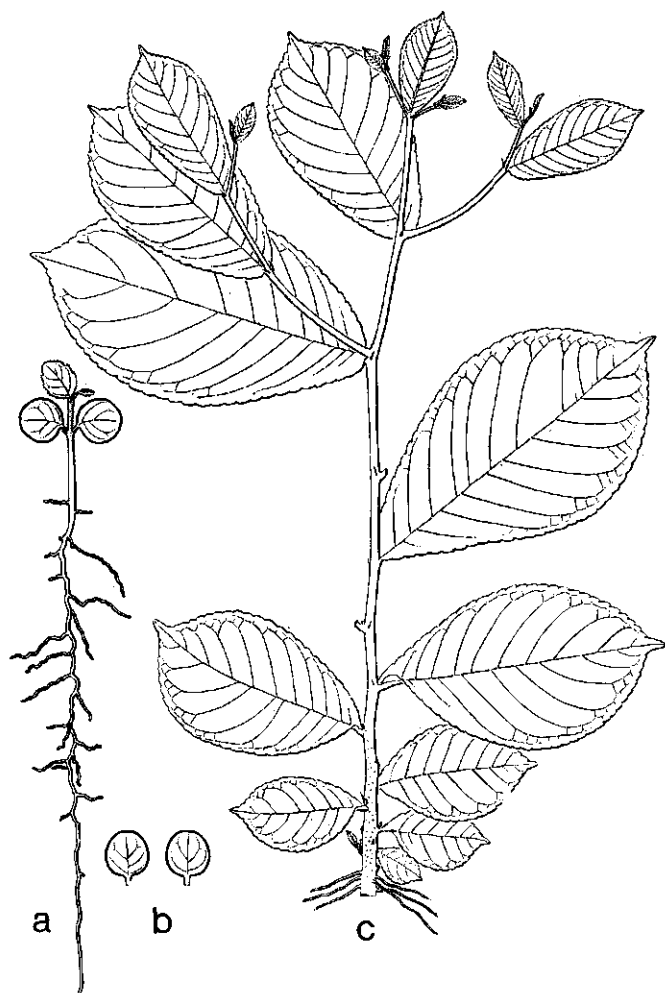


Fig. 46. *Homallum tomentosum* a. young seedling, $1/1\times$; b. cotyledons, $1/1\times$; c. older seedling, $1/4\times$.

terete, smooth, green, white at base, near top simple patent very short colourless hairs. *Cotyledons* epigeous, 2, equal, petiolate; petiole $1-1\frac{1}{2}$ mm, green, hairy like hypocotyl; blade orbicular or ovate, with index ± 1 , $\varnothing 5-7$ mm, thin, having an emarginate or rounded obtuse top and a rounded or slightly exculptate base narrowed into petiole, pinninerved but palmately 3-nerved at base, entire, green, glabrous above, glabrous beneath or hairy on midrib like hypocotyl. *Epicotyl* $\pm \frac{1}{2}$ cm. *Stem* erect, with simple colourless hairs. *Phyllotaxy* spiral but along branches distichous-alternate. *Leaves* stipulate, simple, petiolate; stipules subulate, in higher leaves up to $\frac{1}{2}$ cm long, green, hairy like stem; petiole 1-3 mm, hairy like stem; blade thin, pinninerved, crenate or dentate towards the top, dull green above, hairy on both surfaces like stem. *1st Leaf* blade elliptic, ± 6 by 5 mm, having an acute top and an acute base, dull light green

beneath. *Highest leaves* (2nd stage) blade obovate or obovate-oblong, ± 19 by 10 cm, top acuminate acute, base rounded. *Top of plant* hairy, green.

Seeds from 3 motherplants from different localities.

PANGIUM REINW.

B. I: 282, 283; K. et V. V: 6

Pangium edule REINW.

B. I: 283; K. et V. V: 6

Sund.: pitjung. *Jav.*: putjung, pakem

Fig. 47

Size at 1st stage (hypocotyl erect above the earth, 1st leaf not yet present) 43–52 cm, 18–22 cm above collet; at 2nd stage (6–13 leaves) ± 40 –88 cm above collet. *Roots* pale yellow turning dirty yellow but brownish yellow near collet; tips white; primary root at 1st stage erect, much thicker than lateral ones; collet gradually much thickened; lateral roots at 1st stage moderate in number to very numerous, slightly flexuous, patent, unbranched. *Hypocotyl* epigeous, erect, straight but sometimes curved at base; at 1st stage 8–21 cm, near top $\frac{1}{2}$ – $\frac{3}{4}$ cm near base $1\frac{1}{4}$ cm thick, tapering upwards, terete, smooth, green but white at base, possessing lengthwise-linear yellowish white lenticels turning brown, glabrous. *Cotyledons* epi- or hypogeous, sometimes brought above earth by hypocotyl, sometimes left in the soil and torn from hypocotyl, 2, their upper surfaces in close contact, for the greater part covered with testa, petiolate; petiole ± 1 – $2\frac{1}{2}$ cm long, 5 mm broad, 2 mm thick, slightly channelled, yellowish green, lenticelled like the hypocotyl, glabrous; blade \pm as large as the largest \varnothing of the seed, irregularly folded, thin, palmately nerved, light yellow, on upper surface especially on nerves simple adnate colourless hairs. *Epicotyl* erect, usually straight, 4–10 cm, terete, smooth, with simple brown hairs. *Stem* erect, straight, sometimes spiral owing to obtusangular connection of internodes; fallen cotyledons and leaves leaving large scars. *Phyllotaxy* spiral. *Leaves* exstipulate, simple, petiolate; petiole terete, smooth, green, hairy like stem; blade thin, having an acuminate acute top and a cordate base, palmately nerved, slightly prominently nerved above and considerably beneath, slightly glossy green above, dull light green beneath, hairy on both surfaces especially on nerves, ciliate. *1st Leaf* whether or not developed; if developed: blade cordiform, palmately 5-nerved (middle nerve most distinct), entire. *Highest leaves* (2nd stage) petiole thickened at base; blade cordiform, palmately 3-lobate, having a shortly acuminate acute top at lobes, palmately 7-nerved, 3 middle nerves thickest. *Top of plant* felty haired.

Seeds from 4 motherplants from different localities.

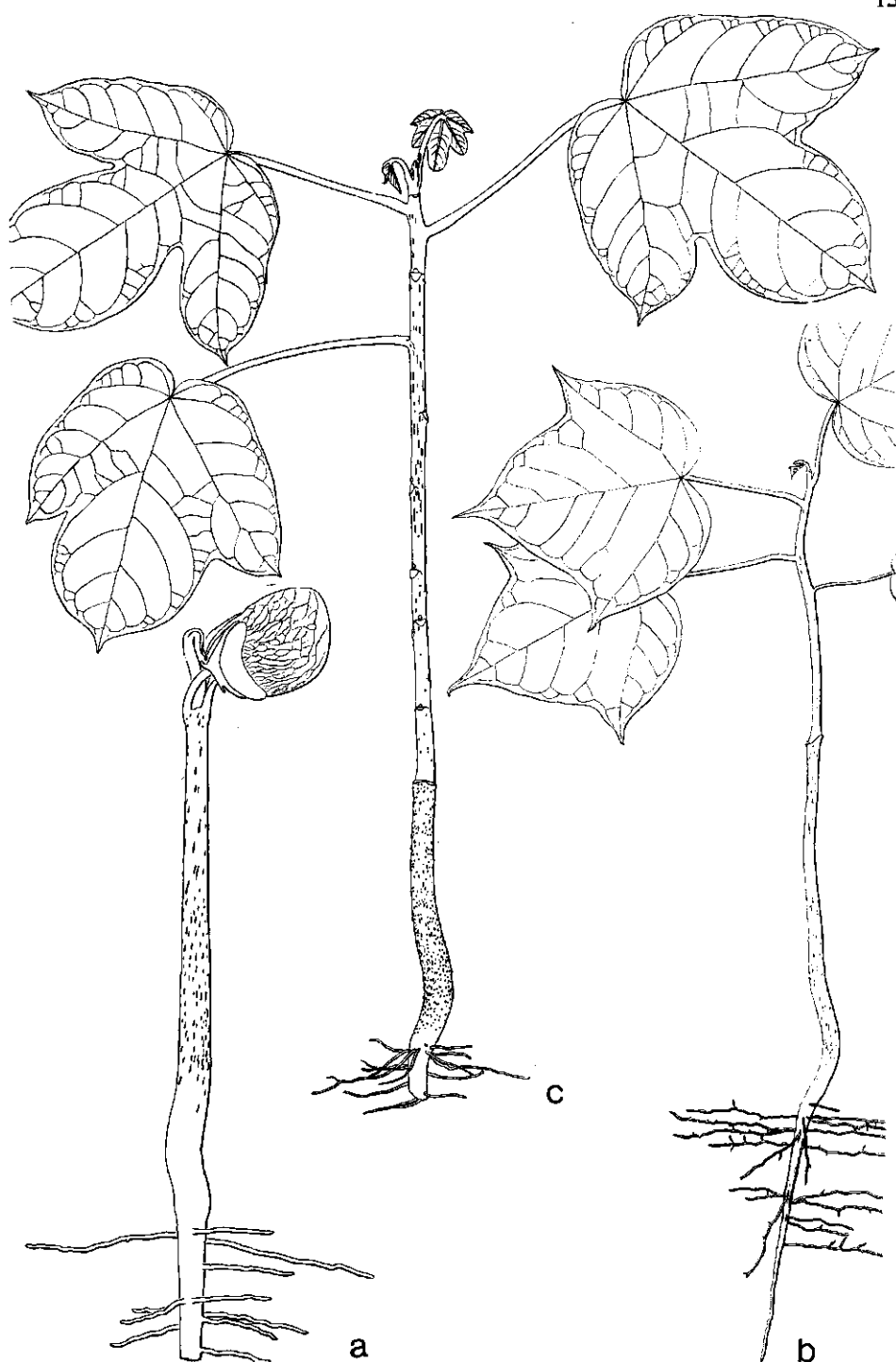


Fig. 47. *Pangium edule* a. young seedling, with seed containing cotyledons, $1/2\times$; b. seedling with developed 1st leaf, $1/4\times$; c. older seedling, $1/8\times$.

HAMAMELIDACEAE

B. I: 645; K. et V. II: 202; TROUP II: 491

ALTINGIA Noroña

B. I: 645, 646; K. et V. II: 203

Altingia excelsa NOROÑA

B. I: 646; K. et V. II: 204

Mal.: kedundung (*Padang Highlands*), pulasan (*S.E.C.*), tjemara abang, tjitam (*Palemb.*). *Sund.*: mala, rasamala

Size at 1st stage (1 leaf only) 6–11½ cm, 3–5 cm above collet; at 2nd stage (12–19 leaves) 31–47 cm above collet. *Plant* with a strong scent of turpentine. *Roots* white turning light brown; primary root at 1st stage moderately flexuous, slightly thicker than lateral ones; collet gradually and slightly thickened; lateral roots at 1st stage moderate in number, moderately flexuous, not or sparsely branched. *Hypocotyl* epigeous, erect, straight, 3–4¾ cm; at 1st stage 1 mm thick, terete, smooth, green, white at base, with simple short upcurved colourless hairs. *Cotyledons* epigeous, 2, symmetrical, or asymmetrical and one another's mirror image, foliaceous, petiolate; petiole 2–3 mm, ½ mm thick, flattened above, convex beneath, green, hairy like hypocotyl; blade ovate or asymmetrically ovate, with index 1½–1½, 10–16 by 8–12 mm, thin, having an obtuse top and an exculptate or rounded base contracted into petiole, palmately 3-nerved, entire or with one or two shallow notches, dark green with a silvery shine above, dull light green beneath, glabrous or with very short colourless hairs above, glabrous beneath. *Epicotyl* erect, straight, 2–8 mm, terete, hairy. *Stem* erect, straight, or spiral owing to obtusangular connection of internodes, terete, smooth, glabrous; at 2nd stage green but light brown near base, with simple patent upcurved colourless hairs. *Phyllotaxy* spiral. *Leaves* stipulate, simple, petiolate; petiole hairy like stem; blade ovate or elliptic, thin, having a rounded base, pinninerved, prominently nerved beneath, serrate or dentate, both surfaces dull green and hairy on nerves like stem. *1st Leaf* petiole ± 3 mm, flattened above, convex beneath, pale green; blade with index 1¼–2, 14–23 by 10–15 mm, having a shortly acuminate obtuse top, entire near base. *Highest leaves* (2nd stage) stipules over ± ½ cm adnate to petiole (tops free and subulate), green and hairy; petiole up to 2½ cm, slightly channelled above, green; blade with index 2–3, up to 14½ by 6½ cm, having an acuminate acute top and a sometimes hastate base. *Top of plant* hairy, green.

Seeds from 3 motherplants from different localities.

LAMIACEAE (LABIATAE)

B. II: 614

SALVIA L.

B. II: 614, 625

Salvia riparia*Salvia riparia* H. B. K. (*S. occidentalis* Auct. non SWARTZ)

B. II: 627; C. A. BACKER, Tectona, XVI, 1923: 50

Dutch.: West-Indische salie. Jav.: langon, legetan, randa nunut

Fig. 48

Size at 1st stage (1st pair of leaves only) $1\frac{1}{2}$ – $2\frac{1}{2}$ cm above collet; at 2nd stage (4 pairs of leaves) 6–8 cm above collet. *Roots* off white; primary root at 1st stage very flexuous, not thicker than lateral ones; collet gradually and slightly thickened; lateral roots at 1st stage very numerous, very flexuous, much branched. *Hypocotyl* epigeous, erect, straight, 9–15 mm; at 1st stage 1 m thick, terete, smooth, pale red, with simple patent colourless hairs. *Cotyledons* epigeous, 2, equal, foliaceous, petiolate; petiole 2–4 mm, flattened above, convex beneath, other characters like those of hypocotyl; blade rhomboid-ovate, with index $\frac{2}{3}$ – $\frac{4}{7}$, 3–5 by 8 mm, thin, having an obtuse or emarginate top and a truncate or cuneate base narrowed into petiole, palmately 3-nerved, entire, dull light green, ciliate, hairy like hypocotyl. *Epicotyl* erect, straight, 5–8 mm, 4-angular, hairy. *Stem* erect, later prostrate with ascending tops, thickened joints above nodes, 4-angular, with dense simple patent colourless hairs. *Phyllotaxy* decussate. *Leaves* exstipulate, simple, petiolate; petiole flattened above, convex beneath, hairy; blade thin, having an obtuse or acute top and an acute base narrowed into petiole, pinninerved, prominently nerved beneath, serrate or crenate, dull green above, dull greyish green beneath, both surfaces hairy like stem. *1st Pair of leaves* petiole 10–13 mm; blade ovate, index $1\frac{1}{2}$ –2, 22–27 by 13–15 mm. *Highest leaves* (2nd stage) blade elliptic or ovate, larger than in 1st pair. *Top of plant* hairy, green.

Seeds from 1 motherplant.

LAURACEAE

B. I: 117; K. et V. X: 66; TROUP III: 785

Hypocotyl hypogeous, very short. *Cotyledons* hypogeous, 2, equal, one cotyledon at either side of stem, or together at one side of stem and their upper surfaces facing but not in contact, covered with testa, thick-fleshy, sessile or shortly petiolate. *Stem* terete. *Phyllotaxy* spiral; sometimes lowest leaves opposite or subopposite. *Leaves*

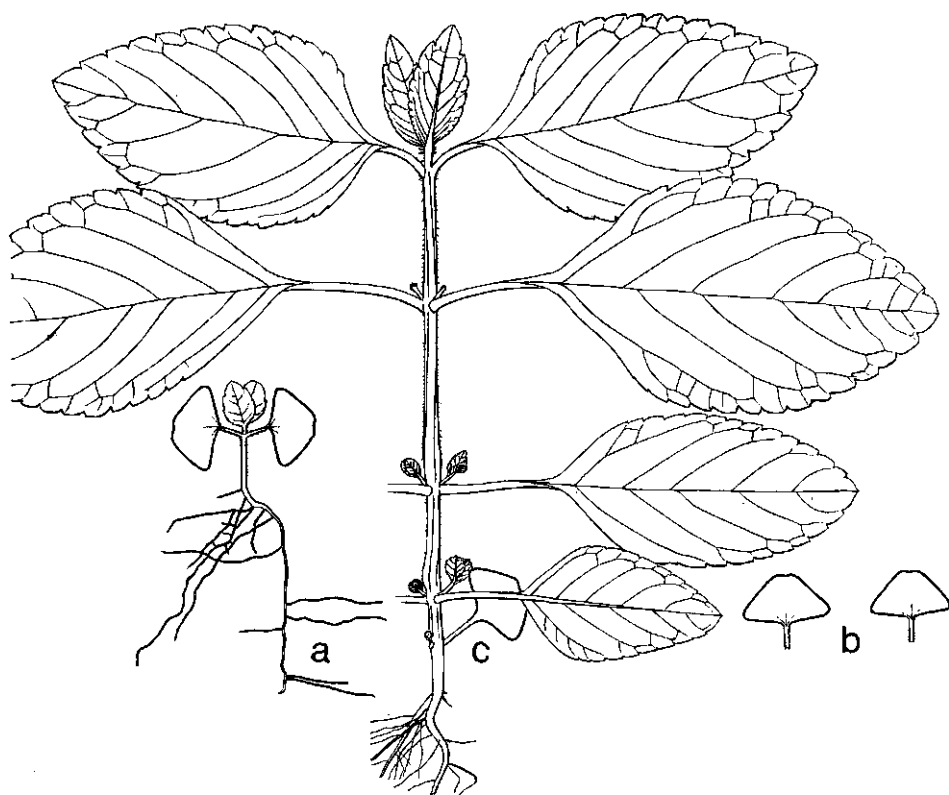


Fig. 48. *Salvia riparia* a. young seedling, 1/1 × ; b. cotyledons, 1/1 × ; c. older seedling, 1/1 × .

exstipulate; lowest leaves scale-shaped; higher ones developed but sometimes alternating with some scale-shaped ones; developed leaves simple, petiolate, entire.

Cotyledons and (or) 1st developed leaves and (or) higher developed leaves present

a. stem and leaves hairy and leaves pseudo-triplinerved, or stem and leaves glabrous and leaves pinninerved *Cinnamomum*

b. stem and leaves hairy and leaves pinninerved *Litsea glutinosa*

CINNAMOMUM SCHAEFF.

B. I: 118, 120; K. et V. X: 70; TROUP III: 789

Roots off white and turning blackish brown or persistently off white. *Cotyledons* hypogeous, 2, equal, sessile or very shortly petiolate, thick-fleshy, plano-convex. *Epicotyl* and *stem* hairy or glabrous. *Phyllotaxy* spiral but sometimes 1st leaves

opposite or subopposite. *Leaves* exstipulate, lowest ones scale-shaped, next ones developed but sometimes alternating with some scale-shaped ones. *Developed* leaves simple, petiolate; petiole channelled or flattened above, hairy or glabrous; blade coriaceous or thin, pseudo-triplinerved or pinninerved, entire, hairy or glabrous. *Top of plant* hairy or glabrous.

Cotyledons and (or) 1st developed and (or) higher developed leaves present

1. a. cot. blade $8-9\frac{1}{2}$ mm long; stem hairy; leaves pseudo-triplinerved . . . *C. iners*
- b. cot. blade ± 5 mm long; stem glabrous; leaves pinninerved
C. parthenoxylon

***Cinnamomum iners* REINW. EX BL.**

B. I: 121

Mal.: tedjo (*Lamp.*), madang kulit manis (*Padang Highlands*). *Sund.*: ki tedja. *Jav.*: tedja. *Mad.*: katjengal

Size at 1st stage (1st developed leaf only) 13–24 cm, 7–12 cm above collet; at 2nd stage (11–15 developed leaves) 26–31 cm above collet. *Roots* off white turning blackish brown; primary root at 1st stage slightly flexuous, much thicker than lateral ones; collet gradually thickened; lateral roots at 1st stage few, slightly flexuous, unbranched. *Hypocotyl* hypogeous, very short. *Cotyledons* hypogeous, 2, equal, one cotyledon at either side of stem or together at one side of stem, their upper surfaces facing, covered with testa beneath, sessile or very shortly petiolate; blade either shield-shaped, orbicular or ovate or elliptic, with index slightly > 1 , $8-9\frac{1}{2}$ by $6\frac{1}{2}-7\frac{1}{2}$ mm, 4 mm thick, thick-fleshy, plano-convex. *Epicotyl* at 1st stage erect, straight or curved, $\frac{1}{2}-3$ cm, $1\frac{1}{2}-2$ mm thick, terete, smooth, brown or green or yellowish white, with simple appressed yellowish white hairs. *Stem* erect; at 2nd stage straight but sometimes spiral owing to obtusangular connection of internodes, terete, smooth, green, with simple colourless hairs. *Phyllotaxy* spiral but sometimes some of the 1st leaves opposite or subopposite. *Leaves* exstipulate; 1st–5th or 8th ones scale-shaped, top-most ones of these slightly larger and green, next ones developed but sometimes alternating with some scale-shaped ones. *Developed leaves* simple, petiolate; petiole flattened above, convex beneath, green, hairy like stem; blade coriaceous, having a usually obtuse sometimes acute top and an acute base which in lowest developed leaves is sometimes rounded and narrowed into petiole, pseudo-triplinerved, prominently nerved on both surfaces, entire, dull green, hairy on midrib beneath like stem. *1st Developed leaf* petiole 5–6 mm; blade ovate or ovate-oblong, index $1\frac{1}{2}-2\frac{1}{4}$, ± 3 by 2 cm. *Highest developed leaves* (second stage) petiole up to $1\frac{1}{2}$ cm; blade oblong or obovate-oblong, with index up to 3, up to $11\frac{1}{2}$ by 3–5 cm, with a shortly acuminate top, glabrous above. *Top of plant* with dense yellowish white hairs.

Seeds from 5 motherplants from different localities.

***Cinnamomum parthenoxylon* (JACK) MEISSN.**

B. I: 121; K. et V. X: 82

Mal.: kaju gadis. *Sund.*: ki pedes, ki sereh. *Jav.*: selasian, telasian

Size at 1st stage (1st developed leaf only) 9–14 cm, $4\frac{1}{2}$ – $5\frac{1}{2}$ cm above collet; at 2nd stage (7–9 developed leaves) 7–10 cm above collet. Slightly fragrant. *Roots* persistently off white; primary root at 1st stage moderately flexuous, slightly thicker than lateral ones; collet gradually and considerably thickened; lateral roots at 1st stage moderate in number, very flexuous, sparsely or not branched. *Hypocotyl* hypogeous, very short. *Cotyledons* hypogeous, 2, equal, facing, one cotyledon at either side of stem or together at one side of stem, covered with testa, sessile but base narrowed; blade orbicular, $\varnothing \pm \frac{1}{2}$ cm, thick-fleshy, flattened above, globose beneath, with a rounded obtuse top, yellowish white. *Epicotyl* at 1st stage erect, straight, ± 1 – $1\frac{1}{2}$ cm, terete, smooth, white, glabrous. *Stem* erect; at 2nd stage straight, or spiral owing to obtusangular connection of internodes, terete, with 2 ridges decurrent from each leaf, green, glabrous. *Phyllotaxy* spiral. *Leaves* exstipulate; 1st– \pm 4th one scale-shaped, 3rd and 4th sometimes having a very small green blade; next ones developed. *Developed leaves* simple, petiolate; petiole channelled above, green or red, glabrous; blade ovate-oblong, with index 2–3, in higher leaves longest, thin, with a rounded or acute base narrowed into the petiole, pinninerved, prominently nerved beneath, entire, dull green above, dull greyish pruinose beneath, glabrous. *1st Developed leaf* petiole 3–6 mm; blade 15–22 by 7–12 mm, top acute. *Highest developed leaf* petiole up to 1 cm; blade up to 8 by 3 cm, top acuminate acute. *Top of plant* green, glabrous.

Seeds from 1 motherplant.

LITSEA LMK.

B. I: 118–120, 125; K. et V. X: 123; TROUP III: 795

***Litsea glutinosa* (LOUR.) C.B. ROBINS (*L. chinensis* LMK.)**

B. I: 125

Sund.: huru batu, h. beusi, h. tangkalak, madang kapas. *Jav.*: adem ati, kupu ketek, njampu wingka, wuru beling

Size at 1st stage (1 developed leaf only) 16–31 cm, 5–11 cm above collet; at 2nd stage (12–21 developed leaves) 20–37 cm above collet. *Roots* off white turning dirty brown; primary root at 1st stage very flexuous, moderately thicker than lateral ones; collet gradually and slightly thickened; lateral roots moderate in number, very flexuous, unbranched. *Hypocotyl* hypogeous, very short. *Cotyledons* hypogeous, 2, equal, upper surfaces facing, one cotyledon at either side of stem or together at one side of stem and covered with testa, sessile or shortly petiolate; blade semiglobose, \varnothing 6–8 mm, flattened above, convex beneath, thick-fleshy, yellow, glabrous. *Epicotyl*

erect, very short, 0–5 mm. *Stem* erect; at 2nd stage straight, terete, smooth, near base brown, with simple colourless hairs. *Phyllotaxy* spiral; developed leaves in groups of 3–6, these groups alternating with scale-shaped leaves. *Leaves* 1st–6th or 9th ones scale-shaped, higher ones of them sometimes having a narrow small green blade; next ones developed, in groups alternating with scale-shaped ones. *Developed leaves* simple, petiolate; petiole green or brownish red, hairy like stem; blade pinninerved, prominently nerved beneath, entire, slightly glossy green above, dull green beneath, on both surfaces especially on nerves hairy like stem. *1st Developed leaf* petiole 3–5 mm; blade ovate or elliptic or oblong, with index $1\frac{1}{2}$ –3, $1\frac{1}{2}$ – $4\frac{1}{2}$ by 1–2 cm, thin, having an acute top and a rounded base, velvety hairy. *Highest developed leaves* petiole up to $1\frac{1}{2}$ cm long, terete; blade lanceolate, up to $18\frac{1}{2}$ by $5\frac{1}{2}$ cm, thin-coriaceous, having an acute sometimes shortly acuminate top and an acute base. *Top of plant* densely hairy, red or green.

Seeds from 2 motherplants from different localities.

LECYTHIDACEAE

B. I: 351, III: 646; K. et V. VI: 1; LUBB. I: 523, *Myrtaceae*; TROUP II: 548, *Myrtaceae*

Cotyledons whether or not developed, if developed: epigeous, 2, equal or unequal, foliaceous. *Hypocotyl* whether or not developing already in the embryo in the tree, if developing in the tree: thick-fleshy (see: *Rhizophoraceae*, *Clusiaceae*, *Lecythidaceae*), hypogeous, semihypogeous or epigeous. *Phyllotaxy* spiral, leaves whether or not in groups. *Leaves* stipulate (K. et V.: exstipulate; B.: stipules none or minute, caducous); stipules very small, fugacious; first leaves scale-shaped or developed; developed ones simple, petiolate.

Cotyledons (if developed) and (or) 1st developed leaf and (or) higher leaves present
a. cot. undeveloped; hypocotyl hypogeous or semi-hypogeous, thick-fleshy, at 1st and 2nd stage much thicker than stem; 1st leaves scale-shaped; stem not marked by crossing ridges decurrent from leaf-scars . . . *Barringtonia acutangula*

ssp. spicata

b. cot. developed, epigeous, foliaceous; hypocotyl at 2nd stage not distinguishable from stem; 1st leaves developed; stem marked by crossing ridges decurrent from leaf-scars . . . *Planchonia valida*

BARRINGTONIA J.R. et G. FORST.

B. I: 351, 352, III, 646; K. et V. VI: 15; TROUP II: 590

***Barringtonia acutangula* (L.) GAERTN. ssp. *spicata* (BL.) PAYENS** (*Chydenanthus dentato-serratus* KNUTH, *Barringtonia spicata* BL.)

B. I: 353, III: 646; K. et V. VI: 15; TROUP II: 590, fig. 222

Mal.: putat lembik. Jav.: putat

Fig. 49

Size at 1st stage (1st developed leaf only) 30–50 cm, 4–14 cm above collet; at 2nd stage (10–17 developed leaves) 24–36 cm above collet. *Roots* off white; primary root at 1st stage slightly flexuous, much thicker than lateral ones; collet abruptly very much thickened; lateral roots at 1st stage moderate in number or very numerous, very flexuous, moderately branched. *Hypocotyl* hypogeous or semihypogeous; at 1st stage remaining in and filling the testa, thick-fleshy, spindle-shaped, considerably varying in size, up to $3\frac{1}{2}$ cm long, $1-1\frac{1}{2}$ cm thick, in transverse section light red, developing into this shape and these dimensions already in the embryo in the tree. *Cotyledons* undeveloped. *Epicotyl* very short. *Stem* erect, straight, terete, having ridges decurrent from the leaf bases, turning smooth, green or brownish red turning grey or green or brownish green, glabrous or with simple patent very short colourless hairs. *Phyllotaxy* spiral; developed leaves in groups alternating with scale-shaped ones. *1st Leaves* scale-shaped, succeeding ones gradually changing into developed leaves. *Developed leaves* stipulate, simple, petiolate; stipules very small, fugacious; petiole in ± 10 th developed leaf up to $\frac{1}{2}$ cm long, length up to $4 \times$ breadth; flattened above, convex beneath, red or green, glabrous; blade in lowest developed leaves obovate or elliptic, in higher ones lanceolate or obovate-lanceolate, in ± 10 th developed leaf with index $\pm 3-4$, up to $13\frac{1}{2}$ by 4 cm, in each group middle ones largest, having an acuminate acute or obtuse top and a cuneate base decurrent into stem, pinninerved, prominently nerved on both surfaces, serrate or dentate, dull green on both surfaces, glabrous. *Top of plant* covered with scale-shaped leaves; young leaves red or brown or green.

Seeds from 5 motherplants from different localities.**PLANCHONIA** BL.

B. I: 352; K. et V. VI: 24; TROUP II: 592.

***Planchonia valida* (BL.) BL.** (*P. littoralis* BL., *P. sundaica* MIQ.)

B. I: 352; K. et V. VI: 24

Sund.: putat. Jav.: putat, p. kebo, p. maesa, p. penggung, p. resek. Mad.: butat Bug.: putjat sasa. Alf. Minah. (not certain): achlem, intjalen, ipil, nipil

Fig. 50

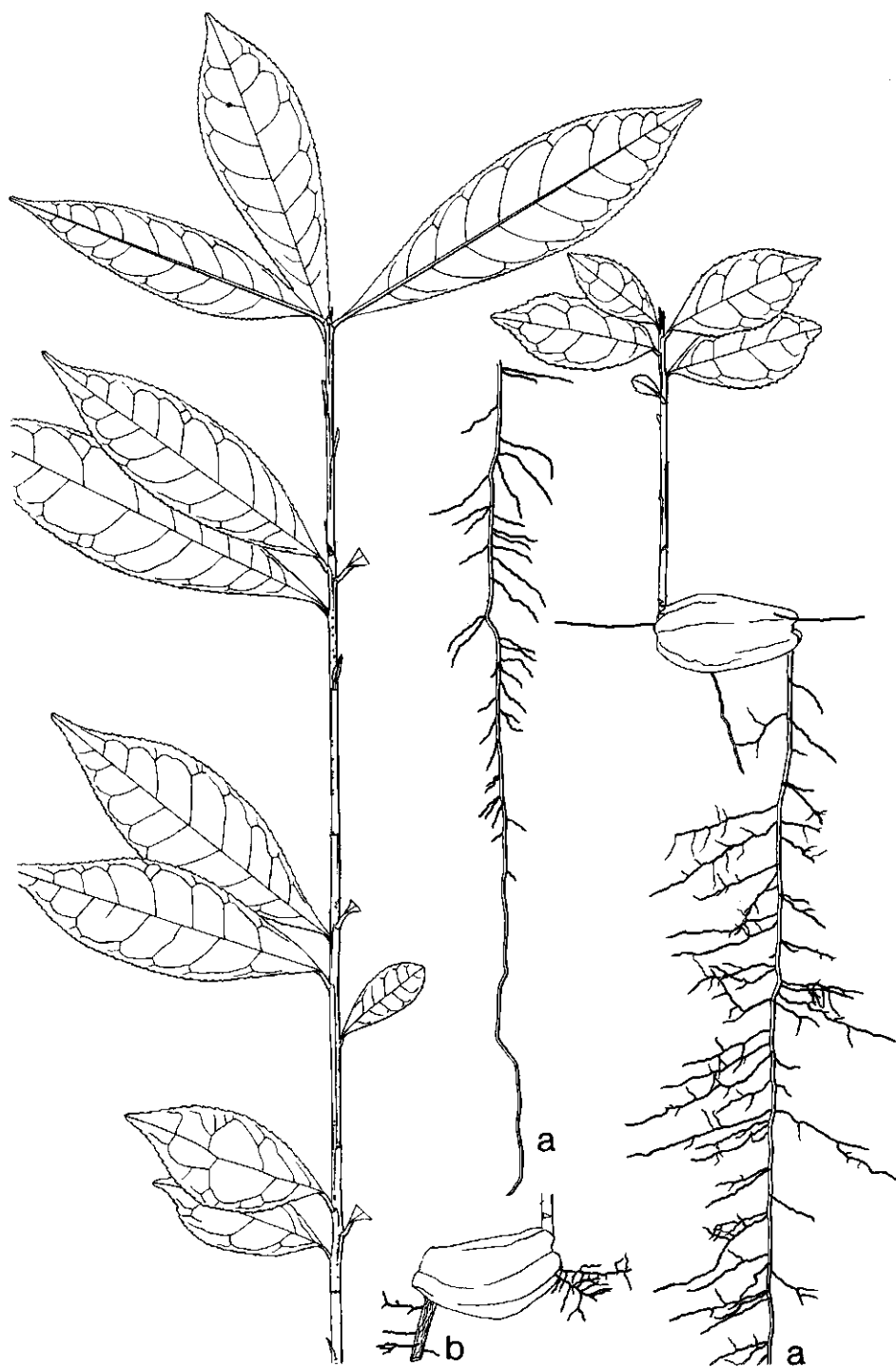


Fig. 49. *Barringtonia acutangula* ssp. *spicata* a. young seedling, $1/2\times$; b. older seedling, $1/2\times$.

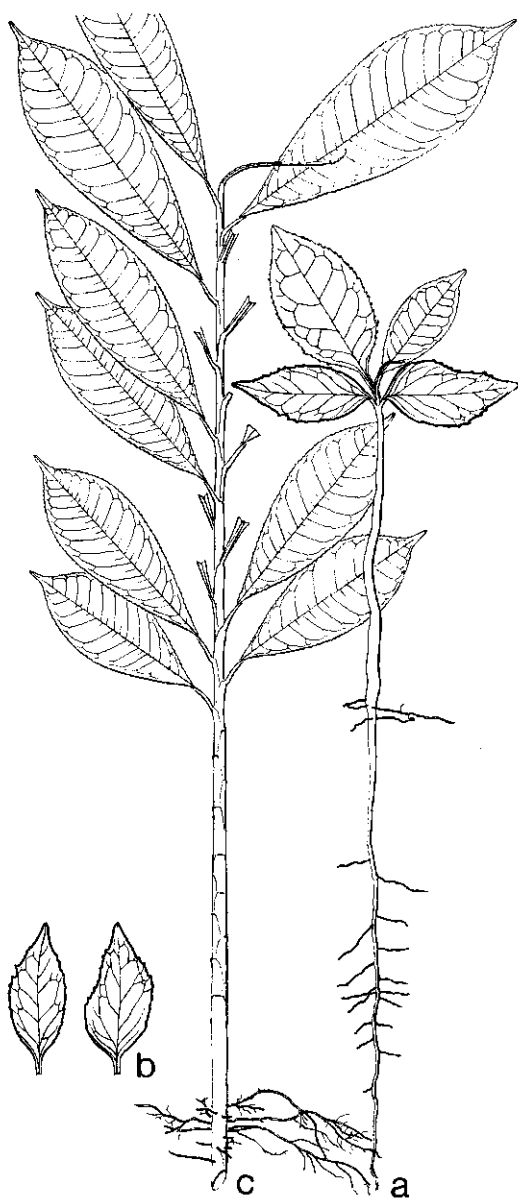


Fig. 50. *Planchonia valida* a. young seedling, $1/2\times$; b. cotyledons, $1/2\times$; c. older seedling, $1/4\times$.

Size at 1st stage (1st leaf only) 15–28 cm, 7–8½ cm above collet; at 2nd stage (24–31 leaves) 30–60 cm above collet. *Roots* white turning yellowish white; primary root at 1st stage slightly flexuous, much thicker than lateral ones; collet gradually much thickened; lateral roots at 1st stage few or moderate in number, moderately flexuous, not or sparsely branched. *Hypocotyl* epigeous, erect, straight or flexuous, 6½–8 cm; at 1st stage irregularly terete, seemingly bruised, at $\pm \frac{1}{4}$ length thickest and there 3–5 mm thick, tapering up and down, green, white at base, glabrous. *Cotyledons* epigeous, 2, equal or unequal, shortly petiolate; blade elliptic or oblong, rarely ovate, with index $1\frac{1}{2}$ – $2\frac{1}{2}$, 3–5 by $1\frac{1}{2}$ –3 cm, thin, having an acuminate obtuse top and an acute base decurrent into petiole, pinninerved, slightly and prominently nerved above and considerably beneath, coarsely dentate with teeth directed towards the top, dull green on both surfaces, glabrous. *Epicotyl* 3–4 mm. *Stem* erect; at 2nd stage spiral owing to obtusangular connection of internodes, terete, marked by leaf-scars from which the margins decur along the stem crossing each other, glossy green in upper part, brownish grey below, glabrous. *Phyllotaxy* spiral. *Leaves* stipulate, simple petiolate; stipules very small, fugacious; petiole narrowly 2-winged; blade thin, having a long-taperpointed base decurrent into petiole and stem, pinninerved, prominently nerved on both surfaces, dentate, each tooth fugaciously mucronate, both surfaces dull green, glabrous. *1st Leaf* blade elliptic or ovate or obovate or oblong or obovate-oblong or lanceolate or obovate-lanceolate, with index $1\frac{1}{2}$ – $3\frac{1}{2}$, $2\frac{1}{2}$ – $5\frac{1}{2}$ by 1–3 cm, top acuminate or obtuse, dents curved towards, wings from leaves on the stem whether or not connate under the leaf into a console-shaped appendix. *Highest leaves* (2nd stage) blade obovate-lanceolate, having a shortly acuminate acute and fugaciously mucronate top, index of largest blade up to 4, up to 23 by 8 cm. *Top of plant* glossy green, glabrous.

Seeds from 1 motherplant.

LEGUMINOSAE

Caesalpinaceae, Mimosaceae and Papilionaceae.

B. I: 547, III: 649; I: 523; I: 565; III: 650; K. et V. I: 265; LUBB. I: 382; TROUP I: 250

Cotyledons usually epigeous, sometimes hypogeous, rarely semihypogeous, whether or not stipulate, thin or coriaceous or thick-coriaceous or fleshy, if fleshy their upper surfaces usually in close contact. *Phyllotaxy* 1st 2 leaves sometimes opposite, next ones spirally arranged, sometimes succeeding ones distichous-alternate. *Leaves* stipulate, rarely exstipulate, whether or not stipulate; biparipinnate or paripinnate or, rarely, simple; stipules sometimes spiniform; plants later having bipinnate leaves, 1st leaf usually pinnate. The young plant from seed has less compound and smaller leaves than the adult plant. *Higher leaves* sometimes reduced to phyllodes.

1. A. cotyledons present 2
 - B. 1st developed leaf present 7
 - C. higher leaves present 12
2. a. cot. hypo- or semihypogeous 3
 - b. cot. epigeous 4
3. a. cot. semihypogeous, blade orbicular *Mimosaceae*
 - b. cot. hypogeous, blade oblong or irregularly oblong or obovate *Papilionaceae*
4. a. cot. blade base not notched; peltate, fleshy, flat . . . *Caesalpinaceae*
 - b. cot. blade not with this combination of characters 5
5. a. cot. blade notched at base or exculptate, not auricled, not asymmetrically
 sidewards lobed, not with forked midrib, if peltate then thin or coriaceous and
 revolute *Mimosaceae*
 - b. otherwise 6
6. a. cot. blade base exculptate, auricled; or base rounded or cordate or exculptate
 and midrib forked at $\frac{1}{2}$ length or higher; or base rounded but exculptate
 at one side, midrib not forked; with index up to $1\frac{1}{4}$ and $1\frac{1}{2}$ – $2\frac{1}{2}$ cm long . . .
 Caesalpinaceae
 - b. cot. blade base rounded but exculptate at one side; no forked midrib; cot.
 < 1 cm long or longer and in that case index $\pm 2\frac{1}{4}$ *Papilionaceae*
7. a. 1st leaf paripinnate, sometimes biparipinnate with 1 pair of pinnae 8
 - b. 1st leaf simple, or 1–3-foliolate, or scale-shaped 10
8. a. middle leaflets blade with asymmetrical and at anterior side highest base,
 or middle leaflets blade not with asymmetrical base *Caesalpinaceae*
 - b. middle leaflets blade with asymmetrical base but at either side with the
 same height 9
9. a. leaflets blade base at posterior side broader; topmost leaflets largest . . .
 Mimosaceae
 - b. leaflets blade base not broader at posterior side; topmost leaflets not
 larger than middle ones; rachis with reddish brown hairs and glandular ones .
 Caesalpinaceae
10. a. 1st leaf scale-shaped *Mimosaceae*
 - b. 1st leaf simple or 1–3-foliolate 11
11. a. 1st leaf 2-lobed *Caesalpinaceae*
 - b. otherwise *Papilionaceae*
12. a. leaves biparipinnate 13
 - b. leaves paripinnate, imparipinnate, or 3-foliolate or simple. 14
13. a. rachis with reddish brown hairs and red topped glandular ones
 Caesalpinaceae
 - b. otherwise *Mimosaceae*
14. a. leaves paripinnate or simple *Caesalpinaceae*
 - b. leaves imparipinnate or 3-foliolate *Papilionaceae*

LEGUMINOSAE-CAESALPINIACEAE

B. I: 523; K. et V. II: 1; LUBB. I: 396; TROUP II: 337

Cotyledons epigeous, whether or not stipulate, thin or coriaceous or thick-coriaceous or fleshy. *Phyllotaxy* spiral or alternate, but sometimes 1st 2 leaves opposite. *1st Leaf* paripinnate or simple. *Higher leaves* biparipinnate or paripinnate or simple.

1. A. cotyledons present 2
 - B. 1st developed leaf present 5
 - C. higher leaves (2nd stage) present 8
2. a. cot. peltate, fleshy *Tamarindus indica*
 - b. cot. not fleshy not peltate 3
3. a. cot. blade base auricled *Peltophorum pterocarpa*
 - b. cot. blade base not auricled 4
4. a. cot. blade midrib bifurcate at $\frac{1}{2}$ length or higher *Cassia*
 - b. cot. blade midrib not bifurcate *Piliostigma malabaricum*
5. a. 1st leaf simple, 2-lobed *Piliostigma malabaricum*
 - b. 1st leaf paripinnate, sometimes biparipinnate, 1 pair of pinnae 6
6. a. 1st leaf middle leaflets blade base not asymmetrical *Cassia*
 - b. 1st leaf middle leaflets blade base asymmetrical 7
7. a. 1st leaf middle leaflets blade base higher at anterior side. *Tamarindus indica*
 - b. 1st leaf middle leaflets blade base equally high at both sides *Peltophorum pterocarpa*
8. a. higher leaves simple, 2-lobed *Piliostigma malabaricum*
 - b. higher leaves compound 9
9. a. higher leaves biparipinnate *Peltophorum pterocarpa*
 - b. higher leaves paripinnate 10
10. a. higher leaves leaflets blades base higher at anterior side *Tamarindus indica*
 - b. higher leaves leaflets blades base equally high at both sides *Cassia*

CASSIA L.

B. I: 525, 535; K. et V. II: 6; LUBB. I: 396; TROUP II: 366

Hypocotyl smooth; turning wrinkled thinner and changing its colour. *Cotyledons* epigeous, foliaceous, thin or coriaceous, palmately nerved, midrib bifurcate at $\frac{1}{2}$ length or higher. *Phyllotaxy* spiral. *Leaves* paripinnate, stipulate; stipules small, very soon falling, scars often indistinct.

1. A. cotyledons and (or) 1st leaf present 2
 - B. plant at 2nd stage ($\pm 6-17$ leaves): topmost leaves 3-10 pairs of leaflets . . . 5
2. a. cot. thick-coriaceous; 1st leaf 6-7 pairs of leaflets or 2 pairs and in the latter case blades $2\frac{1}{2}-3$ cm long 3
 - b. cot. thin; 1st leaf 1-3 pairs of leaflets; blades shorter than 23 mm 4
3. a. cot. 20-25 mm long; midrib bifurcate at $\frac{2}{3}-\frac{3}{4}$ length; 1st leaf 2 pairs of leaflets *C. fistula*
 - b. cot. 16-21 mm long; midrib bifurcate at $\frac{1}{2}-\frac{2}{3}$ length; 1st leaf 6-7 pairs of leaflets *C. javanica*
4. a. cot. with rounded top; midrib bifurcate at $\frac{2}{3}$ length; 1st leaf leaflets: petiolule up to 1 mm or less; blades oblong sometimes ovate, top obtuse rarely notched *C. siamea*
 - b. cot. top flattened; midrib bifurcate at $\frac{3}{4}$ length; 1st leaf leaflets: petiolule up to 2 mm; blades oblong or obovate, top slightly notched or obtuse *C. timoriensis*
5. a. topmost leaves up to 5 pairs of leaflets, largest blades > 7 cm long . *C. fistula*
 - b. topmost leaves more than 6 pairs of leaflets; largest blades not longer than ± 6 cm 6
6. a. blades ovate-lanceolate or lanceolate, index > 3 , up to ± 6 by $1\frac{3}{4}$ cm *C. siamea*
 - b. blades ovate or obovate or oblong, index 1-3, $1\frac{1}{2}-4\frac{1}{2}$ by $1-1\frac{3}{4}$ cm 7
7. a. blades index 1-2, 15-27 by 10-13 mm *C. javanica*
 - b. blades index $1\frac{1}{2}-4$, up to $4\frac{1}{2}$ by $1\frac{3}{4}$ cm *C. timoriensis*

***Cassia fistula* L.**

B. I: 536; K. et V. II: 11; LUBB. I: 461, fig. 302; TROUP II: 366, fig. 145

Mal.: biraka. *Sund.*: bung-bungdelan, tanggoli. *Jav.*: klohur, klohor, tangguli, tengguli, trengguli. *Mad.*: kalobur, klobor. *Mak.*: kaju radja

Fig. 51

Size at 1st stage (1 leaf only) 8–35 cm, 4–11 cm above collet; at 2nd stage (13–15 leaves) 39–42 cm above collet. *Roots* yellowish white to brown; tips yellow; primary root at 1st stage slightly to very flexuous, much thicker than lateral ones; collet gradually and slightly to much thickened; lateral roots at 1st stage absent to moderate in number, moderately to very flexuous, unbranched. *Hypocotyl* epigeous, erect, straight, 3–6½ cm; at 1st stage gradually and slightly thickened up to 3–3½ mm at base, tapering upwards, turning thinner by shrinking, terete, smooth, light green or yellowish green, with simple patent very short colourless hairs. *Cotyledons* epigeous, 2, equal, sometimes asymmetrical and one another's mirror image, sessile but narrowed at base (LUBB.: shortly petiolate; TROUP: sessile or very shortly petiolate); blade obovate or elliptic, with index 1½–2, 20–25 by 10–16 mm, thick-coriaceous, having a rounded obtuse top and a narrowed rounded slightly auricled base, palmately 5-nerved (LUBB.: trinerved) with middle nerve thickest and bifurcate at ¾–¾ length, entire, dull dark green above, dull light green beneath, glabrous. *Epicotyl* 1½–3 cm. *Stem* erect; at 2nd stage spiral owing to obtusangular connection of internodes, 4-angular near top and terete near base, green near top and grey near base; possessing small orbicular yellowish brown lenticels; with sparse simple colourless hairs above. *Phyllotaxy* spiral (TROUP: alternate or first pair opposite or sub-opposite). *Leaves* stipulate, paripinnate; 1st leaf 2 pairs of leaflets; number of pairs increasing with succeeding leaves; stipules small, narrowly triangular (TROUP: linear). *1st Leaf* (LUBB.: deformed) rachis 2½–3½ cm, slightly channelled above, thickened at base, mucronate, green, hairy like stem; leaflets opposite, shortly petiolulate; blades ovate-oblong, with index 2½–3, 2½–4½ by 1–2 cm, in topmost leaflets largest, thin, having a taper-pointed obtuse or acute mucronate top and an acute or rounded base, pinninerved and midrib prominent beneath, dull green above, dull greyish green beneath, on midrib beneath hairy like stem. *Leaves with 3 pairs of leaflets* rachis 8½–16 cm, 1–2 mm thick, terete, flattened above, mucronate, sparsely hairy; leaflets opposite, shortly petiolulate, in highest pair of leaflets largest; blades ovate or elliptic or oblong, with index 2–3, 2½–12 by 1½–4 cm, thin-coriaceous, with taperpointed acute mucronate top and acute base, pinninerved; with simple appressed very small hairs beneath. *Top of plant* hairy, green.

Seeds from 7 motherplants from different localities.

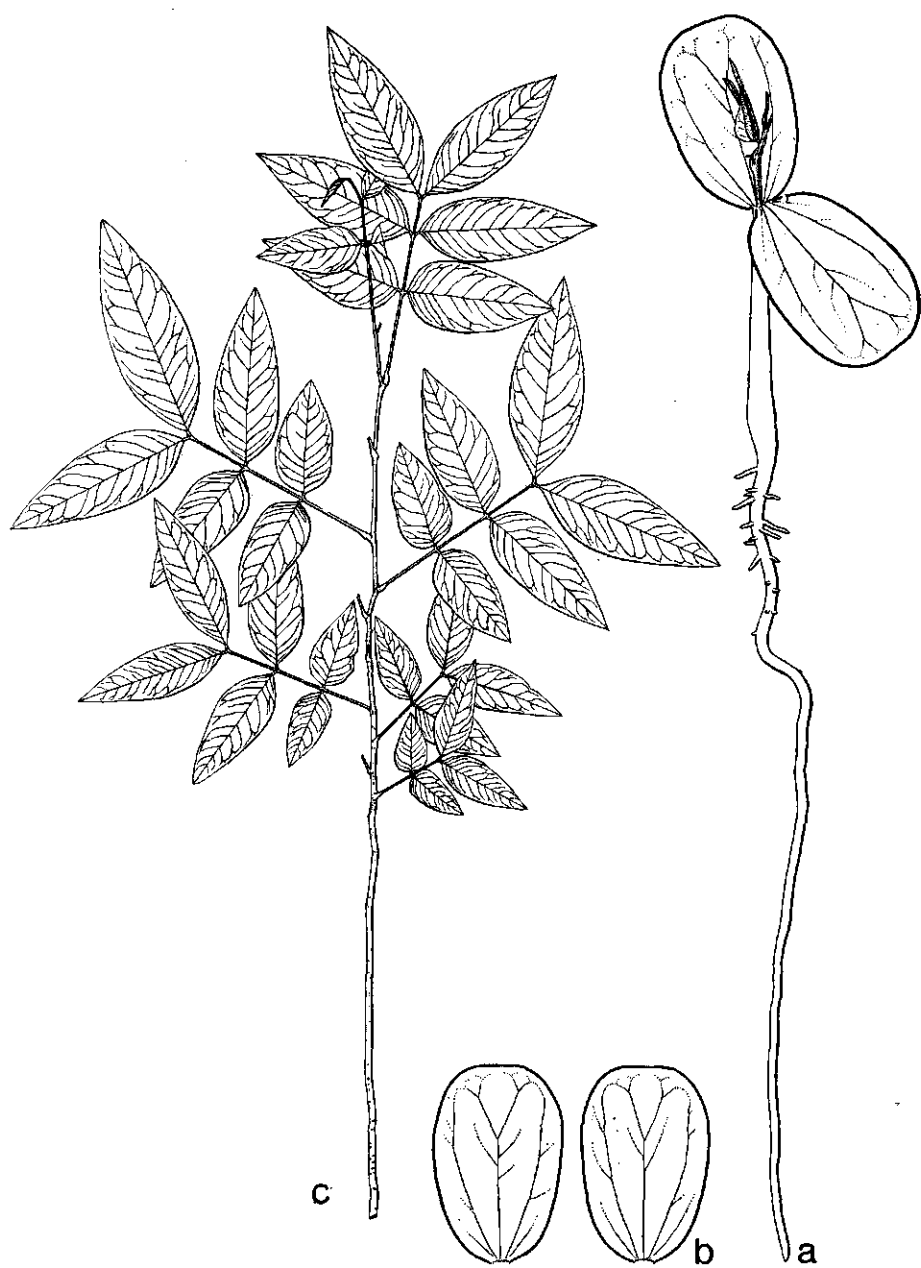


Fig. 51. *Cassia fistula* a. young seedling, $1/1\times$; b. cotyledons, $1/1\times$; c. older seedling, $1/4\times$.

***Cassia javanica* L.**

B. I: 537; K. et V. II: 8

Sund.: bung-bung depan. *Jav.*: tangguli, tengguli, trenggulli, trengguli wangwang

Fig. 52

Size at 1st stage (1 leaf only) 17–30 cm, 6–10 cm above collet; at 2nd stage (6–11 leaves) 10–19 cm above collet. *Roots* pale yellow turning brown; tips dark yellow; primary root at 1st stage slightly flexuous, much thicker than lateral ones; collet gradually and slightly to considerably thickened; lateral roots at 1st stage moderate in number, moderately to very flexuous, unbranched. *Hypocotyl* epigeous, erect, straight, sometimes slightly curved at base, $4\frac{1}{2}$ – $7\frac{1}{2}$ cm; at 1st stage ± 3 mm thick near base, tapering upwards, turning thinner by shrinking, terete, smooth, green or yellow, yellow at base, glabrous or with simple hairs near top. *Cotyledons* epigeous, 2, equal, sometimes asymmetrical and one another's mirror image, sessile; blade elliptic or obovate, with index $1\frac{1}{4}$ –2, 16–21 by 10–14 mm, thick-coriaceous, having a rounded obtuse top and a rounded narrowed base, palmately 3–5-nerved, with middle nerve thickest and bifurcate at $\frac{1}{2}$ – $\frac{2}{3}$ length, entire, dull on both sides, light green beneath, glabrous or having simple colourless hairs above near base. *Epicotyl* 1–2 cm. *Stem* erect; at 2nd stage spiral owing to obtusangular connection of internodes, usually feather-shaped with a sideward bend, 4-angular near top, terete near base, green, with simple very short colourless hairs. *Phyllotaxy* distichous-alternate but lowest leaves spirally arranged. *Leaves* stipulate, paripinnate; 1st leaf 6–7 pairs of leaflets; 2nd leaf sometimes fewer pairs and larger blades; number of pairs increasing with succeeding leaves; ± 10 th leaf 10 pairs; stipules linear, up to 2 mm long, green. *1st Leaf* rachis $3\frac{1}{2}$ –5 cm long, slightly channelled, mucronate, green, with simple dirty yellow hairs; leaflets opposite, rarely some of them alternate, shortly petiolulate; blades asymmetrically elliptic or -oblong sometimes ovate or obovate, with index $1\frac{1}{2}$ – $2\frac{1}{2}$, 10–22 by 6–9 mm, thin, having an obtuse rarely acute rarely notched mucronate top and an asymmetrically rounded base which sometimes is acute at anterior side and usually broader and rounded but rarely slightly cordate at posterior side, pinninerved and midrib prominent beneath, entire, dull green above, dull greyish green beneath, with simple colourless hairs. *Leaves with 10 pairs of leaflets* rachis ± 15 cm; blades with index 1–2; other characters like those of 1st leaf. *Top of plant* hairy.

Seeds from 4 motherplants from different localities.

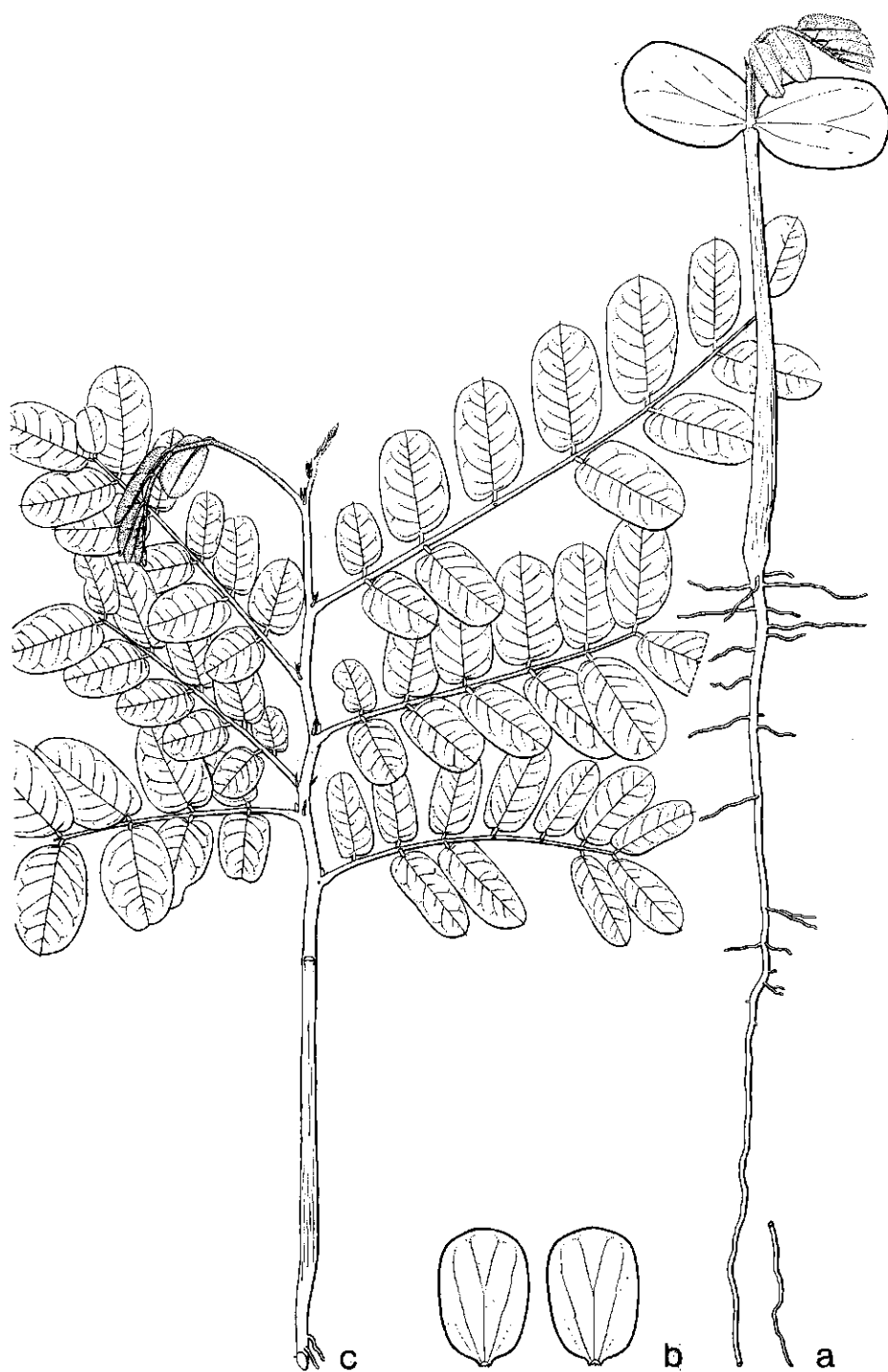


Fig. 52. *Cassia javanica* a. young seedling, 1/1 × ; b. cotyledons, 1/1 × ; c. older seedling, 1/1 × .

***Cassia siamea* LMK.**

B. I: 541; TROUP II: 372

Mal. and *Jav.*: djuwar, djohar

Fig. 53

Size at 1st stage (1 leaf only) 10–20 cm, 3–5 cm above collet; at 2nd stage (± 17 leaves) ± 45 cm above collet. *Roots* brown or brownish black; tips pure yellow; primary root at 1st stage slightly to moderately flexuous, slightly thicker than lateral ones; collet gradually and slightly thickened; lateral roots at 1st stage few to very numerous, very flexuous, moderately branched. *Hypocotyl* epigeous, erect, straight, 2–4 cm; at 1st stage $\pm 1\frac{1}{2}$ mm thick, tapering upwards, turning thinner by shrinking, terete, smooth, yellow at base, near top simple colourless hairs. *Cotyledons* epigeous, stipulate, 2, equal, sessile or very shortly petiolate; stipules very small, subulate, black or brown; blade elliptic or ovate, with index $1-1\frac{1}{2}$, 11–21 by 11–17 mm, thin, having a rounded obtuse top and a slightly cordate or exculptate slightly auricled base, palmately 5-nerved, with midrib bifurcate at $\frac{2}{3}$ length, prominently nerved beneath, entire, dull green on both surfaces, with nerves light above and dark beneath, glabrous. *Epicotyl* $\frac{1}{2}-1\frac{1}{2}$ cm. *Stem* erect; at 2nd stage spiral owing to obtusangular connection of internodes, 4-angular near top, terete near base, green near top and greyish green near base, having numerous orbicular reddish yellow lenticels, glabrous or with sparse simple hairs. *Phyllotaxy* spiral. *Leaves* stipulate, paripinnate; 1st leaf 1–2 pairs of leaflets, number of pairs increasing with succeeding leaves, ± 17 th leaf 7 pairs; stipules linear, very small, very soon falling. *1st Leaf* rachis 7–25 mm, thickened at base, mucronate, red or green, glabrous or with sparse simple colourless hairs; leaflets opposite, petiolulate up to 1 mm; blades elliptic sometimes ovate, with index $1\frac{1}{2}-2$, 11–23 by 5–11 mm, having an obtuse mucronate rarely notched top and a rounded sometimes asymmetrical base, pinninerved, prominently nerved beneath, entire, dull on both surfaces, green above, greyish green beneath, glabrous. *Leaves with 7 pairs of leaflets* rachis up to ± 20 cm, green or reddish brown, glabrous or with appressed very small colourless hairs, other characters like those of 1st leaf; blades up to ± 6 by $1\frac{3}{4}$ cm, ovate-lanceolate or lanceolate, having an acute or obtuse mucronate top and a rounded or acute base, with simple very small appressed hairs, other characters like those of 1st leaf. *Top of plant* glabrous or hairy; youngest leaves often yellow or red or red-margined.

Seeds from 6 motherplants from different localities.

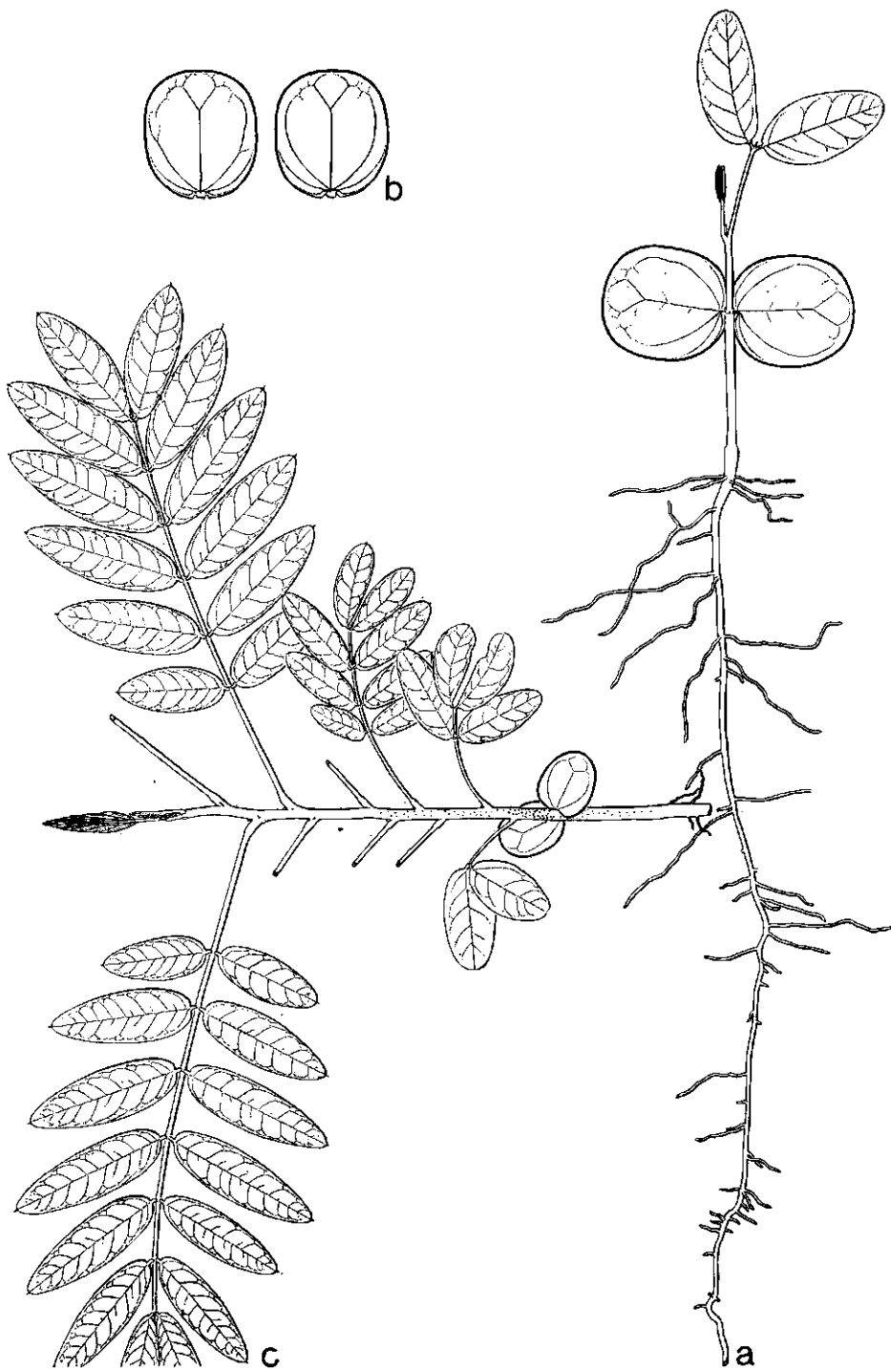


Fig. 53. *Cassia siamea* a. young seedling, $1/1\times$; b. cotyledons, $1/1\times$; c. older seedling, $1/2\times$.

***Cassia timoriensis* DC.**

B. I: 541; K. et V. II: 13

Sund.: haringin. *Jav.*: ehing, hing, ihing, njinging, turen, waringinan. *Timor*: kenamoh
Fig. 54

Size at 1st stage (1 leaf only) 10–23 cm, $3\frac{1}{2}$ –6 cm above collet; at 2nd stage (± 9 –16 leaves) 10–30 cm above collet. *Roots* blackish brown; tips pure yellow; primary root at 1st stage moderately to very flexuous, slightly thicker than lateral ones; collet sometimes gradually or abruptly and moderately thickened; lateral roots at 1st stage moderate in number to very numerous, sparsely branched. *Hypocotyl* epigeous, erect, straight, $2\frac{1}{2}$ – $5\frac{1}{2}$ cm; at 1st stage $\frac{3}{4}$ mm thick, turning thinner by shrinking, 4-angular or slightly or more distinctly terete, glabrous or with simple patent very short colourless hairs. *Cotyledons* epigeous, stipulate, 2, equal, very shortly petiolate; stipules in the shape of some short thick red hairs; blade elliptic sometimes orbicular rarely obovate, with index $1\frac{1}{3}$, 12–17 by 10–15 mm, thin, having a flattened obtuse top and a rounded slightly auricled base palmately 5-nerved, with bifurcate midrib at $\frac{3}{4}$ length, prominently nerved beneath, entire, dull green above but lighter on nerves, dull light greyish green beneath but darker on nerves, sometimes red-margined, glabrous. *Epicotyl* $\frac{1}{4}$ –2 cm. *Stem* erect; at 2nd stage straight, or spiral owing to obtus-angular connection of internodes, angular near top, terete near base, brownish green or grey, with simple very short hairs. *Phyllotaxy* spiral. *Leaves* stipulate, paripinnate; 1st leaf 1–3 pairs of leaflets; number of pairs increasing with succeeding leaves; ± 10 th leaf having 7–10 pairs; stipules narrow, up to 2 mm long, hairy. *1st Leaf* rachis $\frac{3}{4}$ –3 cm, thickened at base, mucronate, red or green, glabrous or with sparse simple colourless hairs; leaflets opposite, petiolulate; petiolule up to 2 mm, blades obovate or oblong, with index $1\frac{2}{3}$ – $2\frac{1}{3}$, 11–21 by 6–10 mm, having a slightly notched or obtuse mucronate top and an acute sometimes asymmetrical base, pinninerved and midrib prominent beneath, entire, dull on both surfaces, light greyish green beneath, usually red-margined, glabrous or hairy. *Leaves with ± 7 –10 pairs of leaflets* rachis up to ± 18 cm, $1\frac{1}{2}$ mm thick, thickened at base, tapering upwards, mucronate, red above, pale green beneath, with simple appressed golden yellow hairs; leaflets opposite; petiolule up to 2 mm; blades in lowest leaflets usually ovate, in topmost ones obovate; other ones oblong, with index $1\frac{1}{2}$ –3, up to $4\frac{1}{2}$ by $1\frac{3}{4}$ cm, thin, velvety to touch, having a mucronate especially in lowest pairs of leaflets notched but in other pairs usually rounded obtuse top, and a rounded or asymmetrical at anterior side acute at posterior side rounded base, pinninerved, prominently nerved beneath, entire, dull green on both surfaces but greyish green beneath, usually red margined, sometimes on both surfaces and on margin colourless hairs like those on the rachis. *Top of plant* green or red, first glabrous later with dense simple appressed golden yellow hairs.

Seeds from 3 motherplants from different localities.

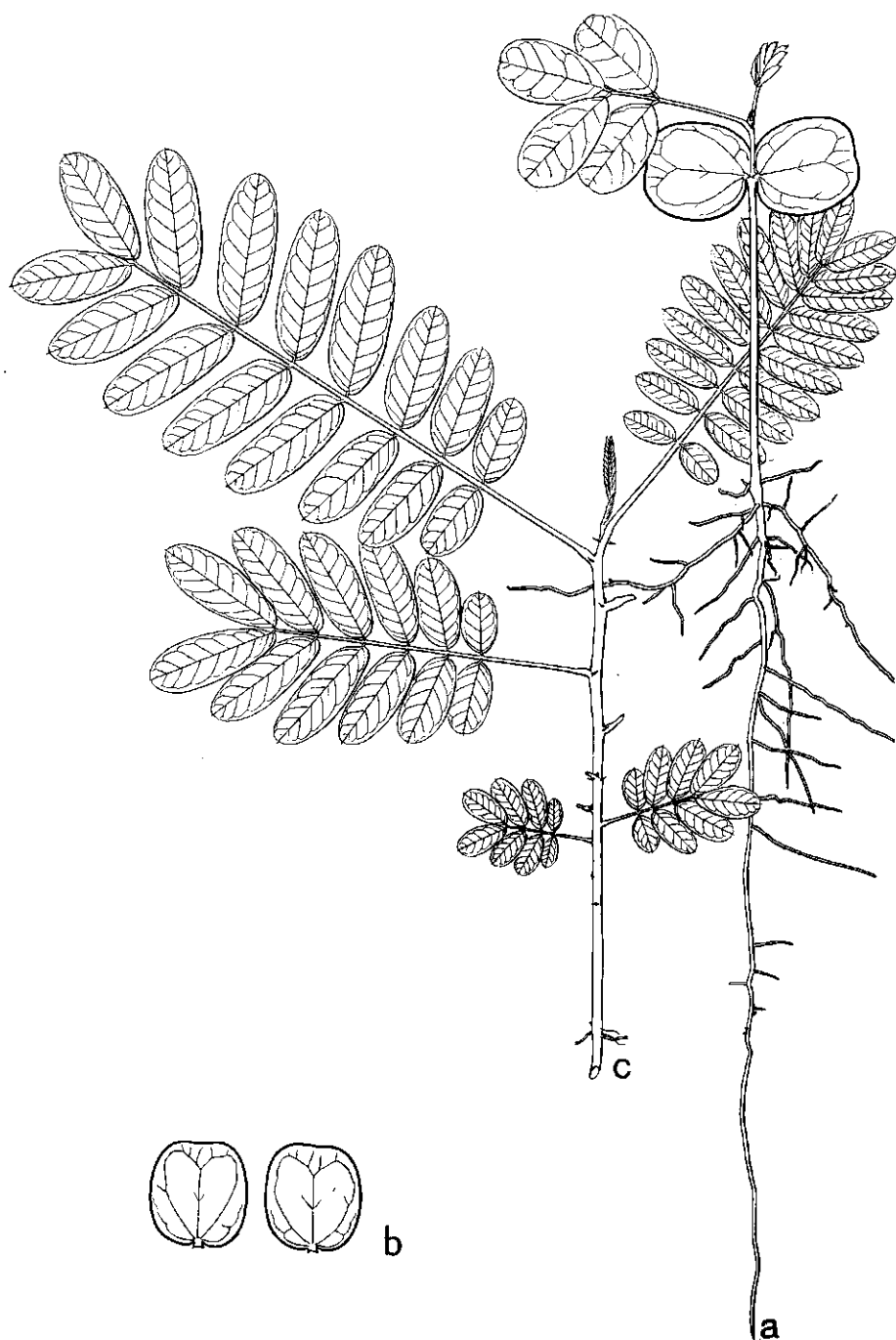


Fig. 54. *Cassia timoriensis* a. young seedling, $1/1 \times$; b. cotyledons, $1/1 \times$; c. older seedling, $1/2 \times$.

PELTOPHORUM WALP.

B. I: 523, 547; K. et V. II: 1

***Peltophorum pterocarpa* (DC.) BACK.** (*P. ferrugineum* (DECNE) BTH., *P. inerme* (ROXB.) LLANOS, *Inga pterocarpa* DC.)

B. I: 547; K. et V. II: 3

Jav.: soga. Timor: ha-u kalo, laru. Roti: lalu loëh

Fig. 55

Size at 1st stage (1 or 2 leaves only) $8\frac{1}{2}$ –26 cm, $5\frac{1}{2}$ –6 cm above collet; at 2nd stage (± 13 leaves) ± 19 cm above collet. Roots white turning greyish white or dirty yellow; primary root at 1st stage slightly flexuous, much thicker than lateral ones; collet gradually and considerably thickened; lateral roots at 1st stage few, very flexuous, unbranched. Hypocotyl epigeous, erect, straight, 4–6 cm; at 1st stage $1\frac{1}{2}$ mm thick, tapering upwards, abruptly thickened at base, terete or 4-angular, pale green, white at base, near top sparse simple colourless or reddish brown hairs. Cotyledons epigeous, 2, equal, rarely asymmetrical and then one another's mirror image, petiolate; petiole 1 mm, green, with reddish brown hairs; blade oblong, with index 2–3, 14–20 by 6–8 mm, thin-coriaceous, having a rounded obtuse top and an exsculptate auricled base, palmately 3-nerved, entire, dull green above, dull greyish green beneath, glabrous. Epicotyl 3–6 mm. Stem erect; at 2nd stage near top simple colourless or red hairs and red-topped glandular ones. Phyllotaxy spiral, 1st 2 leaves sometimes opposite. Leaves stipulate; stipules small and very soon falling, on lowest leaves indistinct; lowest leaf paripinnate; ± 12 th–13th leaf biparipinnate, ± 2 nd– ± 12 th leaf irregular often imperfectly biparipinnate. 1st Leaf 4–6 pairs of leaflets; rachis $1\frac{3}{4}$ – $2\frac{3}{4}$ cm, thickened at base, mucronate, green with simple reddish brown hairs and glandular ones; leaflets opposite, very shortly petiolulate, blades oblong, with index ± 3 , 4–10 by $1\frac{1}{2}$ –4 mm, in middle ones largest, thin, having an acute mucronate top and an asymmetrical base at anterior side acute at posterior side broader and rounded or acute, pinninerved but palmately 3-nerved at base and thickest nerve at anterior side, with midrib prominent beneath, entire, dull green above, dull greyish green beneath, glabrous. ± 12 th–13th Leaf biparipinnate, 6 pairs of pinnae; common rachis ± 11 cm, thickened at base, tapering upwards, mucronate, hairy like stem; pinnae opposite; secondary rachis ± 5 cm, ± 10 pairs of leaflets; blades ± 10 by 4 mm, top obtuse or acute, mucronate; other characters like those of 1st leaf but size smaller than of lower paripinnate leaves. Top of plant densely hairy like stem.

Seeds from 3 motherplants from different localities.

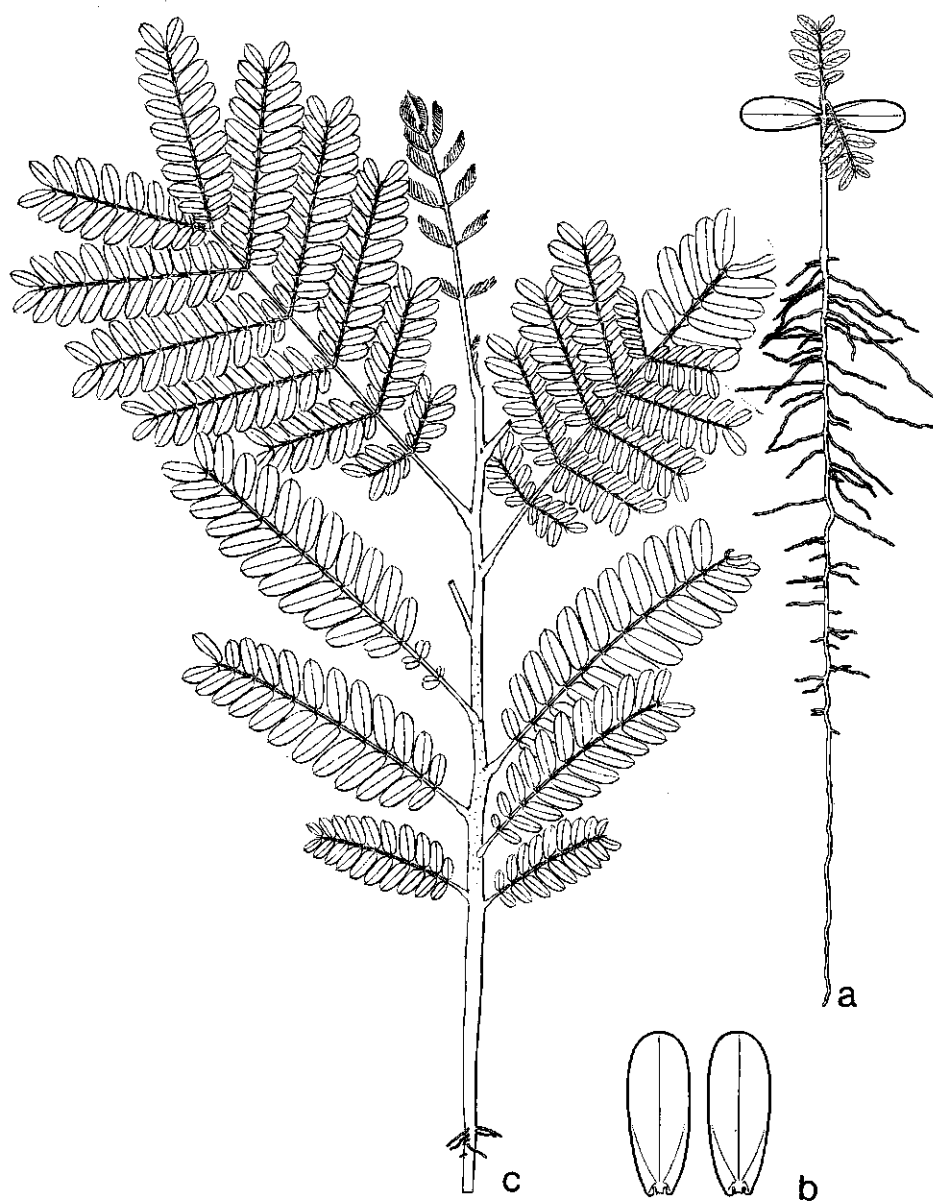


Fig. 55. *Peltophorum pterocarpa* a. young seedling, $1/2\times$; b. cotyledons, $1/1\times$; c. older seedling, $1/2\times$.

PILIOSTIGMA HOCHST.

B. I: 524, 533; K. et V. II: 22, *Bauhinia*; TROUP II: 375, *Bauhinia*

Piliostigma malabaricum (ROXB.) BTH. var. *acidum* (KORTH.) DE WIT (*Bauhinia malabarica* ROXB.)

B. I: 533; K. et V. II: 24; TROUP II: 380, fig. 148

Jav.: bentjuluk, kendajahan

Fig. 56

Size at 1st stage (2 leaves only) 7–26 cm, $1\frac{1}{2}$ –5 cm above collet; at 2nd stage (3–4 leaves) 5–12 cm above collet. *Roots* yellow turning dirty brown; tips white; primary root at 1st stage slightly flexuous, much thicker than lateral ones; collet gradually and considerably thickened; lateral roots few, moderately flexuous, unbranched. *Hypocotyl* epigeous, erect, straight, $1-3\frac{1}{2}$ cm; at 1st stage $2\frac{1}{2}$ mm thick turning thinner by shrinking, gradually and slightly thickened at base, tapering upwards, terete, smooth, red or green, white at base, glabrous (TROUP: sparsely covered with minute stiff hairs). *Cotyledons* epigeous, stipulate, 2, equal, petiolate; stipules hair-shaped; petiole 1–2 mm, broadened, green, glabrous; blade elliptic sometimes ovate (TROUP: oblong or elliptical), with index $1\frac{1}{4}$ – $1\frac{3}{4}$, $1\frac{1}{2}$ – $2\frac{1}{2}$ by $1-1\frac{1}{2}$ cm, coriaceous (TROUP: somewhat fleshy), having a rounded obtuse top and a rounded base narrowed into petiole, palmately 5–7-nerved (TROUP: 5-veined), prominently nerved beneath, entire, dull dark green above, dull light green beneath, glabrous (TROUP: sparsely covered with minute stiff hairs). *Epicotyl* 13–24 mm, *Stem* erect; at 2nd stage spiral owing to obtusangular connection of internodes, green or brownish red, with simple hairs. *Phyllotaxy* spiral. *Leaves* stipulate, simple, petiolate; stipules small, narrow-triangular (TROUP: linear, falcate); petiole flattened above, convex beneath, thickened at top and base, hairy like stem; blade bilobed; lobes semi-orbicular, with index < 1 , they may fold together upwards along the midrib of the blade; total blade with index $2\frac{1}{2}$ –5, thin, having a deeply notched top and a cordate base, palmately 7-nerved, prominently nerved beneath, mucronate, dull green above, dull greyish green beneath, hairy beneath like stem (TROUP: glabrous), glabrous above. *1st Leaf* petiole 4–12 mm; blade 3–20 mm (length of midrib) by 20–45 mm. *Topmost leaves* (2nd stage) like 1st ones but larger. *Top of plant* with dense felty hairs, lobes of leaves conduplicate upwards.

Seeds from 3 motherplants from different localities.

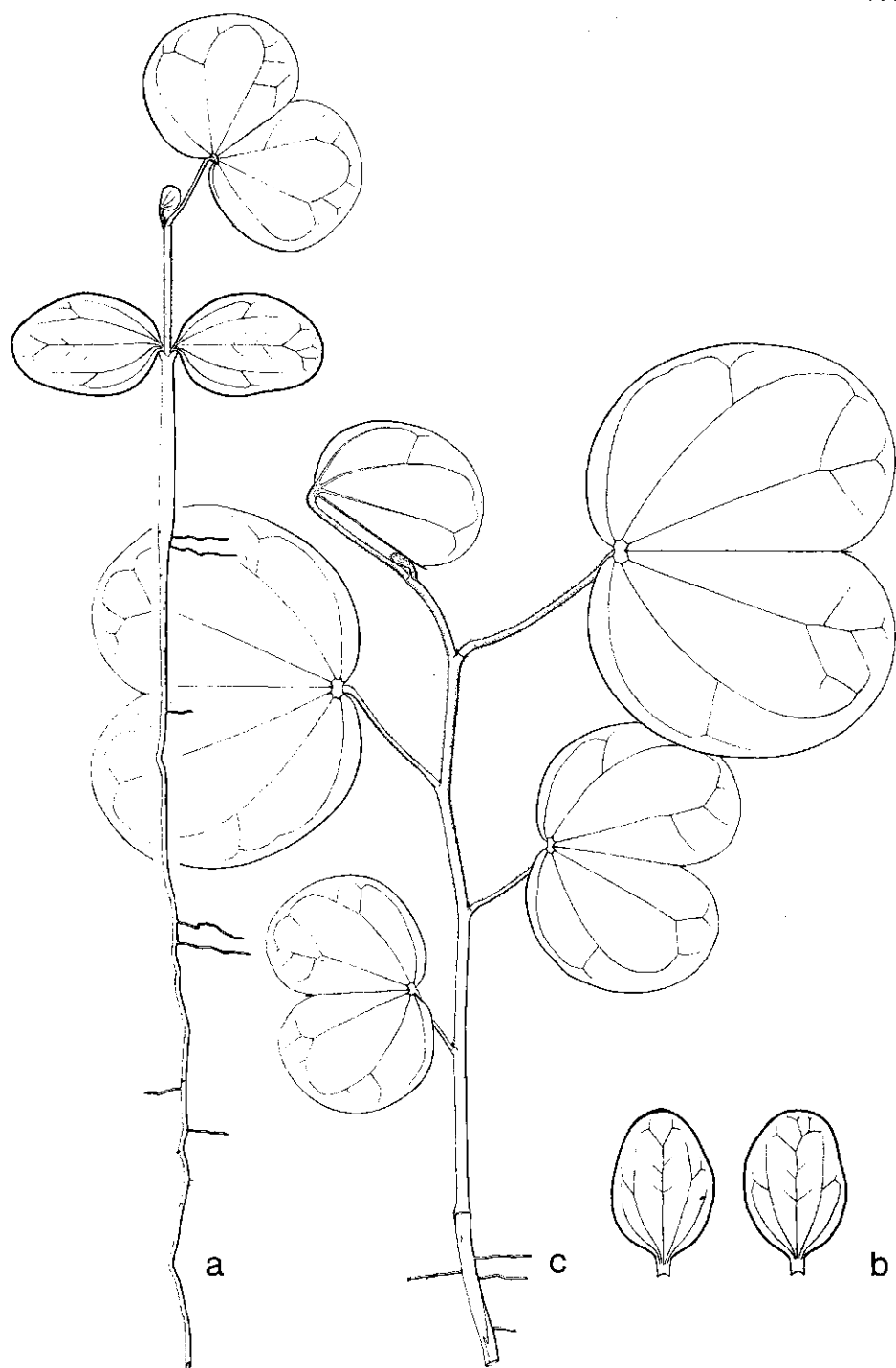


Fig. 56. *Piliostigma malabaricum* var. *acidum* a. young seedling, 1/1 × ; b. cotyledons, 1/1 × ; c. older seedling, 1/1 × .

TAMARINDUS L.

B. I: 525, 529; TROUP: II 362

***Tamarindus indica* L.**

B. I: 529; TROUP II: 362

Dutch.: tamarinde. *Java*: asem

Fig. 57

Size at 1st stage (1st 2 leaves only) up to ± 25 cm, up to ± 8 cm above collet; at 2nd stage ($\pm 7-9$ leaves) $\pm 12-18$ cm above collet. *Roots* dirty yellow; primary root at 1st stage much thicker than lateral ones; collet gradually and slightly thickened; lateral roots unbranched. *Hypocotyl* epigeous, erect, straight, $\pm 3-14$ cm; at 1st stage ± 3 mm thick, tapering upwards, terete (TROUP: slightly compressed), smooth, green, base white, with simple short colourless hairs. *Cotyledons* epigeous, 2, facing, equal, or asymmetrical and one another's mirror image, sessile; blade peltate, irregularly orbicular or elliptic (TROUP: unequally ovate), $\varnothing 10$ mm but varying widely, inserted slightly beneath centre, fleshy, slightly concave above, convex beneath, with a furrow from insertion downwards, green, glabrous. *Epicotyl* $1\frac{1}{2}-5\frac{1}{2}$ cm, terete, at 1st stage pale green, with simple woolly yellow hairs. *Stem* erect, turning feathershaped with a sideward bend. *Phyllotaxy* distichous-alternate but 1st 2 leaves opposite. *1st 2 Leaves* stipulate, paripinnate, 8-10 pairs of leaflets; stipules asymmetrically lanceolate (TROUP: falcate acuminate), green, hairy; rachis $4\frac{1}{2}-9$ cm, thickened at base, fugaciously mucronate, green, hairy like stem; leaflets opposite, very shortly petiolulate (TROUP: subsessile); blades asymmetrically lanceolate, with index 3-3 $\frac{1}{2}$, 10-27 by 3-9 mm, thin, having a rounded abruptly acuminate top and an asymmetrical at anterior side higher acute and at posterior side rounded base, pinninerved, palmately 3-nerved at base and nerve at anterior side thickest, prominently nerved beneath, entire, dull green above, dull greyish green beneath, ciliate, with simple colourless hairs above or glabrous. *Topmost leaves* (2nd stage) almost like 1st 2 leaves, but some with fewer pairs of leaflets and larger and broader blades; blades top rounded or emarginate and fugaciously mucronate, especially in larger and broader blades emarginate. *Top of plant* hairy.

Seeds from 2 motherplants from different localities.

LEGUMINOSAE-MIMOSACEAE

B. I: 547, III: 650; K. et V. I: 273; LUBB. I: 398; TROUP II: 389

Cotyledons epigeous sometimes hypogeous, whether or not stipulate, fleshy but sometimes thick-coriaceous or coriaceous, having a cordate sometimes exculptate or truncate base, sessile or petiolate; if semihypogeous then thick-coriaceous or coriaceous

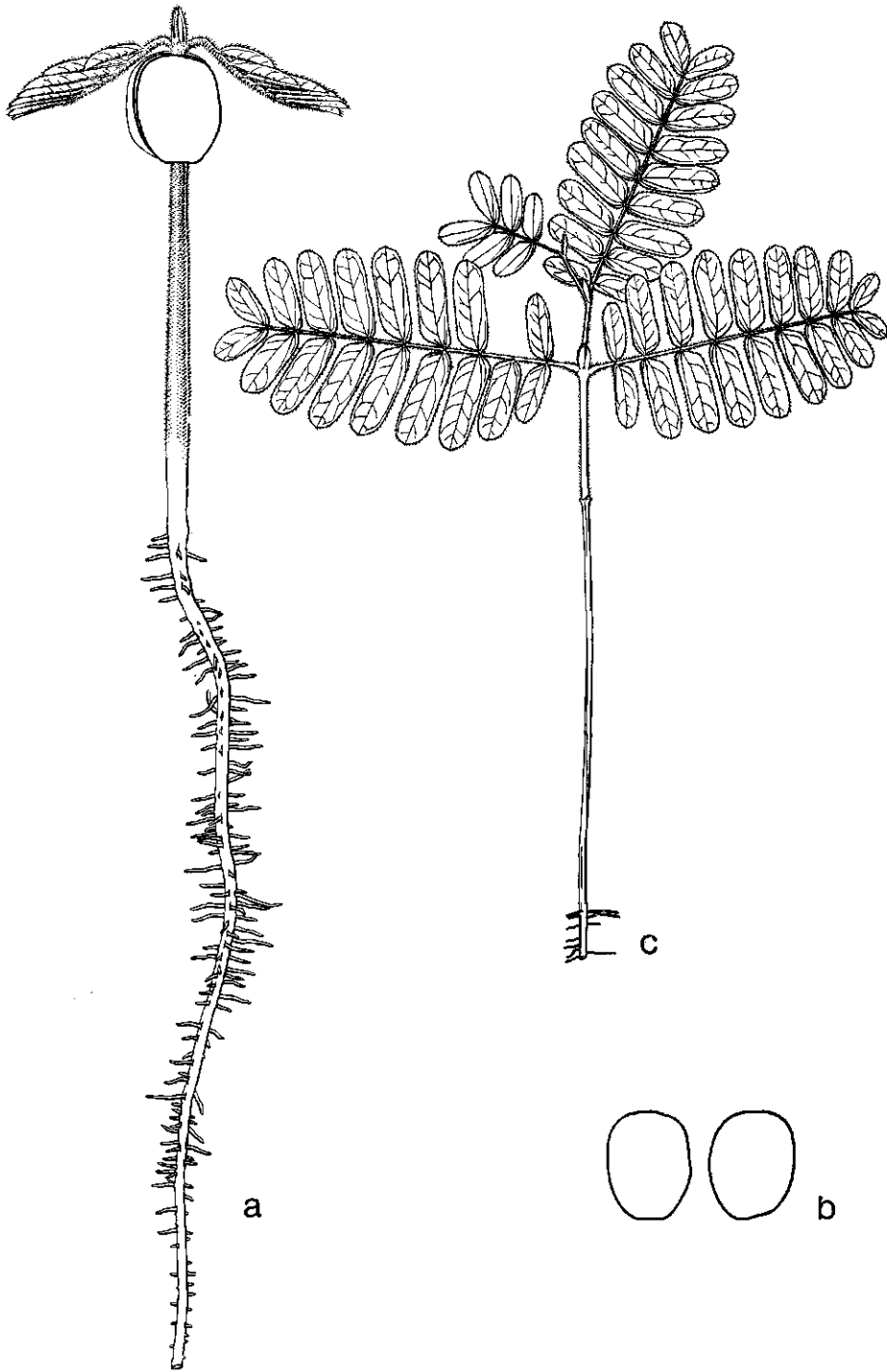


Fig. 57. *Tamarindus indica* a. young seedling, $1/1\times$; b. cotyledons, $1/1\times$; c. older seedling, $1/2\times$.

and diverging but sometimes upper surfaces facing. *Phyllotaxy* spiral, sometimes distichous-alternate but 1st leaves sometimes opposite. *Leaves* stipulate, stipules sometimes spiniform. *Higher leaves* biparipinnate; 1st leaf paripinnate, sometimes scale-shaped. *Ramillary spines* sometimes present. *Young plant* from seed differs from adult plant by a pinnate rarely bipinnate 1st leaf and sometimes by absence of spines when the adult plant is spiny.

1. A. cotyledons present 2
 - B. 1st developed leaf present 6
 - C. higher leaves present 10
2. a. cot. blade base truncate *Dichrostachys*
 - b. cot. blade base notched or exculptate 3
3. a. cot. semihypogeous *Pithecellobium*
 - b. cot. epigeous 4
4. a. cot. lateral margins parallel, straight *Samanea*
 - b. cot. lateral margins rounded 5
5. a. cot. very dark green above, usually with crispate top, fleshy. *Adenanthera*
 - b. cot. not very dark green above; top not crispate; difficult to distinguish between: *Parkia, Acacia, Albizia, Leucaena*
6. a. 1st leaf scale-shaped 7
 - b. 1st leaf developed 8
7. a. 1st developed leaf 3 pairs of pinnae. *Parkia*
 - b. 1st developed leaf 1 pair of pinnae *Pithecellobium*
8. a. blade base of leaflets broader at anterior side *Adenanthera*
 - b. blade base of leaflets broader at posterior side 9
9. a. topmost leaflets largest *Samanea*
 - b. topmost leaflets not larger than middle ones; difficult to distinguish between. *Acacia, Albizia, Dichrostachys, Leucaena*
10. a. leaves biparipinnate, leaflets distichous-alternate *Adenanthera*
 - b. leaves biparipinnate, leaflets opposite 11
11. a. leaves 1 pair of pinnae *Pithecellobium*
 - b. leaves more pairs of pinnae 12
12. a. topmost leaflets much larger than middle ones *Samanea*
 - b. otherwise 13
13. a. no room between margins of blades of leaflets *Parkia*
 - b. otherwise 14
14. a. axillary ramillary spines present *Dichrostachys*
 - b. otherwise 15
15. a. lowest blades subulate; base of blades palmately nerved, thickest nerve at anterior side; or one of the middle nerves thickest and blades in leaves with

- 3 pairs of pinnae > 16 mm long *Albizia*
 b. lowest blades subulate or not; if not subulate: blade base with midrib in
 centre and blades in leaves with 3 pairs of pinnae < 1 cm 16
 16. a. stipules spiniform (*Ac. leucophloea*, *Ac. arabica*, *Ac. tomentosa*); or leaves
 phyllodes (*Ac. oraria*); or leaves with 10 or more pairs of pinnae (*Ac.*
decurrens); or lowest blades subulate (*Ac. villosa*) *Acacia*
 b. otherwise *Leucaena*

ACACIA MILLER

B. I: 548, 549, 555; K. et V. I: 285; LUBB. I: 399, 471; MEIJER DREES: 1; TROUP II: 418.

Collet in most cases abruptly expanded into a disk; sometimes some seedlings from the same lot do not show this character. *Cotyledons* epigeous, sometimes stipulate, fleshy or coriaceous or thin-foliaceous; blade cordately based. *Phyllotaxy* spiral, but 1st 2 leaves sometimes opposite. *Leaves* stipulate; stipules whether or not spinous; 1st leaf paripinnate; 2nd leaf biparipinnate, 1 pair of pinnae, sometimes paripinnate; higher leaves more pairs of pinnae, topmost leaves sometimes reduced to phyllodia; leaflets opposite, shortly or very shortly petiolulate, blades asymmetrically palmately nerved but lowest leaflets sometimes subulate. *Young plant* from seed considerably different from adult plant, especially if the adult one has phyllodes.

1. A. cotyledons and (or) 1st leaf present 2
 B. about 10th–20th leaf present; utmost leaves 3, 4, 5 or 10 pairs of pinnae or
 phyllodes 7
 2. a. cot. stipulate, petiolate, top emarginate, 1st leaf 2–3 pairs of leaflets; blade
 with index up to 2, up to 4½ cm long *A. villosa*
 b. cot. exstipulate, petiolate or sessile, top obtuse or emarginate; 1st leaf
 3–16 pairs of leaflets, blade with index up to 3–4 and up to 6 or 9 or 12 mm
 long 3
 3. a. cot. sessile; 1st leaf: whether or not vertically broadened rachis, 3–6 pairs
 of leaflets, blade with index up to 4 and sometimes up to 9 or 12 mm long . . 4
 b. cot. petiolate; 1st leaf: no vertically broadened rachis, 3–16 pairs of
 leaflets, blade with index up to 3–4 and no longer than 6½ mm 5
 4. a. cot. soon revolute; 1st leaf: no vertically broadened rachis, blade up to
 9 mm long *A. decurrens*
 b. cot. not revolute; 1st leaf: vertically broadened rachis, blade up to 12 mm
 long *A. oraria*
 5. a. cot. orbicular or ovate, top obtuse; cot. blade with index ± 1 , 6–8 mm
 long, obtusely lobed, flattened above, convex beneath; epicotyl 0 mm; 1st leaf
 7–9 pairs of leaflets *A. arabica*
 b. cot. elliptic or ovate, top obtuse or emarginate; cot. blade with index 1–1½,

- 6½–12 mm long, obtuse or acutely lobed, convex above, flattened or concave beneath; epicotyl 0–8 mm; 1st leaf 3–16 pairs of leaflets 6
6. a. cot. ovate, top obtuse or emarginate, blade with index 1½–1½, 8–12 mm long, obtuse or acutely lobed, convex above, flattened or concave beneath; epicotyl 1–8 mm; 1st leaf 9–16 pairs of leaflets *A. tomentosa*
 b. cot. elliptic or ovate, top obtuse, blade with index 1–1½, 6½–9 mm long, acutely lobed, usually convex above, concave beneath; epicotyl 0 mm; 1st leaf 3–7 pairs of leaflets *A. leucophloea*
7. a. stipules spinous 8
 b. stipules not spinous 10
8. a. primary rachis stipitately and glandularly hairy *A. leucophloea*
 b. primary rachis not glandularly hairy 9
9. a. raches glabrous *A. arabica*
 b. raches hairy *A. tomentosa*
10. a. topmost leaves phyllodes *A. oraria*
 b. no phyllodes 11
11. a. ± 20th leaf 10– more pairs of pinnae; blades of lowest leaflets not subulate. *A. decurrens*
 b. ± 20th leaf less than 10 pairs of pinnae; blades of lowest leaflets subulate *A. villosa*

***Acacia arabica* LMK. WILLD.**

B. I: 556; TROUP II: 419, fig. 161

Fig. 58

Size at 1st stage (1st 2 leaves only) 18–44 cm, 3–7 cm above collet; at 2nd stage (19–25 leaves) 30–46 cm above collet. *Roots* white turning dirty yellow; primary root at 1st stage slightly flexuous, much thicker than lateral ones; collet abruptly expanded into a disk but sometimes only gradually and slightly thickened; lateral roots at 1st stage few or none, moderately flexuous, unbranched. *Hypocotyl* epigeous, erect, straight, 2½–5 cm; at 1st stage 1–2½ mm thick, tapering upwards, abruptly disk-shaped but sometimes only slightly thickened at base, near top slightly and laterally compressed, terete, smooth, pale green, glabrous. *Cotyledons* epigeous, 2, equal, petiolate; petiole 2–3 mm, 1 mm thick, pale green, glabrous; blade orbicular or ovate (lobes excluded); with index ± 1, Ø (lobes excluded) 6–8 mm, fleshy, 1 mm thick, flattened above, convex beneath, having a rounded obtuse top and a cordate ± 3 mm long obtusely lobed base (TROUP: sagittate), indistinctly nerved, entire, dark dull green above, light dull greyish green beneath, glabrous. *Epicotyl* very short. *Stem* erect; at 2nd stage spiral owing to obtusangular connection of internodes, slightly angular near top, terete and smooth near base, green but near top brown, having small orbicular yellowish white lenticels near base, glabrous. *Phyllotaxy* spiral, but 1st 2 leaves sometimes opposite. *Leaves* stipulate; stipules of lowest leaves needle-shaped, of higher ones

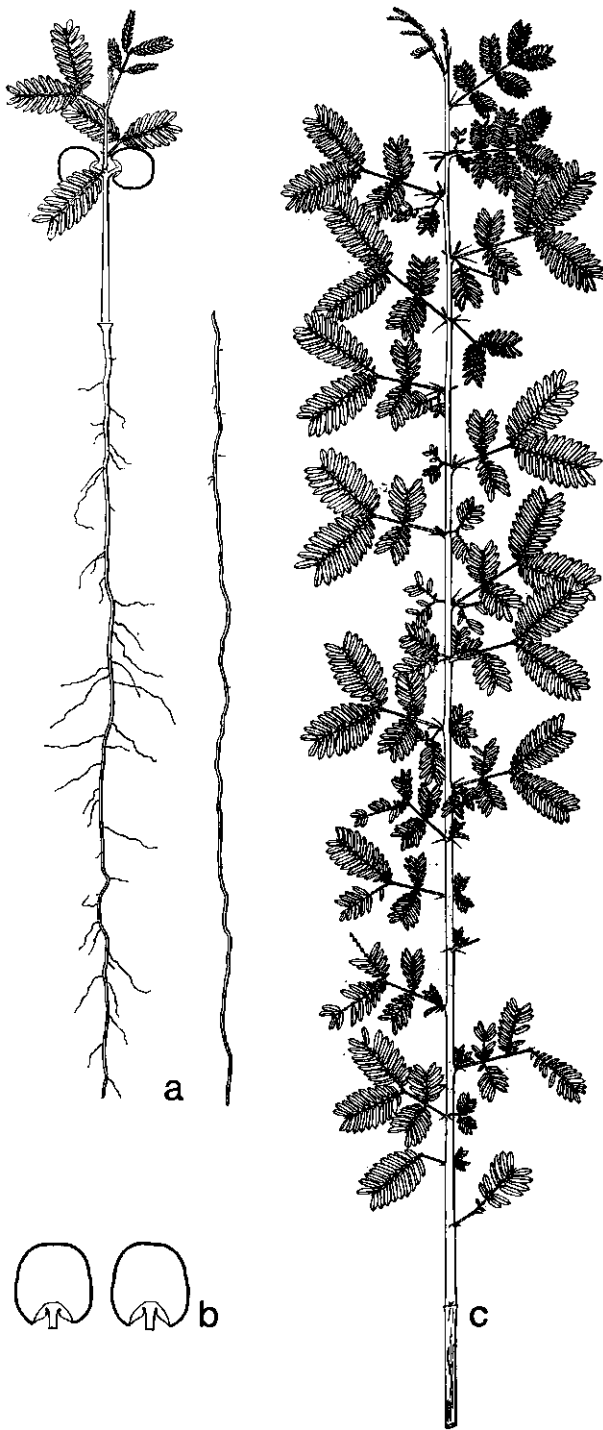


Fig. 58. *Acacia arabica* a. young seedling, $1/2 \times$; b. cotyledons, $1/1 \times$; c. older seedling, $1/2 \times$.

longer and spinous up to ± 7 mm long, sharp, green turning brown; lowest leaves paripinnate, succeeding ones biparipinnate, lower ones of the latter 1 pair of pinnae, succeeding ones 2 pairs, as from 5th or 16th leaf 3 pairs of pinnae; leaves having 3 pairs alternating with ones with 2 pairs of pinnae. *1st Leaf* 7–9 pairs of leaflets (TROUP: p. 428: 4, but in fig. 161: 8–10); rachis 2–2½ cm, slightly thickened at base, tapering upwards, mucronate, green, glabrous; leaflets opposite, shortly petiolulate; blades asymmetrically elliptic or oblong or lanceolate, sometimes asymmetrical-obovate, up to 6 by 2 mm, in middle pairs largest, thin, having an acute top and a base acute at anterior side and rounded at posterior side, with one main nerve, entire, dull green, finely white dotted above, dull light green beneath, glabrous. *2nd Leaf* sometimes similar to 1st leaf, sometimes having larger leaflets, in most cases biparipinnate, 1 pair of pinnae. *Leaves with 3 pairs of pinnae* common rachis 2–3½ cm, ½ mm thick, thickened at base, mucronate, slightly channelled, green, glabrous; pinnae opposite, having 5–12 pairs of leaflets; secondary rachis 7–23 mm, thickened at base, mucronate, green, sometimes with a gland above near highest pair of leaflets, glabrous; leaflets shortly petiolulate; blades oblong or lanceolate; largest ones with index 3–4, up to 7 by 2 mm, thin, having an abruptly acuminate top and an asymmetrically rounded base, palmately 2–3-nerved and nerve at anterior side thickest, entire, dull green above, dull light green beneath, both surfaces white punctate, glabrous. *Top of plant* glabrous, green.

Seeds from 1 motherplant.

***Acacia decurrens* (WENDL.) WILLD.**

B. I: 557; LUBB. I: 474, fig. 310, *A. dealbata* LMB.; TROUP II: 463, *A. decurrens* WILLD. 464, *A. dealbata* LMK.

Australia: wattle

Fig. 59

Size at 1st stage (1 leaf only) 3–20 cm, 1½–7 cm above collet; at 2nd stage (± 16 –28 leaves) 18–44 cm above collet. *Roots* white turning off white; primary root at 1st stage slightly to very flexuous, slightly to moderately thicker than lateral ones; collet in most cases abruptly expanded into a disk but sometimes slightly or more distinctly thickened at one side, sometimes obliquely thickened; lateral roots at 1st stage absent to moderate in number, very flexuous, sparsely branched. *Hypocotyl* epigeous, erect, straight, 10–62 mm; at 1st stage ½–1½ mm thick, in most cases slightly or more distinctly thickened at one side at base, tapering upwards, terete or angular, smooth or finely and irregularly ridged, red or green or purple but sometimes in lower part white, white at base, glabrous or near top sparse simple colourless hairs. *Cotyledons* epigeous, 2, equal, sessile; blade oblong, with index 1½–2, 4–7 by 2½–4 mm, soon revolute and consequently measuring difficult, thin or coriaceous, having a rounded obtuse top and a cordate obtusely lobed but sometimes peltate base, indistinctly nerved, entire, red or green, glabrous. *Epicotyl* 0–2 mm. *Stem* erect sometimes turning feather-

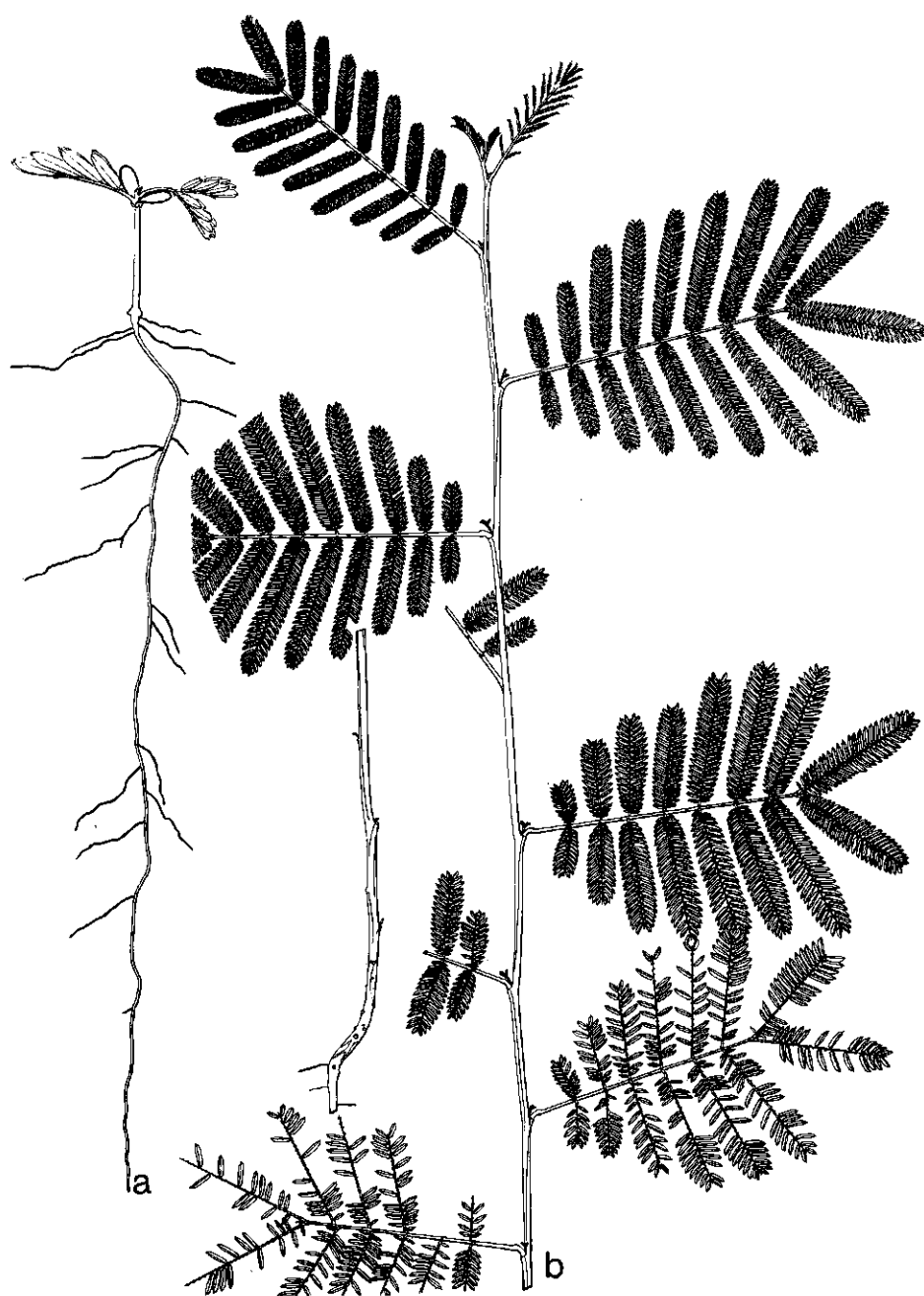


Fig. 59. *Acacia decurrens* a. young seedling, $1/1\times$; b. older seedling, $1/2\times$.

shaped and with a sideward bend; at 2nd stage spiral owing to obtusangular connection of internodes, angular near top, sometimes 4-winged, terete near base, green, with patent or appressed sometimes sparse simple colourless hairs. *Phyllotaxy* spiral but 1st 2 leaves sometimes subopposite, later sometimes tending to distichous-alternate. *Leaves* stipulate; stipules small, considerably varying in shape, decurrent into ridges of stem; lowest leaves paripinnate; next ones biparipinnate; as from \pm 15th or 19th leaf 10 pairs of pinnae. *1st Leaf* 3–6 pairs of leaflets; stipules small, green; rachis 5–18 mm, mucronate, green or red, sometimes hairy; leaflets opposite, shortly petiolate, middle ones largest; blades oblong to lanceolate or ovate or obovate, sometimes asymmetrical in highest leaflets asymmetrically ovate, with index 2–5, up to 9 by 3 mm, thin, having a very shortly acuminate or abruptly acuminate acute top and an obliquely rounded base, palmately 2–3-nerved and central nerve thickest but sometimes one at anterior side thickest, entire, dull green, sometimes red beneath, glabrous. *2nd Leaf* biparipinnate, 1 pair of pinnae; leaflets smaller than those in 1st leaf. *Higher leaves* (2nd stage) main rachis \pm 1½ mm thick, tapering upwards, thickened at base, mucronate, green, hairy like stem, sometimes orbicular yellowish green gland above between the insertions of the pairs of pinnae; pinnae opposite or subopposite; leaflets opposite sometimes alternate, very shortly petiolate; blades asymmetrically lanceolate, up to 7 by 1½ mm, having an acute top and an asymmetrically rounded base broadest at posterior side, palmately 2–4-nerved and nerve at posterior side thickest, entire, glabrous or ciliate with hairs like those on stem, dull green on both surfaces. *Leaves with 10 pairs of pinnae* main rachis up to 8 cm, up to 32 pairs of leaflets; rachis 2nd order up to 4 cm. *Top of plant* green or red.

Seeds from 3 motherplants from different localities.

***Acacia leucophloea* (ROXB.) WILLD.**

B. I: 556; K. et V. I: 286; TROUP II: 444, fig. 166

Jav.: pilang; *Mad.*: opilan, pelang; *Timor*: kabesak, kabisak

Fig. 60

Size at 1st stage (2 leaves only) 7½–18 cm, 1½–4 cm above collet; at 2nd stage (14–21 leaves) 8–34 cm above collet. Stinking. *Roots* pure white turning yellow, later tubercled; primary root at 1st stage moderately or slightly flexuous, moderately thicker than lateral ones; collet usually abruptly thickened; lateral roots at 1st stage few or absent, moderately flexuous, unbranched. *Hypocotyl* epigeous, erect, straight, 1–3 cm; at 1st stage 1½ mm thick, tapering upwards, usually abruptly thickened and disk-shaped at base, terete, near top between the cotyledons 2 fine longitudinal ridges, lengthwise finely ridged in lower part, light green, white at base, glabrous. *Cotyledons* epigeous, 2, petiolate; petiole 1–3 mm, broadened, green, glabrous; blade elliptic or ovate, with index 1–1½, 6½–9 by 6–8 mm, thick coriaceous or fleshy, usually convex above and concave beneath, having a rounded obtuse top and an arrow-shaped base, indistinctly nerved, entire, dull dark green above, dull light green beneath, glabrous. *Epicotyl*

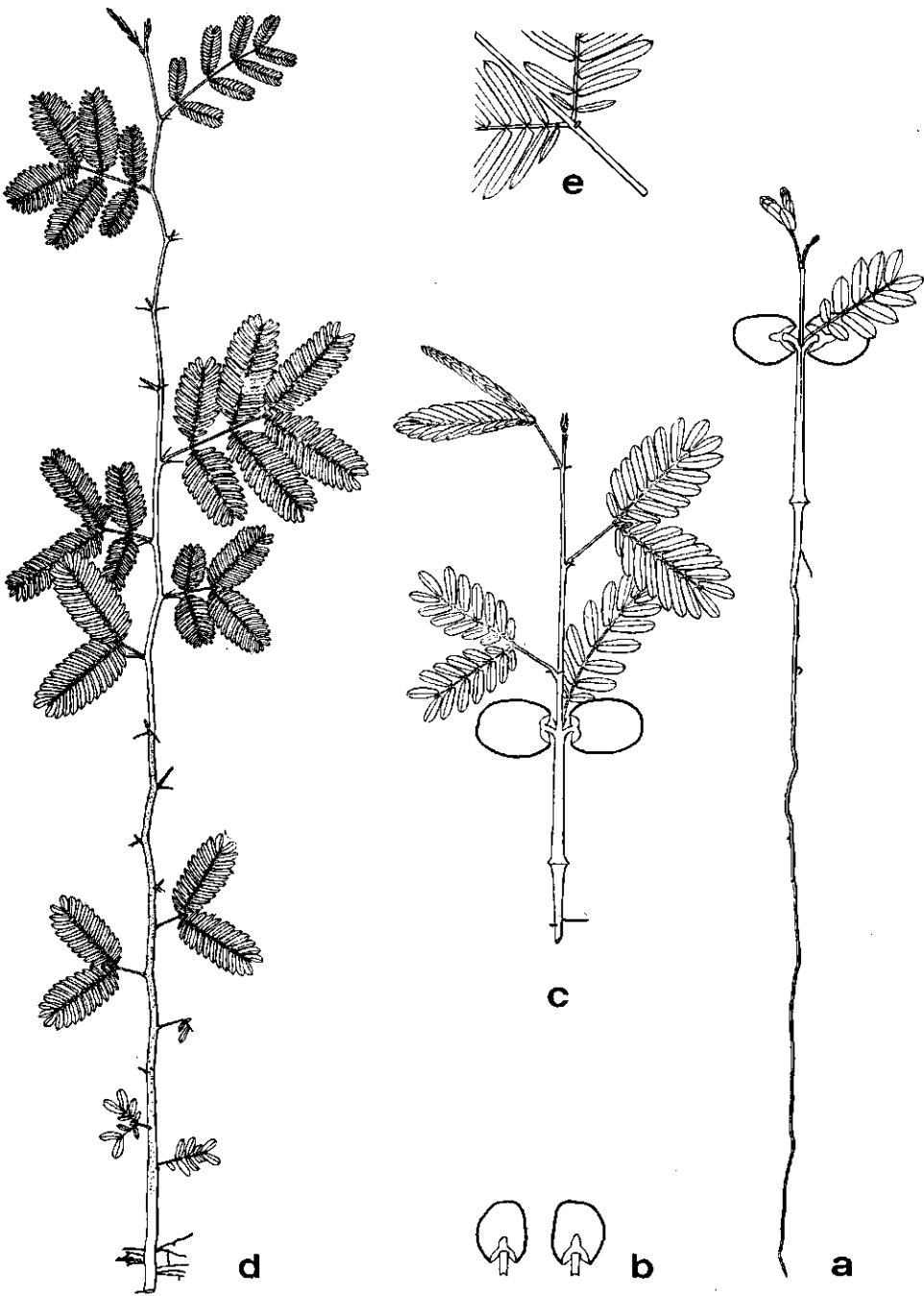


Fig. 60. *Acacia leucophloea* a. young seedling, $1/1\times$; b. cotyledons, $1/1\times$; c. seedling with 4 leaves, $1/1\times$; d. older seedling, $1/2\times$; e. gland on rachis, $2/1\times$.

very short. *Stem* (2nd stage) spiral owing to obtusangular connection of internodes, sometimes feather-shaped with a sideward bend, terete, angular near top, green or red near top, greyish green near base, possessing small grey orbicular lenticels, glabrous. *Phyllotaxy* spiral, higher leaves sometimes distichous-alternate. *Leaves* stipulate; 1st leaf paripinnate; succeeding ones biparipinnate; lower ones of the latter 1 pair of pinnae and succeeding ones 2 pairs; as from 11th or 14th leaf 3 pairs of pinnae; sometimes alternating with leaves having more pairs of pinnae or some with less. *1st Leaf* 3–7 pairs of leaflets (TROUP: 4–7), having small thorn-shaped stipules; rachis $1\frac{1}{2}$ – $2\frac{1}{4}$ cm, thickened at base, mucronate, slightly channelled near base, green, glabrous; leaflets opposite, very shortly petiolulate; blades asymmetrically lanceolate, with index 3–4, $4\text{--}6\frac{1}{2}$ by 1–2 mm, thin, having an abruptly acuminate acute top and an asymmetrically rounded base, palmately 2–3-nerved and thickest nerve at anterior side, dull dark green above, dull greyish green beneath; glabrous. *2nd Leaf* blades like those in 1st leaf but smaller. *Leaves with 3 pairs of pinnae* stipular spines unbranched, $\frac{1}{2}$ –1 cm, reddish brown; main rachis $1\frac{1}{2}$ – $3\frac{1}{2}$ cm, $\frac{1}{2}$ mm thick, thickened at base, with a spine-like cusp, convex beneath, flattened or slightly channelled above, green beneath, green or red above, possessing a red or green stipitate gland on upper side near lowest and near highest pair of pinnae; pinnae opposite; rachis 2nd order 1–3 cm, thickened at base, mucronate, green, glabrous; leaflets 8–18 pairs, opposite, very shortly petiolulate; blades asymmetrically lanceolate, largest in middle leaflets, with index up to 6, up to 9 by $2\frac{1}{2}$ mm, thin, having an abruptly acuminate acute top and an asymmetrically rounded base, palmately 2–4-nerved and thickest nerve at anterior side, slightly prominently nerved beneath, entire, dull green on both surfaces, glabrous. *Top of plant* glabrous, red or green.

Seeds from 2 motherplants from different localities.

***Acacia oraria* F. v. M.**

B. I: 559

Timor: kaju besi (*Mal.*), ai suli (*Belu*), ha u popi (*Central Timor*)

Fig. 61

Size at 1st stage (1 leaf only) 10–20 cm, $3\text{--}5\frac{1}{2}$ cm above collet; at 2nd stage (11–19 leaves) 12–28 cm above collet. *Roots* white turning yellowish white, later tubercled; primary root at 1st stage moderately flexuous, slightly to moderately thicker than lateral ones; collet abruptly thickened into disk-shape; lateral roots at 1st stage moderate in number, unbranched. *Hypocotyl* epigeous, erect, straight, $2\frac{1}{2}$ –5 cm; at 1st stage $\frac{1}{2}$ –1 mm thick, abruptly thickened into disk-shape at base, tapering upwards, terete, sometimes 4-angular, finely lengthwise furrowed, green, brownish purple near top, white at base, sometimes bluish purple on middle part, glabrous. *Cotyledons* epigeous, 2, equal, sessile; blade elliptic or oblong or obovate (lobes excluded), with index 1– $1\frac{1}{2}$, 5–6 (lobes excluded) by 4–5 mm, fleshy turning coriaceous, having a rounded obtuse top and an arrow-shaped base, indistinctly nerved, entire, dull dark green above,

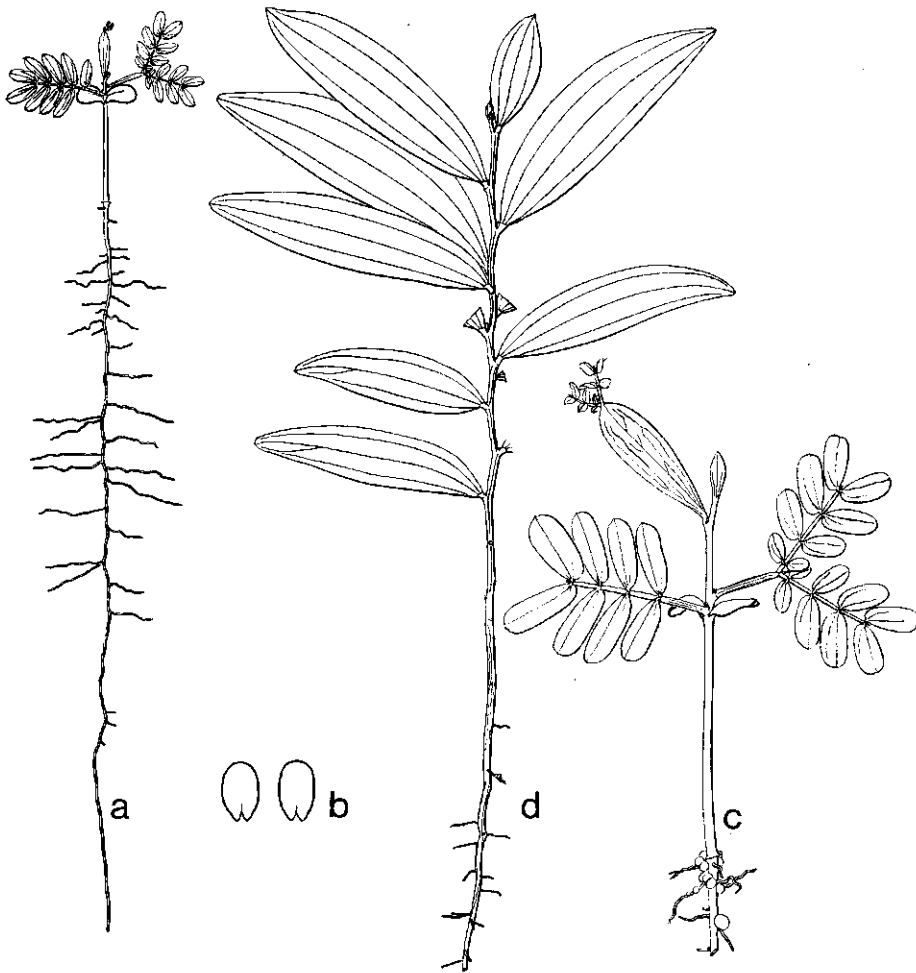


Fig. 61. *Acacia oraria* a. young seedling, $1/2\times$; b. cotyledons, $1/1\times$; c. seedling with developed 1st leaf, $1/1\times$; d. older seedling, $1/2\times$.

dull yellowish green beneath, glabrous. *Epicotyl* very short. *Stem* erect; at 2nd stage spiral owing to obtusangular connection of internodes, angular, greyish green, greyish scaly, glabrous. *Phyllotaxy* spiral. *Leaves* stipulate; stipules very small, very soon falling; 1st leaf paripinnate; succeeding ones biparipinnate followed by some possessing a vertically broadened common rachis; \pm 10th leaf and highest ones consisting of phyllodes without any pinnae. *1st Leaf* 4–5 pairs of leaflets; rachis 1–2½ cm, slightly and vertically broadened, mucronate, green, possessing scattered small red and white glands, with simple colourless hairs; leaflets opposite, shortly petiolulate; blade asymmetrically lanceolate, with index up to 4, up to 12 by 4 mm, thin, having an abruptly acuminate acute top and an asymmetrically rounded base, palmately 3-nerved, prominently nerved beneath and thickest nerve at anterior side or in centre, entire, dull dark green above, dull greyish green beneath, glabrous. *2nd Leaf* smaller blades. *Phyllodes without leaflets or pinnae* (2nd stage) falcate-lanceolate, with index 3–6, up to 10 by 2 cm, having an obtuse mucronate top and a narrowed and thickened base, often near base twisted into a horizontal position, palmately 3-nerved curved to top, entire, dull green on both surfaces, sometimes white scaly. *Top of plant* having small white and red glands, green, becoming white scaly.

Seeds from 2 motherplants from different localities.

***Acacia tomentosa* (ROXB.) WILLD. var. *chrysocoma* (MIQ.) BACK.**

B. I: 556; K. et V. I: 289

Sund.: kolampis; *Jav.*: klampis. *Mad.*: klampes, longghaj

Fig. 62

Size at 1st stage (1 leaf only) 9½–21 cm, 3½–7 cm above collet; at 2nd stage (10–20 leaves) 16–30 cm above collet. *Roots* pure white turning off white or yellowish white, stinking, later tubercled; primary root at 1st stage slightly flexuous, much thicker than lateral ones; collet usually abruptly thickened into disk-shape; lateral roots at 1st stage few or none, moderately flexuous, unbranched. *Hypocotyl* epigeous, erect, 2½–6½ cm; at 2nd stage 1½–2 mm thick, thinner near top, having a base usually abruptly thickened into disk-shape, terete, finely lengthwise ridged, light green, white or green near base, glabrous. *Cotyledons* epigeous, 2, equal, petiolate; petiole 1–2 mm, broadened, green, glabrous; blade ovate, with index 13–1½, 8–12 by 5–8 mm, fleshy or coriaceous, convex above, flattened or convex beneath, having a rounded obtuse or emarginate top and a cordate obtusely or acutely lobed base, palmately but indistinctly nerved, entire, dull dark green above, dull light green beneath, glabrous. *Epicotyl* 1–8 mm long. *Stem* erect; at 2nd stage spiral owing to obtusangular connection of internodes, terete near base, 4-angular near top, green, possessing small orbicular or lengthwise-elliptic lenticels near base and sparse simple colourless hairs near top. *Phyllotaxy* spiral. *Leaves* spinously stipulate; lowest leaf paripinnate, next ones biparipinnate with 1 pair of pinnae, followed by leaves having 2 pairs, with

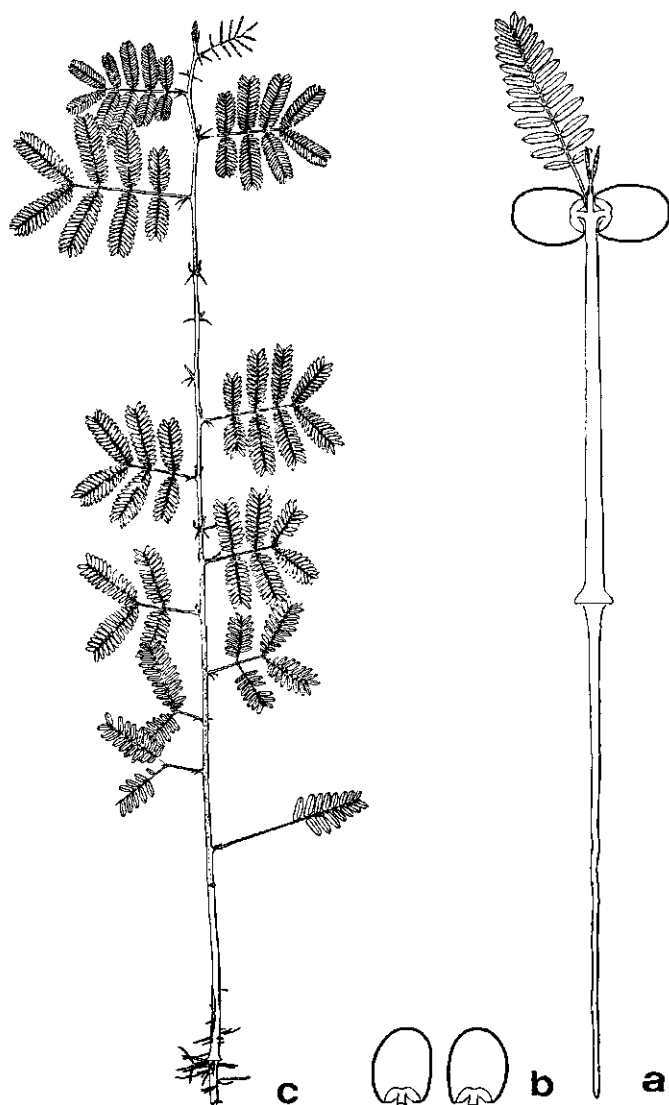


Fig. 62. *Acacia tomentosa* a. young seedling, 1/1 × ; b. cotyledons, 1/1 × ; c. older seedling, 1/2 × .

succeeding ones number of pinnae increasing: 3, 4, 5, sometimes some with more pairs alternating with one with fewer pairs of pinnae, as from 9th or 11th–14th or 19th leaf 4 pairs of pinnae. *1st Leaf* 9–16 pairs of leaflets; stipules up to 2 mm long; rachis $2\frac{1}{2}$ – $3\frac{1}{2}$ cm, 1 mm thick, thickened at base, mucronate, having one ridge above, channelled near base, convex beneath, light green, sparsely hairy like stem; leaflets opposite, shortly petiolulate, middle ones largest; blades asymmetrically oblong-lanceolate, with index 4, up to 6 by $1-1\frac{1}{2}$ mm, thin, having an abruptly acuminate

acute top and an asymmetrically rounded base, palmately 3-nerved and central nerve thickest but other ones indistinct, entire, dark dull green above, dull greyish green beneath, glabrous. *2nd Leaf* possessing an orbicular gland above on common rachis near the insertion of a pair of pinnae; blades smaller than in 1st leaf. *Leaves having 4 pairs of pinnae* stipules 2–11 mm long; common rachis $1\frac{1}{2}$ –3 cm, channelled, 2-winged, thickened at base, mucronate, green, hairy like stem, gland near the topmost pair of pinnae; pinnae opposite, 10–17 pairs of leaflets; rachis 2nd order 8–20 mm; leaflets opposite, very shortly petiolulate; blades asymmetrically lanceolate, in middle pairs largest, with index up to 8 up to 4 by 1 mm, thin, having an acute top and an asymmetrically rounded base, palmately 2-nerved and thickest nerve on anterior side of leaf, entire, dark dull green above, dull greyish green beneath, glabrous. *Top of plant* in most cases hairy, green.

Seeds from 4 motherplants from different localities.

***Acacia villosa* WILLD. *forma glabra* BACK.**

B. I: 557

Jav.: (Djakakarta): watapana

Fig. 63

Size at 1st stage (1 leaf only) $4\frac{1}{2}$ –15 cm, 1–2 cm above collet; at 2nd stage (7–16 leaves) 11–40 cm above collet. *Roots* at 1st stage white; primary root moderately flexuous, much thicker than lateral ones; collet abruptly thickened into disk-shape; lateral roots few or absent, slightly flexuous, unbranched. *Hypocotyl* epigeous, erect, straight, 8–19 mm; at 1st stage $\frac{3}{4}$ mm thick, abruptly shaped into disk at base, lengthwise finely ridged and 2 opposite more conspicuous ridges between cotyledons, pale green, glabrous. *Cotyledons* epigeous, 2, equal, stipulate, petiolate; stipules connate, subulate, $\pm 1\frac{1}{2}$ mm long, colourless; petiole $\pm 1\frac{1}{2}$ mm, green, glabrous; blade orbicular or ovate (lobes excluded), \varnothing 4–6 mm, coriaceous, having an emarginate top and an arrow-shaped base, palmately nerved but nerves indistinct, dull dark green above, dull pale green beneath, glabrous. *Epicotyl* very short. *Stem* erect; at 2nd stage spiral owing to obtusangular connection of internodes, 4-angular near top, terete near base, usually reddish brown, rarely green, glabrous. *Phyllotaxy* spiral but 1st 2 leaves subopposite. *Leaves* stipulate; 1st leaf paripinnate; 2nd leaf paripinnate or biparipinnate possessing 1 pair of pinnae, number of pairs increasing with succeeding leaves: 3, 4, 5, as from 10th or 14th leaf 3 pairs of pinnae. *1st Leaf* 2–3 pairs of leaflets, stipulate; stipules ± 1 mm long, subulate, green; rachis 10–14 mm, mucronate, very slender, green, glabrous; leaflets opposite, shortly petiolulate; blade asymmetrically oblong, with index almost 2, $\pm 4\frac{1}{2}$ by $2\frac{1}{2}$ mm, thin, having an acute top and a rounded base, palmately 2-nerved and nerve at anterior side thickest, entire, dull green above, dull greyish green beneath, glabrous. *2nd Leaf* blades smaller. *Leaves having 3 pairs of pinnae* stipules ± 3 mm long, linear, green or brownish red, glabrous; common rachis 2–8 cm, $\frac{3}{4}$ mm thick, tapering upwards, thickened at base,

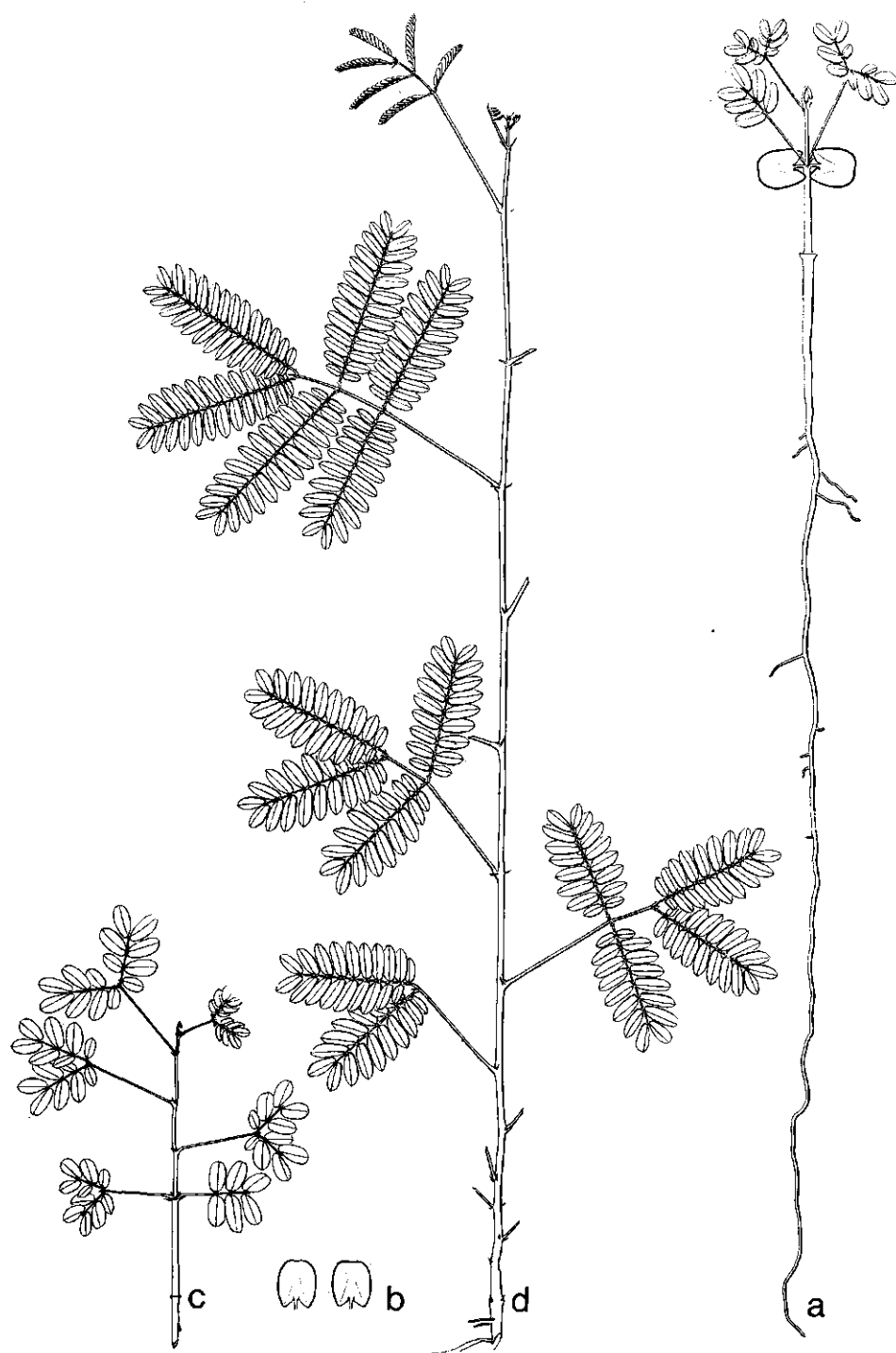


Fig. 63. *Acacia villosa* form *glabra* a. young seedling, $1/1\times$; b. cotyledons, $1/1\times$; c. seedling with some more leaves, $1/1\times$; d. older seedling, $1/2\times$.

mucronate, slightly channelled, usually brownish red, rarely green, sometimes possessing a gland above near insertions of 1 or 2 topmost pairs of pinnae, glabrous or having sparse simple colourless hairs; pinnae opposite, with 8–17 pairs of leaflets seemingly 7–16 pairs; rachis 2nd order $\frac{3}{4}$ – $5\frac{1}{2}$ cm, thickened at base, mucronate, very slender, brownish red or green, hairy like main rachis; leaflets opposite, very shortly petiolulate, 1st pair very small, subulate, 2nd pair intermediate; blade of topmost leaflets obovate, in other ones asymmetrically oblong-lanceolate, with index up to 5, up to 4 by 3 mm, thin, having an acute top and an asymmetrically rounded base, palmately 3-nerved and central nerve thickest and nerve at anterior side smallest, entire, dull green above, dull greyish green beneath, sometimes scattered hairs like those on rachis. *Top of plant* glabrous later hairy, green.

Seeds from 1 motherplant.

ADENANTHERA L.

B. I: 549, 563; K. et V. I: 279; LUBB. I: 398; TROUP II: 485

Hypocotyl near base thick, tapering upwards, turning thinner. *Cotyledons* epigeous, stipulate, sessile; stipules clustered hair-shaped; blade fleshy, orbicular or obovate, base arrow-shaped. *Phyllotaxy* spiral but 1st 2 leaves opposite or subopposite. *Leaves* stipulate; lowest leaves pinnate, leaflets opposite or distichous-alternate; next leaves sometimes imperfectly bipinnate followed by biparipinnate ones, with opposite pinnae; leaflets distichous-alternate; blades asymmetrical at base, broadest at anterior side, pinninerved.

Cotyledons and (or) 1st leaf and (or) leaves with 3 pairs of pinnae present

a. cot. \varnothing 8–10 mm (lobes excluded); blades in 1st leaf up to 16 by 7 mm, base asymmetrical; blades in leaves having 3 pairs of pinnae: index 2–3, up to 11 by 5 mm *A. microsperma*

b. cot. 9–12 (lobes excluded) by 10–12 mm; blades in 1st leaf up to 19 by 9 mm, base lowest at posterior side; blades in leaves having 3 pairs of pinnae: index 2– $2\frac{1}{2}$, up to 22 by 11 mm *A. pavonina*

Adenanthera microsperma T. et B.

B. I: 563; K. et V. I: 279

Mal.: kenderi, saga pohon; *Jav.*: segawe; *Mad.*: baj

Fig. 64

Size at 1st stage (2 leaves only) $7\frac{1}{2}$ –25 cm, $3\frac{1}{2}$ –9 cm above collet; at 2nd stage (7–12 leaves) 8–17 cm above collet. *Roots* white or off white, sometimes yellow near collet, turning brown; tips yellow; primary root at 1st stage slightly to moderately flexuous, slightly to moderately thicker than lateral ones; collet gradually and slightly thickened;

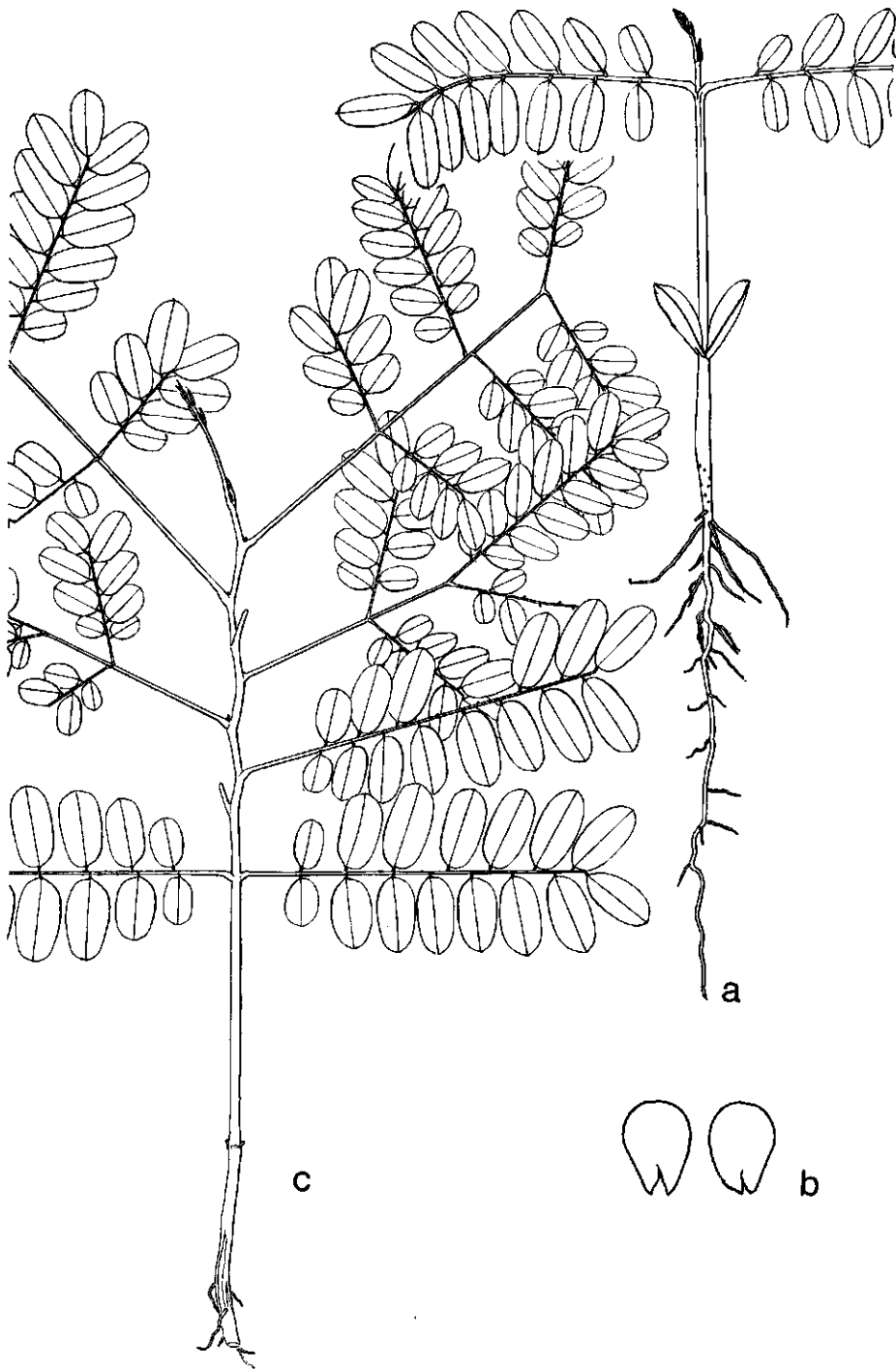


Fig. 64. *Adenanthera microsperma* a. young seedling, 1/1 \times ; b. cotyledons, 1/1 \times ; c. older seedling, 1/1 \times .

lateral roots at 1st stage few to moderate in number, moderately to very flexuous, slightly or unbranched. *Hypocotyl* epigeous, erect, straight, 2–5½ cm; at 1st stage 1¼–2 mm thick, tapering upwards, slightly or more distinctly 4-angular near top, terete near base, pale green near top, white near base, glabrous. *Cotyledons* epigeous, 2, equal, stipulate, sessile; stipules having the shape of a few red or colourless hairs; blade orbicular (lobes excluded), obovate (lobes included), Ø 8–10 mm (lobes excluded), sometimes with index < 1, fleshy, having a rounded obtuse sometimes crisped top and an arrow-shaped base, entire, indistinctly nerved, dark dull green above, dull yellowish green beneath, glabrous. *Epicotyl* 3½–5 cm. *Stem* erect; at 2nd stage spiral owing to obtusangular connection of internodes, 4-angular near top, terete near base, glabrous. *Phyllotaxy* spiral, but 1st 2 leaves opposite or subopposite. *Leaves* stipulate; stipules small, subulate; 1st and 2nd to 4th or 9th leaf paripinnate, next ones imperfectly biparipinnate, succeeding ones biparipinnate; as from 5th or 10th leaf 3 pairs of pinnae, sometimes irregular transitions. *1st Leaf* 7–19 leaflets; rachis 3–6 cm, very slender, thickened at base, sometimes slightly channelled near base, mucronate, (once observed by the author having a rhomboid terminal leaflet instead of a mucro), terete near base, having a longitudinal ridge near top, green, near top glabrous or simple colourless hairs; leaflets opposite or alternate, sometimes lower ones opposite and higher ones alternate, shortly petiolulate; blades elliptic-oblong, with index 1¼–3, thin, 7–16 by 4–7 mm, in lowest leaflets smallest, in middle ones largest, having an acute top and an asymmetrical acute and sometimes rounded base at anterior side broadest, pinninerved and midrib sunk above, prominently nerved beneath, entire, glabrous; *leaflets not folding but each leaflet moving between a horizontal and a vertical position. Leaves with 3 pairs of pinnae common* rachis ± 3½–10 cm, having a large mucro very soon falling; pinnae opposite; secondary rachis 1½–5½ cm; leaflets distichous-alternate, blade oblong, with index 2–3, 6–11 by 2–4 mm, top obtuse or acute; middle leaflets largest; other characters like those of 1st leaf. *Top of plant* glabrous or sparsely hairy, green.

Seeds from 4 motherplants from different localities.

***Adenanthera pavonina* L.**

B. I: 563; K. et V. I: 281; LUBB. I: 468, fig. 306; TROUP II: 485

Mal.: saga utan (*Bangka*); *Sund.*: ki toke laut; *Jav.*: saga telik, segawe sabrang
Fig. 65

Size at 1st stage (2 leaves only) 8½–22 cm, 3½–9 cm above collet; at 2nd stage (12–17 leaves) 10–33 cm above collet. *Roots* light yellow turning dirty yellow; tips dark yellow; primary root at 1st stage slightly to moderately flexuous, much thicker than lateral ones; collet gradually and slightly thickened; lateral roots at 1st stage few to moderate in number, moderately flexuous, unbranched. *Hypocotyl* epigeous, erect, straight or curved at base, 2½–4½ cm (LUBB.: 1½ cm); at 1st stage 2–3 mm thick, tapering upwards, turning thinner by shrinking, 4-angular turning multangular.

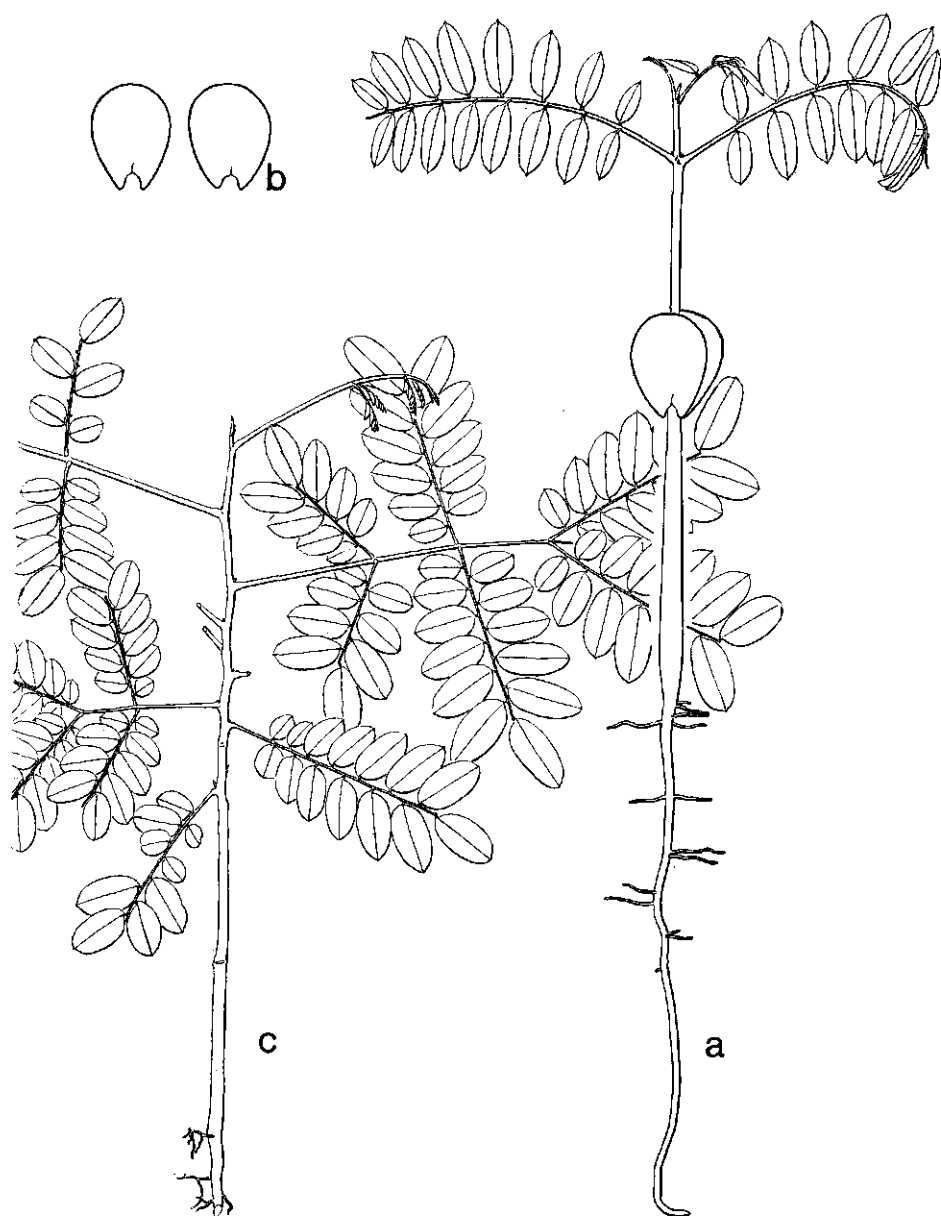


Fig. 65. *Adenanthera pavonina* a. young seedling, 1/1 \times ; b. cotyledons, 1/1 \times ; c. older seedling, 1/1 \times .

light green, white at base, glabrous. *Cotyledons* like those in *A. microsperma* but: stipules in the shape of a cluster of simple colourless hairs and blade 9–12 (lobes excluded) by 10–12 mm. *Epicotyl* 2–3½ cm. *Stem* erect; at 2nd stage spiral owing to obtusangular connection of internodes, 4-angular near top, terete near base, green near top, brown near base, glabrous. *Phyllotaxy* spiral but 1st 2 leaves opposite or subopposite. *Leaves* stipulate, stipules small subulate (LUBB.: minute, glandular); 1st–6th or 8th leaf pinnate, 7th or 9th–8th or 11th ones bipinnate with 2 pairs of pinnae, sometimes some leaves imperfectly bipinnate, next ones 3 and succeeding ones 4 pairs of pinnae, sometimes alternating with some with fewer pairs. *1st Leaf* 8–17 leaflets; rachis 4–6½ cm, ½ mm thick, thickened at base, channelled above near base, higher part laterally compressed, having a large mucro very soon falling, green, glabrous or with sparse simple colourless hairs; leaflets distichous-alternate, shortly petiolulate; lowest ones subopposite or opposite; blades elliptic or oblong sometimes ovate, with index 1½–2½, 6–19 by 3½–9 mm, in middle leaflets largest, having an abruptly acuminate top and an asymmetrical acute base at posterior side lower and at anterior side broader but in higher leaflets less acute and by curving of the midrib seemingly rounded, pinninerved and midrib prominent beneath, entire, dull dark green above, dull pale greyish green beneath, glabrous. *Leaves with 3 pairs of pinnae* common rachis 4–12½ cm, 1 mm thick, tapering upwards, fugaciously mucronate, thickened at base, slightly channelled or flattened above, convex beneath, green, with very sparse simple colourless hairs; pinnae opposite, ± 8–14 leaflets, on topmost pinnae largest number; secondary rachis 1¼–5½ cm; leaflets distichous-alternate, shortly petiolulate; blades with index 2–2½, up to 22 by 11 mm, sometimes obtuse at top (LUBB.: obtuse and minutely cuspidate on upper part of pinnae); topmost leaflets largest; other characters like those of 1st leaf. *Top of plant* glabrous or with white glandular hairs, turning hairy, green.

Seeds from 5 motherplants from different localities.

ALBIZIA DURAZZ. (wrong spelling: *Albizzia*)

B. I: 548, 549, 552; K. et V. I: 291; TROUP II: 466

Roots collet in most cases abruptly thickened into disk-shape; this character is often not present in all individuals of the same lot. *Cotyledons* epigeous, whether or not stipulate; stipules wart-shaped or hair-shaped or having the shape of clustered hairs, sessile or shortly petiolate, fleshy sometimes turning coriaceous, base arrow-shaped, upper surfaces in close contact sometimes diverging later. *Phyllotaxy* spiral but 1st 2 leaves often opposite. *Leaves* stipulate; 1st leaf paripinnate, rarely biparipinnate; 2nd leaf and next ones usually biparipinnate, higher ones biparipinnate; pinnae and leaflets opposite; lowest leaflets subulate or very small; leaflets blades base at posterior side broadest, asymmetrically and palmately nerved, thickest nerve at anterior side.

1. A. cotyledons and (or) 1st 2 leaves present 2
 - B.¹ 10th or 15th leaf present; topmost leaves 2-6 pairs of pinnae 7
2. a. cot. stipulate; stipules hair-shaped or wart-shaped, sessile; 1st 2 leaves opposite or subopposite and in 1st leaf no more than 6 pairs of leaflets or 1st 2 leaves spirally arranged and 1st leaf 10-13 pairs of leaflets 3
 - b. cot. exstipulate, petiolate; 1st 2 leaves spirally arranged, 3-4 pairs of leaflets *A. procera*
3. a. cot. blade index 2 or less (lobes excluded); 1st leaf paripinnate and 10-13 pairs of leaflets or biparipinnate 4
 - b. cot. blade index $1\frac{1}{2}$ or less (lobes excluded); 1st leaf paripinnate, 4-6 pairs of leaflets 5
4. a. cot. index $1\frac{1}{2}$ -2 (lobes excluded); 1st 2 leaves opposite, biparipinnate *A. falcataria*
 - b. cot. blade index 2 (lobes excluded), 1st 2 leaves spirally arranged; 1st leaf paripinnate *A. lophantha*
5. a. cot. wart-shaped, stipulate; epicotyl 0 mm long; 1st leaf 5-6 pairs of leaflets *A. lebbekoides*
 - b. cot. stipules hair-shaped or clustered-hair-shaped; epicotyl 2 mm long or longer; 1st leaf 4-5 pairs of leaflets 6
6. a. cot. blade ± 5 mm long; 1st leaf blades 4-7 mm long *A. chinensis*
 - b. cot. blade 7-11 mm long; 1st leaf blades ± 12 mm long *A. lebeck*
7. a. leaf stipules large, asymmetrically ovate *A. chinensis*
 - b. leaf stipules small, narrow-triangular or linear 8
8. a. ± 12 th leaf 6 pairs of pinnae, leaflets blades up to 12 mm long *A. falcataria*
 - b. ± 12 th leaf no more than 4 pairs of pinnae; leaflets blades up to 16 or 37 mm long 9
9. a. leaflets blades up to 16 mm long *A. lebbekoides*
 - b. leaflets blades up to 27 or 37 mm long 10
10. a. leaflets blades up to 27 mm long *A. lebeck*
 - b. leaflets blades up to 37 mm long *A. procera*

1 2nd stage of *A. lophantha* not in this key.

***Albizia chinensis* (OSB.) MERR. (*A. stipulata* BOIV.)**

B. I: 553; K. et V. I: 303; TROUP II: 473, fig. 181

Sund.: djeundjing, djeundjing sunda; *Jav.*: sengon, sengon djawa

Fig. 66

Size at 1st stage (1 leaf only) ± 7 cm, $\pm 3\frac{1}{2}$ cm above collet; at 2nd stage (11–15 leaves) 15–42 cm above collet. *Roots* white turning yellowish white; primary root at 1st stage moderately flexuous, much thicker than lateral ones; collet abruptly thickened into disk-shape; lateral roots at 1st stage few, moderately flexuous, unbranched. *Hypocotyl* epigeous, erect, straight, $\pm 2\frac{1}{2}$ – $4\frac{1}{2}$ cm, 1 mm thick, tapering upwards, abruptly thickened into disk-shape at base, terete, smooth, light green, with simple very short colourless hairs. *Cotyledons* epigeous, 2, stipulate, equal, sessile (TROUP: sessile or very shortly petiolate); stipules hair- or clustered-hair-shaped; blade orbicular but elliptic when lobes included (TROUP: elliptical or ovate), ± 5 mm long and broad (lobes excluded), fleshy, having an obtuse top and an arrow-shaped base, indistinctly turning more distinctly palmately-5-nerved, entire, dull green, glabrous. *Epicotyl* ± 4 mm. *Stem* erect; at 2nd stage spiral owing to obtusangular connection of internodes, 4-angular near top, terete near base; near top simple yellowish white hairs. *Phyllotaxy* spiral but 1st 2 leaves opposite or subopposite. *Leaves* stipulate; 1st leaf paripinnate (TROUP: sometimes bipinnate); 2nd leaf biparipinnate, 1 pair of pinnae, next ones 2 or 3 pairs; 8th or 11th up to 9th or 12th leaf 4 pairs of pinnae. *1st Leaf* 4–5 pairs of leaflets; stipules linear, ± 1 mm long, red; rachis 9–13 mm, very thin, mucronate, thickened at base, green or red, hairs like those on stem but colourless; leaflets opposite, very shortly petiolulate; blades asymmetrically-oblong or -lanceolate sometimes slightly falcate, with index 2– $3\frac{1}{2}$, 4–7 by $1\frac{1}{2}$ – $2\frac{1}{2}$ mm, largest in middle leaflets, in topmost ones usually asymmetrical, having an acute top and an asymmetrical base at anterior side acute and at posterior side broader and rounded, palmately 3-nerved and thickest nerve at anterior side, entire, dull, red or green, glabrous. *Leaves with 4 pairs of pinnae* stipules large, asymmetrically-ovate (TROUP: falcate), ± 6 by 5 mm, having an acuminate mucronate top and a rounded base, thin, asymmetrically and palmately nerved, light green, glabrous above, hairy beneath like stem; common rachis $7\frac{1}{2}$ –9 cm, ± 1 mm thick, thickened at base, sometimes having shortly stipitate glands on upper side inserted between base and 1st pair of pinnae and near insertions of 1 or 2 topmost pairs of pinnae, mucronate, green or brownish green, hairy like stem, pinnae opposite, 9–24 pairs of leaflets; secondary rachis $2\frac{1}{2}$ – $6\frac{1}{2}$ cm; leaflets opposite, very shortly petiolulate, in 1st pair subulate; blades in next leaflets asymmetrically lanceolate, with index 4–6, 5–8 by 1 – $2\frac{1}{2}$ mm, prominently nerved beneath, dull green above, dull greyish green beneath, hairy beneath on midrib like stem or glabrous; other characters like those of 1st leaf. *Top of plant* white-hairy.

Seeds from 4 motherplants from different localities.

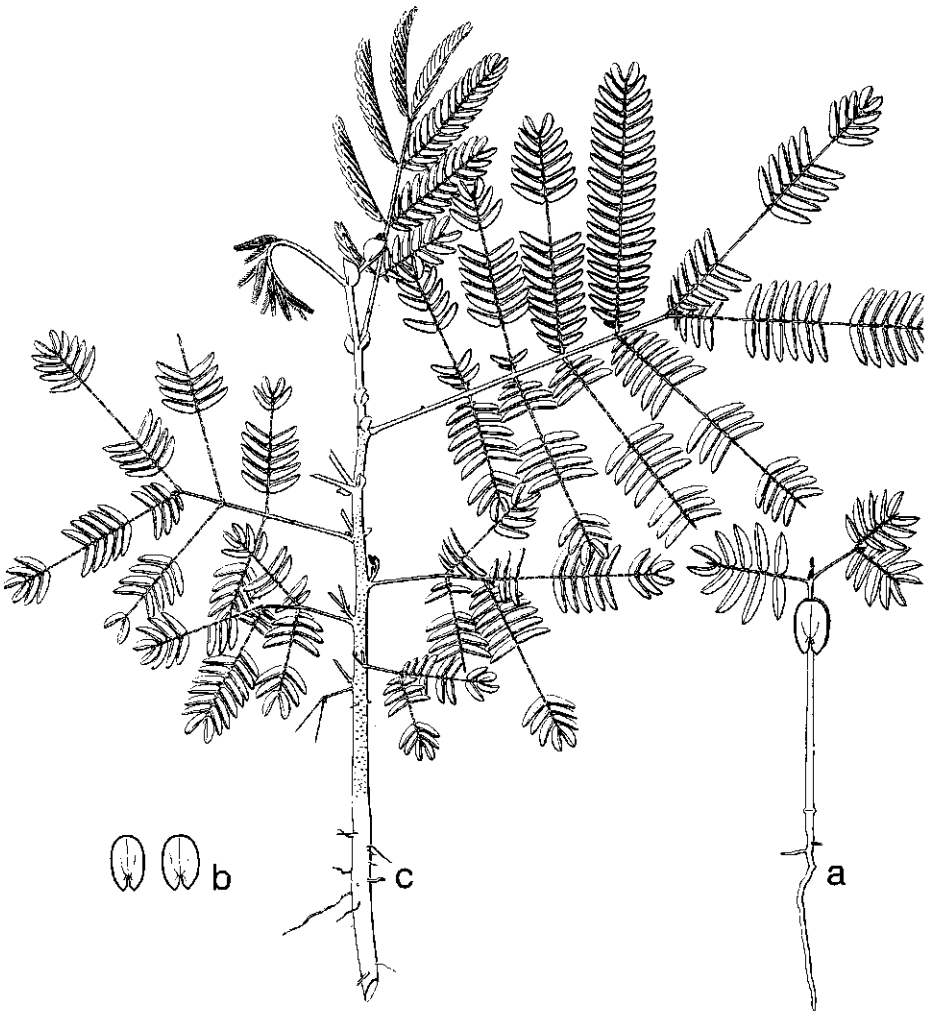


Fig. 66. *Albizia chinensis* a. young seedling, $1/1 \times$; b. cotyledons, $1/1 \times$; c. older seedling, $1/2 \times$.

***Albizia falcataria* (L.) FOSBERG** (*A. moluccana* MIQ., *A. falcata* (L.) BACK.)

B. I: 553; III: 650; TROUP II: 484

Mal.: kaju salwaku putih. *Sund.*: djeundjing, djeundjing laut. *Jav.*: sengan laut, sengan sabrang. *Amb.*: seia. *Banda*: sikat. *Tern.*: rare

Fig. 67a and b

Size at 1st stage (1st 2 leaves only) 3–13 cm, 2–4 cm above collet; at 2nd stage (± 12 leaves) ± 20 cm above collet. *Roots* pure white turning off white, sometimes tubercled; primary root at 1st stage very flexuous, not or slightly thicker than lateral ones; collet abruptly thickened into disk-shape; lateral roots at 1st stage very numerous, very flexuous, moderately or unbranched. *Hypocotyl* epigeous, erect, straight, 13–27 mm; at 1st stage 1 mm thick, tapering upwards, abruptly thickened into disk-shape at base, 4-angular near top, terete near base, green, white at base, near top sparse simple patent very short colourless hairs. *Cotyledons* epigeous, 2, stipulate, equal, sessile; stipules connate, subulate, small, green; blade elliptic or ovate, with

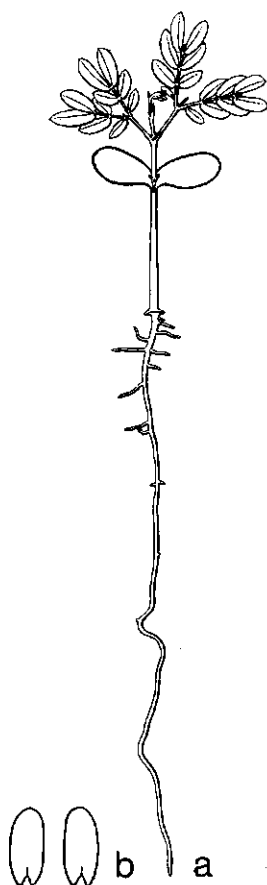


Fig. 67a. *Albizia falcataria* a. young seedling, 1/1 \times ; b. cotyledons. 1/1 \times .

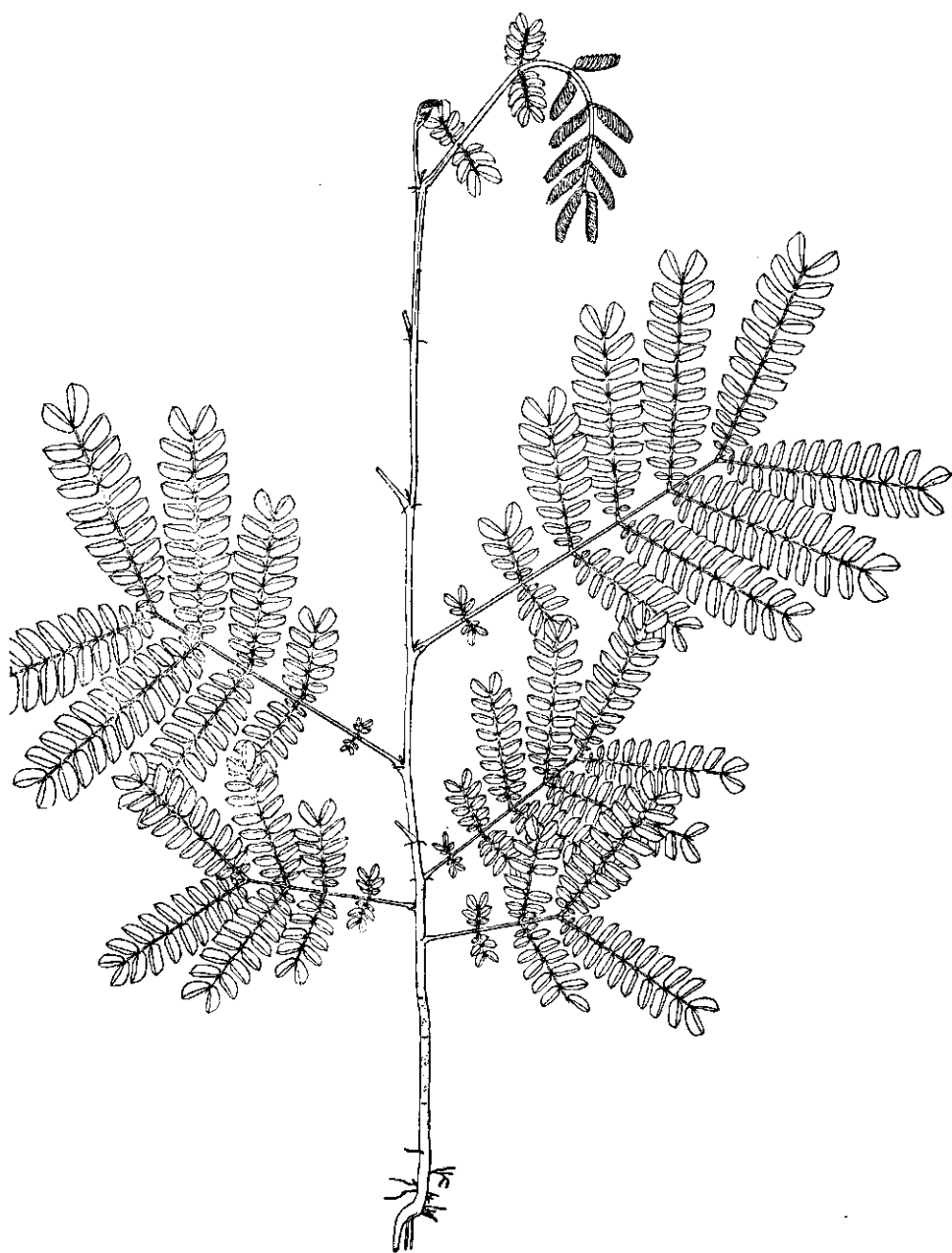


Fig. 67b. *Albizia falcataria* older seedling, $1/2 \times$.

index $1\frac{1}{2}$ –2, 5–10 by 3–5 mm, fleshy turning coriaceous, having a rounded obtuse top and an arrow-shaped base, indistinctly nerved, entire, dull green, glabrous. *Epicotyl* 2–5 mm. *Stem* erect; at 2nd stage spiral owing to obtusangular connection of internodes, 4-angular near top, terete near base, brown, having transversally-elliptic whitish yellow lenticels, hairy near top. *Phyllotaxy* spiral but 1st 2 leaves opposite or subopposite. *Leaves* stipulate, biparipinnate; 1st \pm 6th leaves 1 pair of pinnae, next ones 2, 3 and more pairs, \pm 12th leaf 6 pairs of pinnae; stipules small, green. *1st Leaf* common rachis 3–5 mm, thickened at base, mucronate, with simple colourless hairs; pinnae opposite, 3 pairs of leaflets; secondary rachis 4–7 mm; leaflets opposite, in 1st posterior pair of leaflets subulate or very small, in topmost pair largest; very shortly petiolulate; blades asymmetrically elliptic or -oblong, with index $1\frac{1}{2}$ –3, 2–5 by 1 – $2\frac{1}{2}$ mm, having an abruptly acuminate top and an asymmetrical base at anterior side acute at posterior side broader and rounded, palmately 2–4-nerved and 1st or 2nd nerve at anterior side thickest, entire, dull green above, dull greyish green beneath, glabrous. *Leaves with \pm 6 pairs of pinnae* common rachis thickened at base, tapering upwards, mucronate, possessing a gland on upper side just beneath lowest pair of pinnae and just beneath 2 or 3 topmost pairs, green, hairy like 1st leaf; pinnae opposite, \pm 4–15 pairs of leaflets most numerous in topmost pairs, gland on secondary rachis on upper side just beneath each of highest 2 pairs of leaflets; leaflets opposite, sessile or very shortly petiolulate; blades oblong, in topmost pair obovate, with index \pm $2\frac{1}{2}$, \pm 12 by 5 mm, in middle leaflets largest, with simple colourless hairs; other characters like those of 1st leaf. *Top of plant* with dense appressed yellow or white hairs.

Seeds from 5 motherplants from different localities.

***Albizia lebbeck* (L.) BTH.**

B. I: 554; K. et V. I: 297; TROUP II: 466, fig. 178

Sund.: ki toke, tarisi. *Jav.*: tekik

Fig. 68

Size at 1st stage (2 leaves only) up to \pm 18 cm, up to $6\frac{1}{2}$ cm above collet; at 2nd stage (\pm 10 leaves) \pm 25 cm above collet. *Roots* white turning yellowish white, later tubercled; collet (1st stage) abruptly thickened into disk-shape; lateral roots at 1st stage few, unbranched. *Hypocotyl* epigeous, erect, straight, \pm 3– $5\frac{1}{2}$ cm; at 1st stage $2\frac{1}{2}$ mm thick, having a base abruptly thickened into disk-shape, terete, smooth, light green but lighter green at base, near top sparse simple very short colourless hairs. *Cotyledons* epigeous, stipulate, 2, equal, sessile; stipules connate, hair-shaped, colourless; blade elliptic (lobes excluded), with index \pm 1 – $1\frac{1}{2}$, \pm 7–13 (lobes excluded) by 7 mm, fleshy, flat above, convex beneath, having a rounded obtuse top and an arrow-shaped base, indistinctly nerved, entire, glabrous. *Epicotyl* \pm 4 mm. *Stem* erect; at 2nd stage spiral owing to obtusangular connection of internodes, 4-angular near top, terete near

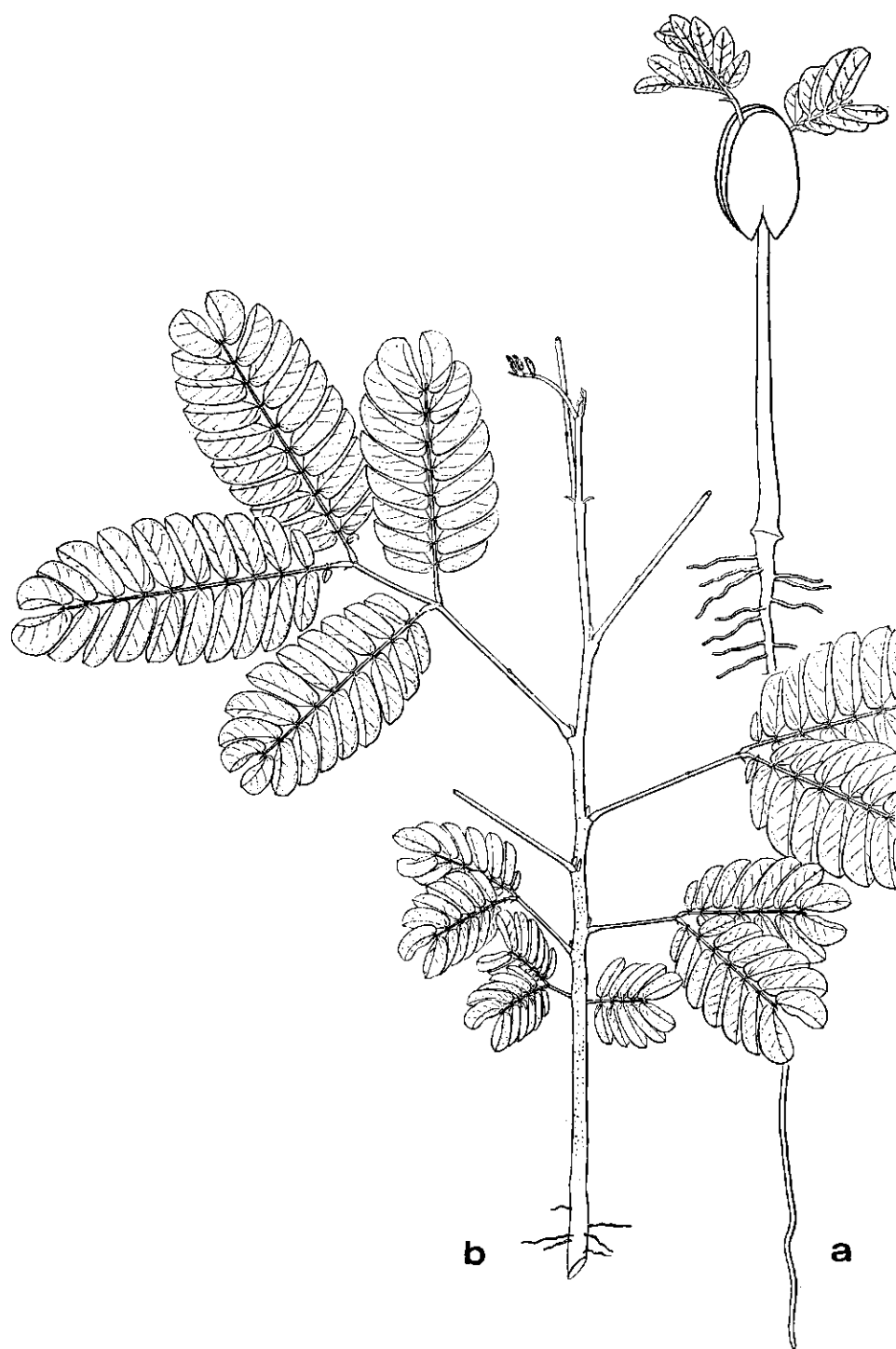


Fig. 68. *Albizia lebbeck* a. young seedling, 1/1 x ; b. older seedling, 1/1 x .

base, with sparse simple colourless hairs. *Phyllotaxy* spiral but 1st 2 leaves subopposite. *Leaves* stipulate; 1st leaf paripinnate, 2nd–7th leaf biparipinnate with 1 pair of pinnae; number of pairs increasing with succeeding leaves, as from 7th or 10th leaf 2 pairs; stipules lanceolate, having an acute top, green, hairy. *1st Leaf* 4–5 pairs of leaflets (TROUP: 5 or 6 pairs, in fig. 178: 5); stipules up to $1\frac{1}{2}$ mm long; rachis $\pm 2\frac{1}{2}$ cm, thickened at base, mucronate, green, with sparse colourless or ferrugineous hairs like those on stem; leaflets opposite, shortly petiolulate; blades asymmetrically-oblong or -lanceolate, in topmost pair of leaflets asymmetrically-obovate-oblong, with index ± 3 , ± 12 by 4 mm, thin, having an abruptly acuminate top and a base at anterior side acute at posterior side broader and rounded, palmately nerved and thickest nerve at anterior side, dull green above, light dull greyish green beneath, glabrous or hairy. *Leaves with 2 pairs of pinnae* stipules up to 4 mm long; common rachis up to ± 5 cm, 1 mm thick, thickened at base, mucronate, with a gland on upper side between base and 1st pair of pinnae and one at the insertion of each pair, green, hairy like stem; pinnae opposite, ± 7 –14 pairs of leaflets; secondary rachis ± 5 cm, possessing a gland above at insertion of 2–3 topmost pairs of leaflets; leaflets opposite, shortly petiolulate, in 1st pair subulate; blades with index $\pm 2\frac{1}{2}$, up to ± 12 by 5 mm, palmately ± 4 -nerved, with simple hairs or glabrous, other characters like those of 1st leaf. *Top of plant* densely hairy.

Seeds from 1 motherplant.

Albizia lebbekoides (DC.) BTH.

B. I: 553; K. et V. I: 306

Sund.: tarisi. *Jav.*: kedinding, tekik. *Mad.*: reng

Fig. 69

Size at 1st stage (2 leaves only) 5–17 cm, 2– $6\frac{1}{2}$ cm above collet; at 2nd stage (± 12 leaves) up to ± 45 cm above collet. *Roots* pure white turning yellowish white; primary root at 1st stage slightly to moderately flexuous, moderately to much thicker than lateral ones; collet abruptly thickened into disk-shape; lateral roots at 1st stage absent or few, slightly to moderately flexuous, unbranched. *Hypocotyl* epigeous, erect, straight, 2–6 cm; at 1st stage 1 mm thick, tapering upwards, with a base abruptly thickened into disk-shape, terete, finely ridged, green, white at base, with simple colourless hairs. *Cotyledons* epigeous, stipulate, 2, equal, sessile; stipules wart-shaped; blade elliptic or orbicular (lobes excluded), elliptic or obovate (lobes included), with index $1-1\frac{1}{2}$, 4–7 by $4-5\frac{1}{2}$ mm (lobes excluded), having a rounded obtuse top and an arrow-shaped base, fleshy turning coriaceous, turning distinctly and palmately 5-nerved, entire, dull green, glabrous. *Epicotyl* very short. *Stem* erect; at 2nd stage spiral owing to obtusangular connection of internodes, 4-angular near top, terete near base, green near top, grey near base, near top simple colourless hairs. *Phyllotaxy* spiral but 1st 2 leaves subopposite. *Leaves* stipulate; 1st leaf paripinnate; next ones biparipinnate, 1 pair of pinnae, ± 10 th leaf 2 pairs, ± 11 th 3 pairs; stipules narrowly

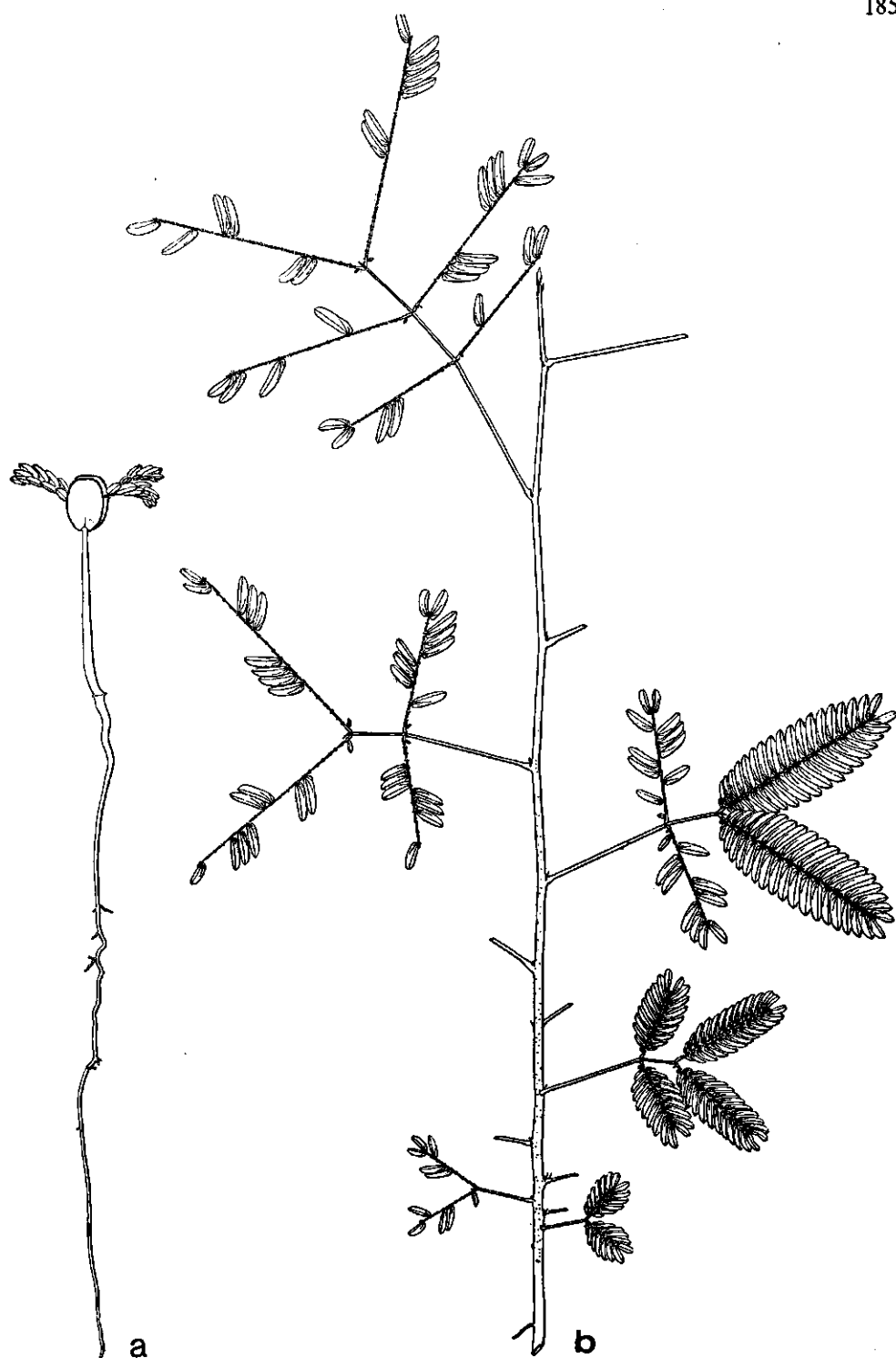


Fig. 69. *Albizia lebbekoides* a. young seedling, $1/1 \times$; b. older seedling, $1/2 \times$.

triangular up to 3 mm long. *1st Leaf* 5–6 pairs of leaflets; rachis 1–2 cm, thickened at base, mucronate, green, hairy like stem; leaflets opposite, very shortly petiolulate; blades asymmetrically-oblong-lanceolate, in topmost pair of leaflets asymmetrically-oblong to -obovate-lanceolate, with index $2\frac{1}{2}$ –4, 5–8 by $1\frac{1}{2}$ –3 mm, in middle pair largest, thin, having an acute top and a base at anterior side acute at posterior side rounded and broader, palmately 2–4-nerved and thickest nerve at anterior side, entire, dull green above, dull light greyish green beneath, glabrous. *2nd Leaf* blades smaller. *Leaves with 2 pairs of pinnae* common rachis \pm 5–7 cm, thickened at base, mucronate, green, possessing a sometimes stipitate orbicular green gland on upper side at insertion of each pair of pinnae, with simple ferrugineous or colourless hairs; pinnae opposite, \pm 14–30 pairs of leaflets; secondary rachis \pm 6–8 cm, thickened at base, mucronate, hairy like common rachis; leaflets opposite, shortly petiolulate; lowest blades subulate or very small; other characters of blades like those of 1st leaf but up to 16 by 4 mm, sometimes ciliate. *Top of plant* with light ferrugineous or brownish hairs.

Seeds from 4 motherplants from different localities.

***Albizia lophantha* (WILLD.) BTH. (*A. distichya* MC. BRIDE; *A. montana* BTH.)**

B. I: 552; K. et V. I: 292

Sund.: haruman. *Jav.*: kemlandingan, kemlandingan gunung, pubungan

Size at 1st stage (2 leaves only) \pm 15 cm, 4 cm above collet. *Roots* white, stinking; primary root at 1st stage slightly flexuous, much thicker than lateral ones; collet sometimes abruptly and slightly or more distinctly asymmetrically thickened into disk-shape; lateral roots at 1st stage few, moderately flexuous, unbranched. *Hypocotyl* epigeous, erect, straight, sometimes curved at base, $1\frac{3}{4}$ –8 cm; at 1st stage 2 mm thick, tapering upwards, having a base which is gradually but downwards abruptly and sometimes slightly or more distinctly asymmetrically thickened into disk-shape, terete, smooth, green, red or white near base, glabrous. *Cotyledons* epigeous, 2, stipulate, sessile; stipules hair- or clustered-hair-shaped; blade elliptic-oblong, with index 2, \pm 8 (lobes excluded) by $4\frac{1}{2}$ mm, fleshy turning coriaceous, having a rounded obtuse top and an arrow-shaped base, indistinctly nerved, slightly glossy green above, purple beneath, glabrous. *Epicotyl* 1–2 mm. *Stem* erect; at 2nd stage spiral owing to obtusangular connection of internodes, 2nd internode longer than epicotyl. *Phyllotaxy* spiral. *Leaves* stipulate, 1st leaf paripinnate; 2nd one biparipinnate, 1 pair of pinnae. *1st Leaf* 10–13 pairs of leaflets; stipules triangular, \pm 2 mm long, green; rachis \pm $2\frac{1}{2}$ – $4\frac{1}{2}$ cm, mucronate, possessing a gland on upper side just beneath 1st pair of leaflets, red or green, with sparse simple colourless hairs; leaflets opposite, very shortly petiolulate; blades asymmetrically-lanceolate, in topmost pair of leaflets smallest and falcate, in middle leaflets largest, with index 4, \pm 5–8 by $1\frac{1}{2}$ –2 mm, thin, having an abruptly acuminate top and a base acute at anterior side but at posterior side rounded and broader; palmately 3-nerved and thickest nerve at anterior side, entire, glabrous. *2nd Leaf* blades slightly smaller; lowest blades at anterior side

subulate. *Top of plant* hairy, green.

Seeds from 1 motherplant.

N.B. The seedlings in Bogor (Java) died before reaching the 2nd stage, so this stage could not be described here.

***Albizia procera* (ROXB.) BTH.**

B. I: 554; K. et V. I: 299; TROUP II: 476, fig. 182

Sund.: ki hijang. *Jav.*: wangkal, weru. *Mad.*: bankal, beru

Fig. 70

Size at 1st stage (2 leaves only) $6\frac{1}{2}$ –25 cm, 4–10 cm above collet; at 2nd stage (12–17 leaves) 28–50 cm above collet. *Roots* white turning yellowish white, later tubercled; primary root at 1st stage slightly to moderately flexuous, much thicker than lateral ones; collet sometimes abruptly thickened into disk-shape; lateral roots at 1st stage absent to moderate in number, moderately to very flexuous, sparsely branched. *Hypocotyl* epigeous, erect, straight, 2–7½ cm; at 1st stage 1–1½ mm thick, tapering upwards, sometimes abruptly thickened into disk-shape at base, smooth, turning finely ridged, green (TROUP: green or pinkish), white at base, glabrous or with sparse simple colourless hairs near top. *Cotyledons* epigeous, 2, equal, shortly petiolate (TROUP: sessile or sub-sessile); blade orbicular or obovate (lobes excluded) (TROUP: elliptical), with index 1–1½ (lobes excluded), 5–7 (lobes excluded) by 4–6 mm, fleshy, having a rounded obtuse top and an arrow-shaped base, palmately nerved, entire, dark dull green above, light dull green beneath, glabrous. *Epicotyl* 3–18 mm. *Stem* erect; at 1st stage straight, or spiral owing to obtusangular connection of internodes, glabrous or hairy like hypocotyl. *Phyllotaxy* spiral. *Leaves* stipulate; 1st leaf paripinnate, 2nd–9th or –13th biparipinnate, 1 pair of pinnae 1st order; 8th–10th or 17th one 2 pairs; stipules linear, small. *1st Leaf* 3–4 pairs of leaflets; rachis 1–2 cm, thickened at base, mucronate, sometimes possessing a gland above near 1st pair of leaflets, hairy like stem; leaflets opposite, very shortly petiolulate; blades asymmetrically-oblong (TROUP: obliquely ovate or obovate oblong), in topmost pair of leaflets asymmetrically obovate, with index 2–3, thin, 9–15 by 4–7 mm, in middle pair largest, having an abruptly acuminate top (TROUP: acute or obtuse) and a base at anterior side acute but at posterior side rounded and broader, palmately 2–3-nerved and thickest nerve at anterior side, entire, dull green above, dull light greyish green beneath, glabrous. *2nd Leaf* smaller blades. *Leaves with 2 pairs of pinnae* common rachis 6–14 cm, 1 mm thick, tapering upwards, thickened at base, mucronate, having a gland above between base and 1st pair of pinnae and near insertion of 2nd pair, green, glabrous or hairy like hypocotyl; pinnae opposite, 2nd pair largest, 6–11 pairs of leaflets; secondary rachis 3½–13 cm; leaflets opposite (TROUP: opposite or subopposite), shortly petiolulate, 1st pair subulate or very small, middle ones largest; blades like those in 1st leaf but elliptic or oblong, with index 1½–3, 16–37 by 8–17 mm,

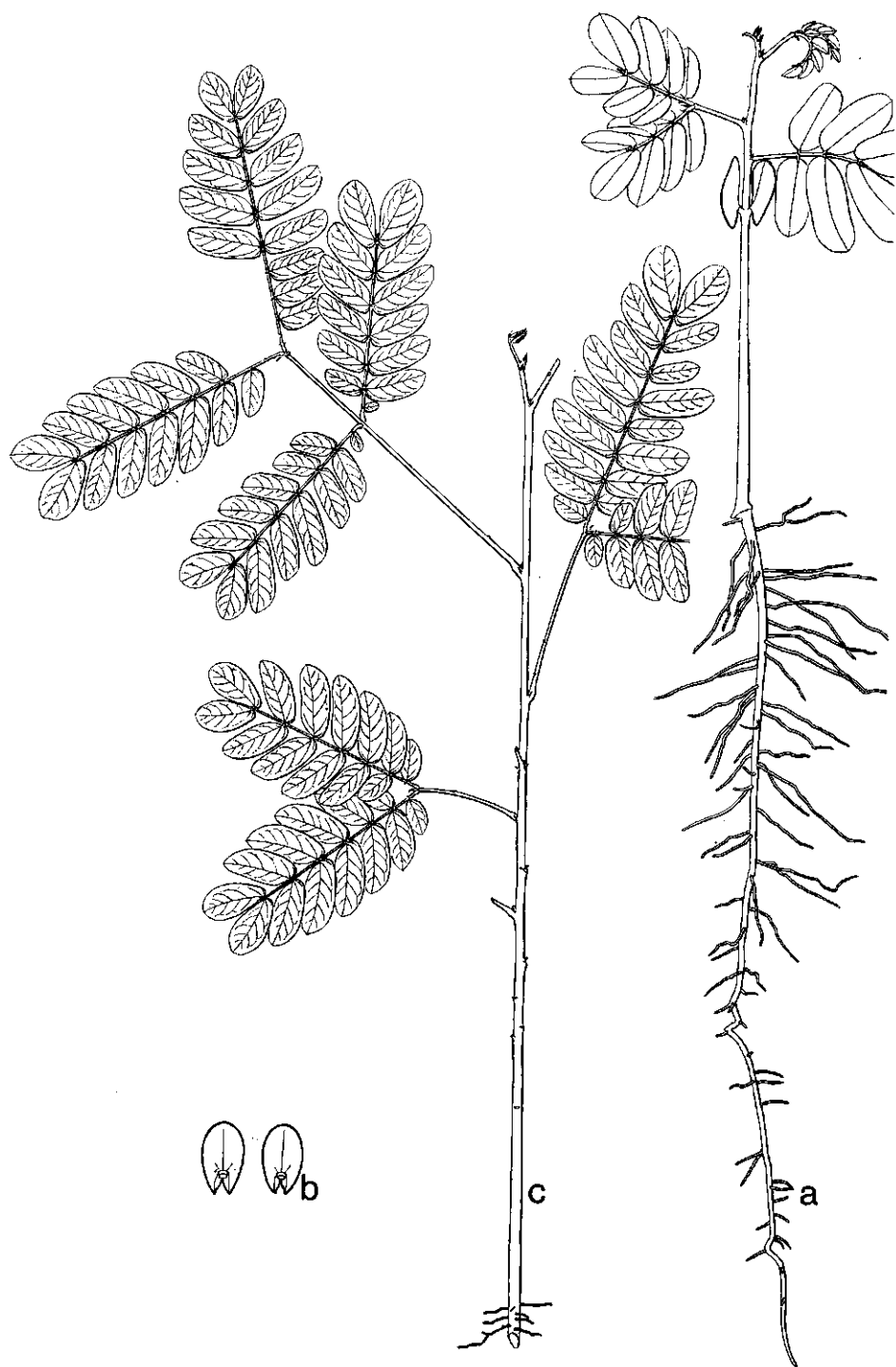


Fig. 70. *Albizia procera* a. young seedling, $1/1 \times$; b. cotyledons, $1/1 \times$; c. older seedling, $1/2 \times$.

palately 3–4-nerved, in lowest blades middle nerve thickest but in higher ones 2nd nerve from anterior side thickest (midrib prominent beneath), glabrous or with sparse simple appressed colourless hairs above. *Top of plant* with appressed white hairs, green.

Seeds from 5 motherplants from different localities.

DICHROSTACHYS W. et A.

B. I: 549, 562; K. et V. I: 283; LUBB. I: 470; TROUP II: 484

Dichrostachys cinerea (L.) W. et A.

B. I: 562; K. et V. I: 283; LUBB. I: 470; TROUP II: 484

Sund.: peucung. *Jav.*: pung. *Mad.*: pereng

Fig. 71

Size at 1st stage (1 leaf only) $8\frac{1}{2}$ –20 cm, 2–6 cm above collet; at 2nd stage (9–14 leaves) 24–38 cm above collet. Malodorous. *Roots* white or off white, tubercled; primary root at 1st stage moderately to very flexuous, slightly thicker than lateral ones; collet sometimes abruptly thickened into disk-shape; lateral roots at 1st stage few or moderate in number, very flexuous, unbranched. *Hypocotyl* epigeous, erect, straight, 17–40 mm; at 1st stage $1\frac{1}{4}$ mm thick turning thinner by shrinking, tapering upwards, sometimes abruptly thickened into disk-shape at base, slightly laterally compressed, having 2 fine ridges between cotyledons, pale green, white at base turning brown, near top simple patent colourless hairs. *Cotyledons* epigeous, stipulate, 2, equal, very shortly petiolate; stipules hair-shaped; blade orbicular (lobes excluded), rarely elliptic or ovate or obovate (LUBB: oblong-ovate), 6–10 by $5\frac{1}{2}$ –10 mm, coriaceous, having a rounded obtuse top and a truncate obtusangularly lobed base, palately 3–5-nerved, entire, dull dark green above, dull light green beneath, glabrous. *Epicotyl* $\frac{1}{2}$ –6 mm. *Stem* erect; at 2nd stage spiral owing to obtusangular connection of internodes, sometimes feather-shaped with a sideward bend, 4-angular near top, terete near base, smooth, green, brown near base; small yellow lenticels; usually ramillary axillary spines $\pm\frac{1}{2}$ cm long; near top simple colourless hairs. *Phyllotaxy* spiral, sometimes distichous-alternate. *Leaves* stipulate; 1st leaf paripinnate; next ones biparipinnate; number of pairs of pinnae increasing with succeeding leaves, 2nd–3rd or 7th still 1 pair, 8th or 11th–10th or 14th leaf 3 pairs; stipules narrow, up to 3 mm long. *1st Leaf* 7–10 pairs of leaflets; rachis $1\frac{1}{2}$ – $2\frac{1}{2}$ cm, thickened at base, mucronate, hairy like stem; leaflets opposite, very shortly petiolulate, middle ones largest; blades asymmetrical, oblong or lanceolate, with index 2– $4\frac{1}{2}$, 1– $6\frac{1}{2}$ by $\frac{1}{2}$ –2 mm, thin, having an acute top and an asymmetrical at anterior side usually acute but at posterior side rounded and broader base, palately 3–4-nerved and nerve at anterior side thickest, entire, dull green on both surfaces, ciliate, with simple colourless hairs. *Leaves* with 3 pairs of pinnae common rachis $1\frac{1}{2}$ –5 cm, thickened at base, mucronate,

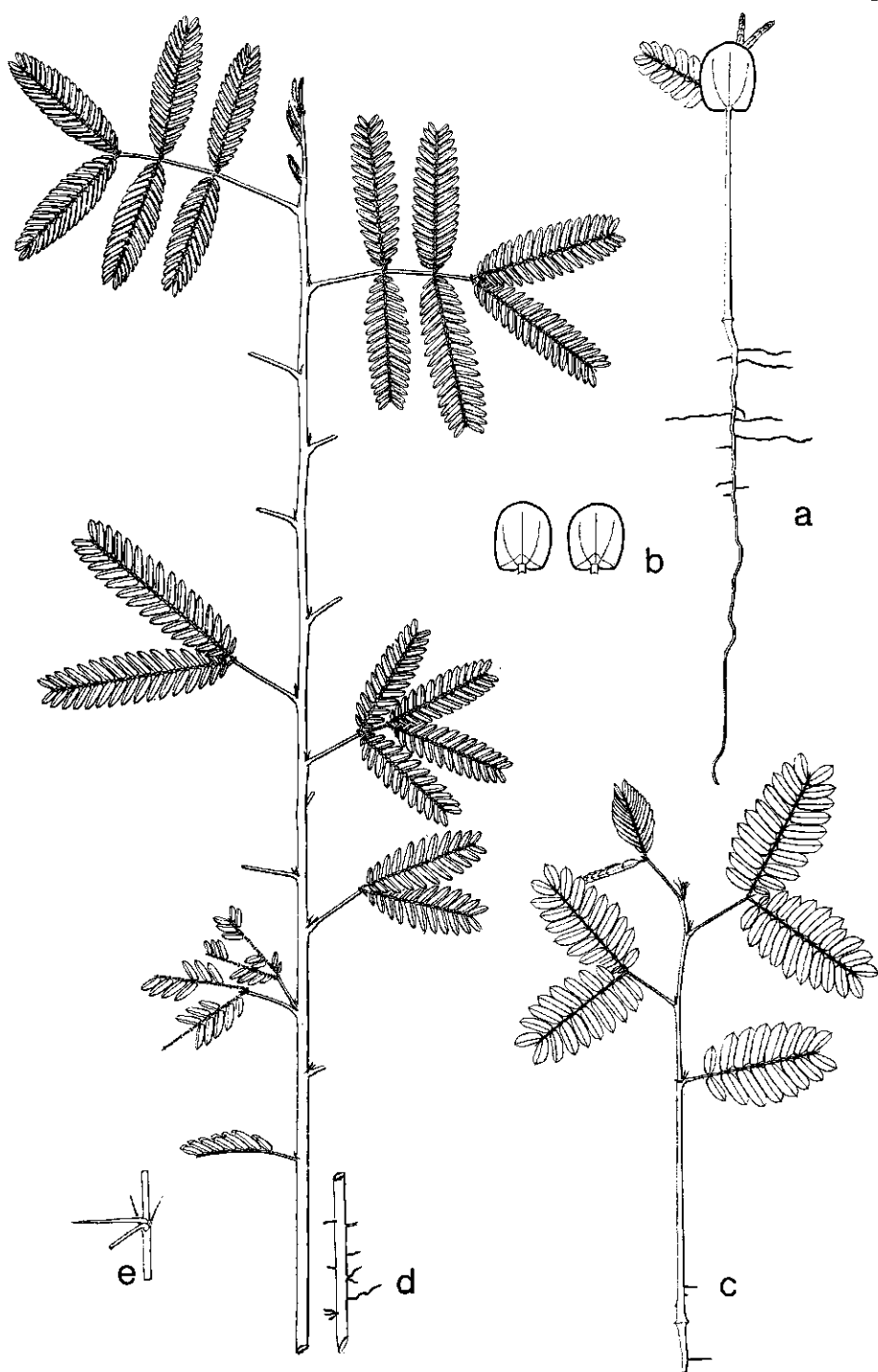


Fig. 71. *Dichrostachys cinerea* a. young seedling, $1/1 \times$; b. cotyledons, $1/1 \times$; c. seedling with developed 1st leaf, $1/1 \times$; d. older seedling, $1/2 \times$; e. spine, $2/1 \times$.

having a stipitate gland above near each pair of pinnae, reddish brown or green; hairy like stem; pinnae opposite; secondary rachis $1\frac{1}{2}$ –4 cm; leaflets opposite, very shortly petiolulate, blades like those in 1st leaf but: asymmetrical, lanceolate, with index 3–5, 4–8 by $1-1\frac{1}{2}$ mm, pinninerved but palmately nerved at base, sometimes ciliate. *Top of plant* hairy, green.

Seeds from 3 motherplants from different localities.

LEUCAENA BTH.

B. I: 549, 560; LUBB. I: 470; TROUP II: 486

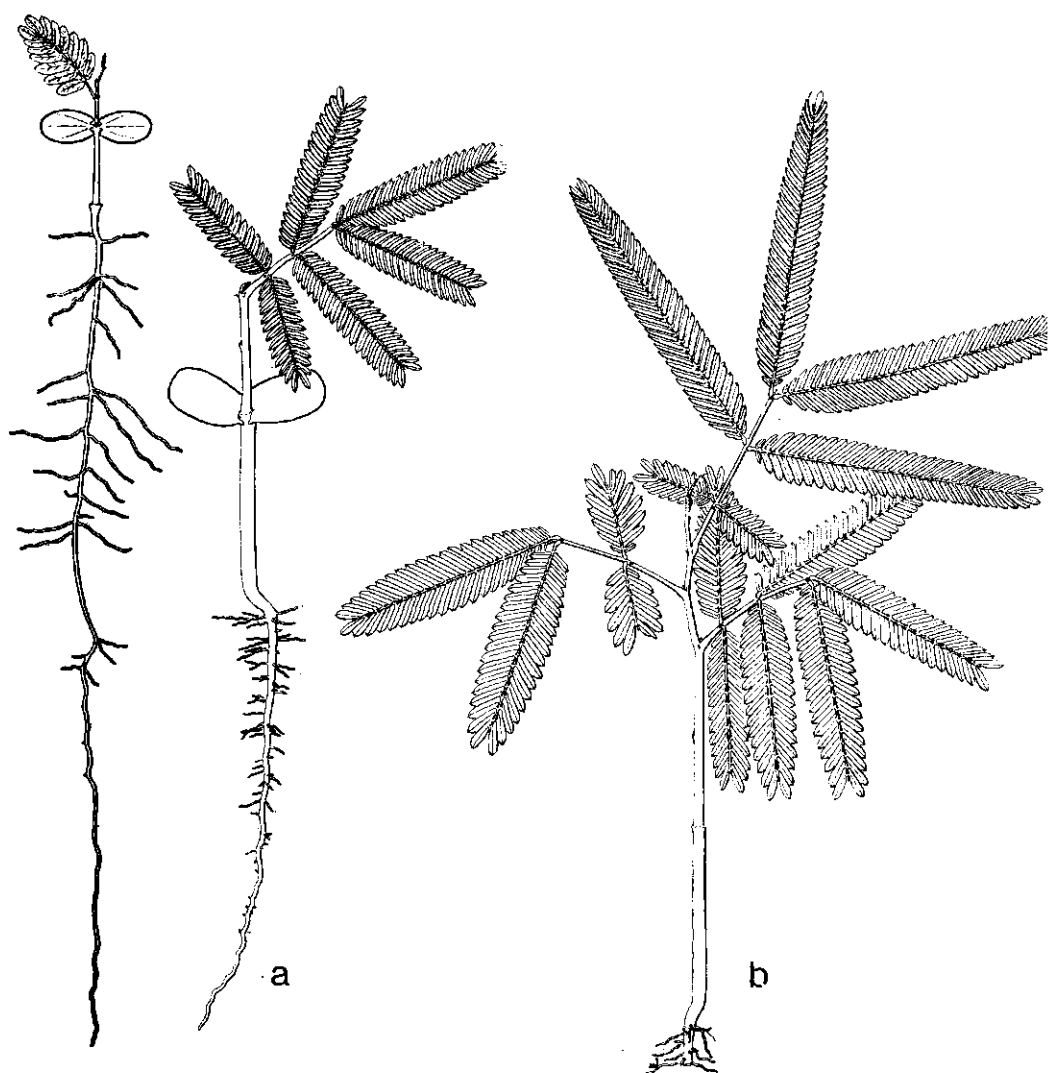
Leucaena leucocephala (LMK.) DE WIT (*L. glauca* Auct. non BTH.)

B. I: 560; LUBB. I: 470, fig. 307; TROUP II: 486

Mol.: pete tjina. *Sund.*: kemlandingan. *Jav.*: kemlandingan, lamtara. *Mad.*: kalan-dingan

Fig. 72

Size at 1st stage (1 leaf only) 18–25 cm, $2\frac{1}{2}$ –12 cm above collet; at 2nd stage (8–24 leaves) 15–50 cm above collet. *Roots* white or off white turning yellowish white, tubercled; primary root at 1st stage moderately flexuous, moderately thicker than lateral ones; collet sometimes abruptly thickened into disk-shape; lateral roots at 1st stage moderate in number, moderately flexuous, unbranched. *Hypocotyl* epigeous, erect, straight, $1-8\frac{1}{2}$ cm; at 1st stage $1\frac{1}{2}$ mm thick, sometimes abruptly thickened into disk-shape at base, sometimes thickened into disk-shape at $\frac{1}{2}$ length near surface of the earth, possessing 2 low ridges, tapering upwards, pale green, white at base, near top simple patent very short colourless hairs. *Cotyledons* epigeous, stipulate, 2, equal, petiolate; stipules small, hair-shaped, red at top; petiole 1–2 mm, broadened, green, hairy; blade elliptic or obovate, with index $1\frac{1}{10}$ – $1\frac{1}{2}$, 9–14 by 6–11 mm, thick-coriaceous, having a rounded obtuse sometimes emarginate top and a cordate or exculptate acutely lobed base, palmately 3–5-nerved, entire, dull dark green above, dull light green beneath, glabrous. *Epicotyl* $\frac{1}{2}$ – $1\frac{1}{2}$ cm. *Stem* erect; at 1st stage spiral owing to obtusangular connection of internodes, 4-angular near top, terete near base, numerous transversally elliptic brown lenticels in lower part, green; near top sparse simple colourless hairs. *Phyllotaxy* spiral. *Leaves* stipulate; 1st leaf paripinnate, next ones biparipinnate; \pm 17th–22th leaf 3 pairs of pinnae; stipules narrowly triangular, up to 3 mm long. *1st Leaf* 6–9 pairs of leaflets; rachis $2\frac{1}{2}$ –4 cm, thickened at base, mucronate, red or green, sparsely hairy like stem; leaflets opposite, shortly petiolulate; blades asymmetrically-oblong, with index 2–3, 5–13 by $1\frac{1}{2}$ – $4\frac{1}{2}$ mm, in middle leaflets largest, thin, having an abruptly acuminate top and an asymmetrical at anterior side acute but at posterior side broader and rounded or acute base, palmately 2–3-nerved and thickest nerve at anterior side, entire, dull green above, dull light green beneath, glabrous or sparsely hairy like stem. *2nd Leaf* smaller blades.



Left: Fig. 72. *Leucaena leucocephala* young seedling, $1/2\times$.

Right: Fig. 73. *Parkia roxburghii* a. young seedling, $1/2\times$; b. older seedling, $1/2\times$.

Leaves with 3 pairs of pinnae common rachis 6–8 cm, $\frac{1}{2}$ –1 mm thick, thickened at base, tapering upwards, mucronate, green, sometimes having a sessile or stipulate gland near 1st pair of pinnae, hairy like stem; pinnae opposite; secondary rachis 3–7 $\frac{1}{2}$ cm; leaflets opposite, shortly petiolulate; blades with index 2–4, palmately 3-nerved and thickest nerve at anterior side, dull dark green above, dull greyish green beneath, ciliate, other characters like those of 1st leaf. *Top of plant* hairy, green.

Seeds from 5 motherplants from different localities.

PARKIA R. BR.

B. I: 548, 564; K. et V. I: 275

Parkia roxburghii G. DON. (*P. biglobosa* Auct. non BTH.)

B. I: 564; K. et V. I: 276

Mal.: alei, kedahung. *Sund.*: peundeuj. *Jav.*: kedawung

Fig. 73

Size at 1st stage (1 developed leaf only) 17–30 cm, 7–14 cm collet; at 2nd stage (4–5 leaves) 12–20 cm above collet. Malodorous. *Roots* white turning dirty yellow; tips white; primary root at 1st stage slightly flexuous, much thicker than lateral ones; collet gradually and moderately thickened; lateral roots at 1st stage moderate in number, slightly flexuous, unbranched. *Hypocotyl* epigeous, erect, straight, 3 $\frac{1}{2}$ –6 $\frac{1}{2}$ cm; at 1st stage 3 $\frac{1}{2}$ mm thick, slightly and laterally compressed, green, white at base, with simple colourless hairs. *Cotyledons* epigeous, sometimes having small connate hair-shaped stipules, 2, equal, their upper sides facing, later diverging, petiolate; petiole $\frac{1}{2}$ mm long, 1 $\frac{1}{2}$ mm broad; blade elliptic, with index 1 $\frac{1}{2}$, ± 17 by 11 mm, fleshy, having a rounded obtuse top and an arrow-shaped base, indistinctly nerved, entire, green, glabrous. *Epicotyl* 1 $\frac{1}{4}$ –1 $\frac{1}{2}$ cm. *Stem* erect; at 2nd stage lengthwise ridged near top, terete near base, green, with simple hairs. *Phyllotaxy* spiral. *Leaves* stipules small; 1st leaf usually scale-shaped, very rarely developed and in that case paripinnate, 7 pairs of leaflets; next leaves biparipinnate; 2nd leaf 3 pairs of pinnae, 3rd one 2 pairs, 4th leaf usually 4. *2nd Leaf* common rachis 3–4 cm, 1 mm thick, thickened at base, mucronate, green, with simple brown or yellowish white hairs, with a gland above between base and 1st pair of pinnae and one slightly below 3rd pinna or without glands, pinnae opposite; secondary rachis 4–8 cm; leaflets opposite, 13–21 pairs, sessile; blades oblong, with index 2–3, 4–10 by 2–4 mm, in lowest pairs smallest, thin, having an acute top and an asymmetrical base at anterior side acute but at posterior side rounded and broader and obtusely lobed but in higher leaves often acutely lobed, pinninerved, palmately 3–5-nerved at base and thickest nerve at anterior side, entire, faintly glossy dark green above, dull greyish green beneath, ciliate. *Higher leaves* larger. *Top of plant* white hairy turning brown.

Seeds from 2 motherplants from different localities.

PITHECELLOBIUM MART.

B. I: 548, 550; K. et V. I: 309; TROUP II: 485

***Pithecellobium jiringa* (JACK) PRAIN ex KING.** (*Pithecolobium lobatum* BTH., *Zygia jiringa* (JACK) KOSTERM.)

B. I: 552

Mal.: djenkol, djering. *Sund.*: djengkol. *Jav.*: djinkol

Fig. 74

Size at 1st stage (1 leaf only) ± 70 cm, 20 cm above collet; at 2nd stage (± 5 developed leaves) ± 40 cm above collet. Stinking. *Roots* yellowish white turning yellow; primary root at 1st stage with irregular white lengthwise ridges; collet at 1st stage gradually and slightly thickened; lateral roots at 1st stage few, moderately branched. *Hypocotyl* epi- of hypogeous, whether or not erect, whether or not straight, very short; at 1st stage 5 mm thick. *Cotyledons* semi-hypogeous, 2, diverging, equal, sessile, usually partly covered with testa; blade orbicular, $\varnothing 3\frac{1}{2}$ cm, in centre 1 cm thick, thick-fleshy, on both surfaces convex, having a flattened top and an arrow-shaped base, indistinctly nerved, entire, dull dark green above, dull dirty yellow beneath, glabrous. *Epicotyl* very short, 4 mm thick, with simple yellow hairs or glabrous. *Stem* erect; at 2nd stage straight, or spiral owing to obtusangular connection of internodes. *Phyllotaxy* spiral but 1st 2 leaves sometimes opposite. *Leaves* often with 2 axillary buds inserted one above the other; 1st-4th or 5th leaf scale-shaped; next ones biparipinnate; 1st developed leaf 1 pair of pinnae each with 1 pair of leaflets, number of leaflets increasing with succeeding leaves, ± 11 th leaf 3 pairs of leaflets. *1st Developed leaf* common rachis $\pm 2\frac{1}{2}$ -3 cm, 1 mm thick, thickened at base, mucronate, green or brown, having an orbicular light green gland on upper side at $\frac{1}{2}$ length or (and) near the pair of pinnae, with simple appressed yellow hairs; pinnae opposite, 1 pair of leaflets; sometimes irregular and more pairs of pinnae; secondary rachis sometimes having a gland near pair of leaflets; leaflets opposite, petiolulate; petiolule 4 mm, red or green, hairy like rachis; blades ovate or elliptic or oblong, very variable in size, sometimes 10 by 4 cm, having an acuminate obtuse top and a rounded sometimes acute base, pinninerved, prominently nerved beneath, entire, glossy green above, dull or faintly glossy green beneath, sparsely hairy on nerves beneath like rachis. *Higher leaves* larger. *Top of plant* yellow hairy, green or red.

Seeds from 2 motherplants from different localities.

SAMANEA MERR.

B. I: 548, 550; K. et V. I: 309; LUBB. I: 475; TROUP II: 485

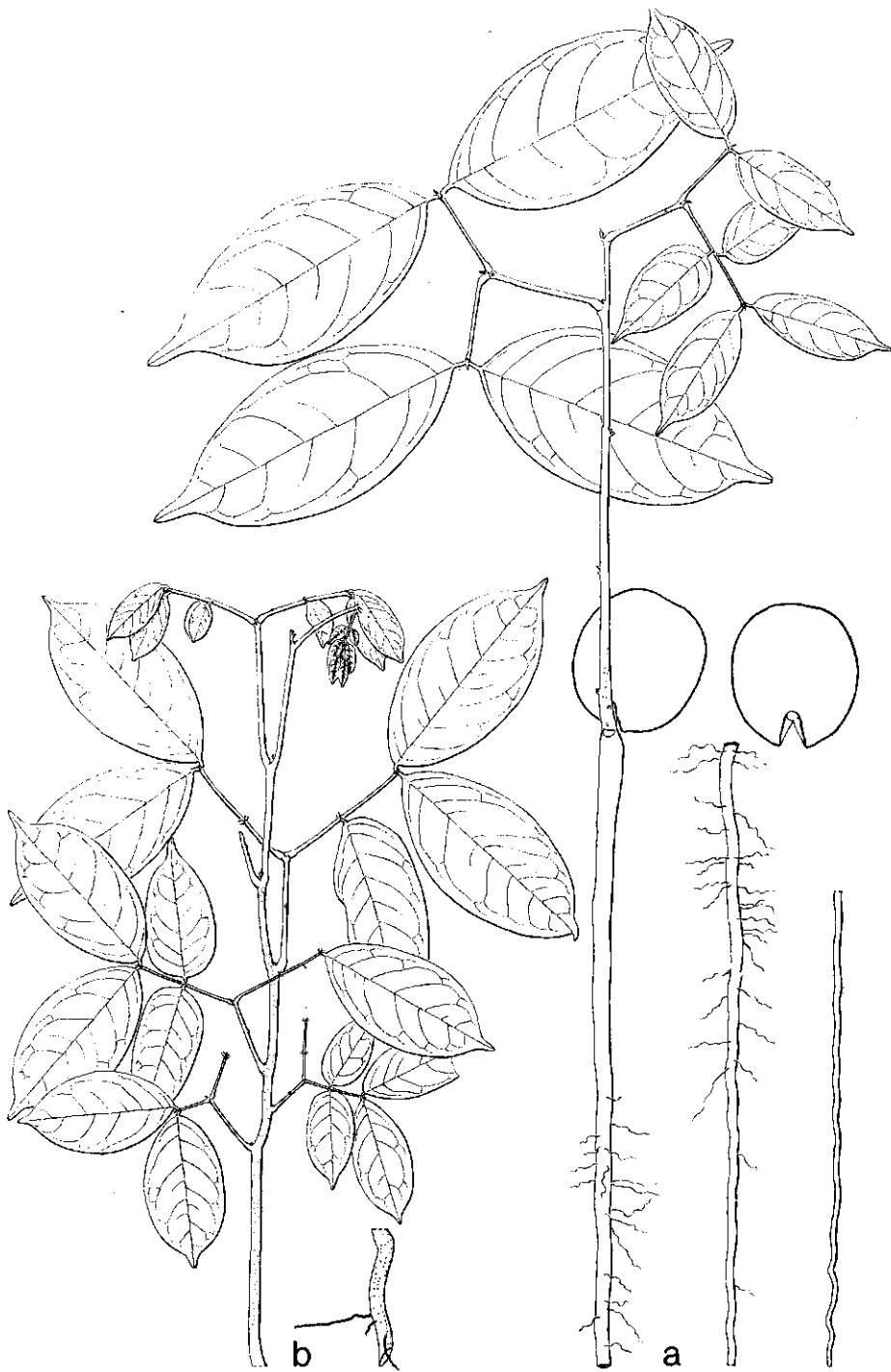


Fig. 74. *Pithecollobium jiranga* a. young seedling, $1/2\times$; b. older seedling, $1/4\times$.

***Samanea saman* (JACQ.) MERR. (*Pithecolobium saman* (JACQ.) BTH.)**

B. I: 550; LUBB. I: 475; TROUP II: 485

Dutch: regenboom. *Mal.*: kaju ambon. *Jav.*: kaju trembesi

Size at 1st stage (1 leaf only) 16–26 cm, $6\frac{1}{2}$ –10 cm above collet; at 2nd stage (13–17 leaves) 35–50 cm above collet. Stinking. *Roots* white turning whitish yellow; primary root at 1st stage slightly flexuous, much thicker than lateral ones; collet gradually and slightly thickened; lateral roots moderately numerous, slightly flexuous, unbranched. *Hypocotyl* epigeous, erect, straight, $5\frac{1}{2}$ –10 cm; at 1st stage $1\frac{1}{2}$ –2 mm thick, tapering upwards, terete, smooth, green, white at base, near top very short colourless hairs. *Cotyledons* epigeous, stipulate, 2, equal, their upper surfaces facing, later diverging, shortly petiolate; stipules subulate, 1 mm long; blade having parallel sides, almost elliptic (lobes included), 7–10 mm long (lobes excluded), $6\frac{1}{2}$ –9 mm broad, fleshy, usually having an emarginate top and an arrow-shaped base, indistinctly nerved, entire, dull green, glabrous. *Epicotyl* 2–3 mm. *Stem* erect; at 2nd stage straight, or spiral owing to obtusangular connection of internodes, 4-angular near top, terete near base, with simple hairs. *Phyllotaxy* spiral but 1st 2 leaves opposite or sub-opposite. *Leaves* stipulate; 1st leaf paripinnate (LUBB.: the primary rachis of the first leaf frequently ends in a small, lanceolate, acute leaflet, thus making the leaf imparipinnate), next leaves biparipinnate; up to \pm 13th or 17th leaf 1 pair of pinnae; as from 13th or 17th leaf 2 pairs of pinnae; stipules linear or narrow-triangular, up to 9 mm long, hairy. *1st Leaf 3 pairs of leaflets* rachis 2–3 cm, thickened at base, mucronate, possessing a gland on upper side near 1st pair of leaflets, green, hairy like stem; leaflets opposite, sessile or very shortly petiolulate, topmost ones largest; blades asymmetrical, ovate or oblong, in topmost leaflets obovate, with index 2–3, thin, 14–25 by 6–13 mm, having an abruptly acuminate acute top and an asymmetrical base at anterior side acute but at posterior side rounded and broader, pinninerved, prominently nerved beneath, entire, dull green above, dull greyish green beneath, on both surfaces or only beneath and on margin hairy like stem. *Leaves having 2 pairs of pinnae* common rachis 8–13 cm, thickened at base, mucronate, having an orbicular gland on upper side near each pair of pinnae, hairy like stem; pinnae opposite (LUBB.: stipellate at the base), 2–4 pairs of leaflets, on higher pinnae largest number of pairs; secondary rachis 1– $4\frac{1}{2}$ cm, possessing a gland on upper side near the 2 utmost pairs of leaflets; leaflets opposite, sessile or very shortly petiolulate; lowest pairs of leaflets undeveloped subulate; blades usually asymmetrical, elliptic or ovate or obovate, with index $1\frac{1}{2}$ –2, 1– $5\frac{1}{2}$ by $\frac{1}{2}$ –3 cm, in highest pair of pinnae and in utmost pair of leaflets largest, other characters like those of 1st leaf. *Top of plant* with dense woolly white hairs.

Seeds from 2 motherplants from different localities.

LEGUMINOSAE-PAPILIONACEAE

B. I: 565, III, 650; K. et V. II: 52; LUBB. I: 386; TROUP I: 252

Cotyledons epigeous sometimes hypogeous, whether or not stipulate, thin or coriaceous sometimes fleshy, blade base rounded but sometimes cordate; if hypogeous: upper surfaces in close contact, covered with testa together at side of stem; if epigeous: diverging. *Phyllotaxy* spiral or distichous-alternate but 1st 2 leaves opposite if cotyledons hypogeous or fleshy, in other cases spiral sometimes alternate. *Leaves* whether or not stipulate, whether or not stipellate. *1st Leaf* 1-3-foliolate or simple. *Higher leaves* (2nd stage) imparipinnate or palmately 3-foliolate.

1. A. cotyledons present 2
 - B. one developed leaf present (1st stage) 9
 - C. higher leaves present (2nd stage) 16
2. a. cot. hypogeous 3
 - b. cot. epigeous 5
3. a. cot. petiole 1-3 cm, blade $3\frac{1}{2}$ - $4\frac{1}{2}$ cm long *Butea monosperma*
 - b. cot. sessile or petiolate, if petiolate: petiole <3 mm 4
4. a. cot. sessile, 11-15 mm long *Erythrina subumbrans*
 - b. cot. petiolate, blade \pm 6 mm long *Clitoria laurifolia*
5. a. cot. blade base cordate semihastate 6
 - b. cot. blade base rounded or exculptate at one side. 7
6. a. cot. blade emarginate at one side *Dalbergia*
 - b. cot. blade not emarginate at one side *Pterocarpus indicus*
7. a. cot. stipulate, glabrous *Indigofera galeoides*
 - b. cot. exstipulate, hairy 8
8. a. cot. blade base rounded, not asymmetrical *Crotalaria zanzibarica*
 - b. cot. blade base asymmetrical *Tephrosia candida*
9. a. 1st leaf: blade 7- $13\frac{1}{2}$ cm long *Butea monosperma*
 - b. 1st leaf: blade <5 cm long 10
10. a. 1st leaf: leaflets stipellate *Erythrina subumbrans*
 - b. 1st leaf: leaflets exstipellate 11
11. a. 1st leaf blade top acuminate but not abruptly, acute *Pterocarpus indicus*
 - b. 1st leaf otherwise 12
12. a. 1st leaf blade ovate, 1st 2 leaves opposite *Clitoria laurifolia*
 - b. 1st leaf otherwise 13
13. a. 1st leaf exstipulate *Crotalaria zanzibarica*
 - b. 1st leaf stipulate 14
14. a. 1st leaf blade top notched or emarginate or abruptly acuminate *Dalbergia*
 - b. 1st leaf otherwise 15

- | | | | |
|--------|---|-------------------------------|----|
| 15. a. | 1st leaf blade elliptic | <i>Indigofera galegoides</i> | |
| b. | 1st leaf blade oblong or ovate or lanceolate | <i>Tephrosia candida</i> | |
| 16. a. | higher leaves leaflets alternate | | 17 |
| b. | higher leaves leaflets opposite | | 18 |
| 17. a. | higher leaves blade top acuminate | <i>Pterocarpus indicus</i> | |
| b. | higher leaves otherwise | <i>Dalbergia</i> | |
| 18. a. | higher leaves more than 1 pair of leaflets | | 19 |
| b. | higher leaves 1 pair of leaflets or palmately 3-foliolate | | 20 |
| 19. a. | higher leaves stipellate | <i>Indigofera galegoides</i> | |
| b. | higher leaves exstipellate | <i>Tephrosia candida</i> | |
| 20. a. | higher leaves stipellate | | 21 |
| b. | higher leaves exstipellate | | 22 |
| 21. a. | higher leaves stipels only in pair of leaflets; terminal leaflet exstipellate | <i>Erythrina subumbrans</i> | |
| b. | higher leaves pair of leaflets and terminal leaflet stipellate | <i>Clitoria laurifolia</i> | |
| 22. a. | higher leaves imparipinnate, with 1 pair of leaflets | <i>Butea monosperma</i> | |
| b. | higher leaves palmately 3-foliolate | <i>Crotalaria zanzibarica</i> | |

BUTEA ROXB.

B. I: 570, 628; K. et V. II: 71; TROUP I: 257

Butea monosperma (LMK.) TAUB. (*B. frondosa* ROXB.)

B. I: 629; K. et V. II: 72; TROUP I: 257, fig. 104

Mal.: palasa. *Sund.*: plasa. *Jav.*: plasa

Fig. 75

Size at 1st stage (2 leaves only) 38–75 cm, 10–17 cm above collet; at 2nd stage (3–4 leaves) 15–32 cm above collet. **Roots** off white; tips pure white; primary root at 1st stage slightly flexuous, much thicker than lateral ones; collet gradually much thickened; lateral roots at 1st stage moderate in number to very numerous, moderately flexuous, moderately branched. **Hypocotyl** hypogeous, very short. **Cotyledons** hypogeous, 2, asymmetrical, one another's mirror image, their upper surfaces in close contact, together at side of stem, usually covered with testa, petiolate; petiole broadened, slightly channelled above near base, 1–3 cm by 3 mm, yellow, whether or not having sparse simple patent colourless hairs; blade asymmetrically elliptic or obovate (TROUP: reniform) with index $1\frac{1}{2}$ – $1\frac{3}{4}$, $3\frac{1}{2}$ – $4\frac{1}{2}$ by 2–3 cm, 2 mm thick, fleshy, flattened on both surfaces, smooth above, irregularly wrinkled beneath, having a rounded obtuse top and a base at one side narrowed into petiole at the other side semicordate, indistinctly nerved, entire but at one side very exculptate, glabrous. **Epicotyl** erect, straight, 8½–25 cm, 3–6 mm thick, tapering upwards, terete, smooth, green, white at base, with

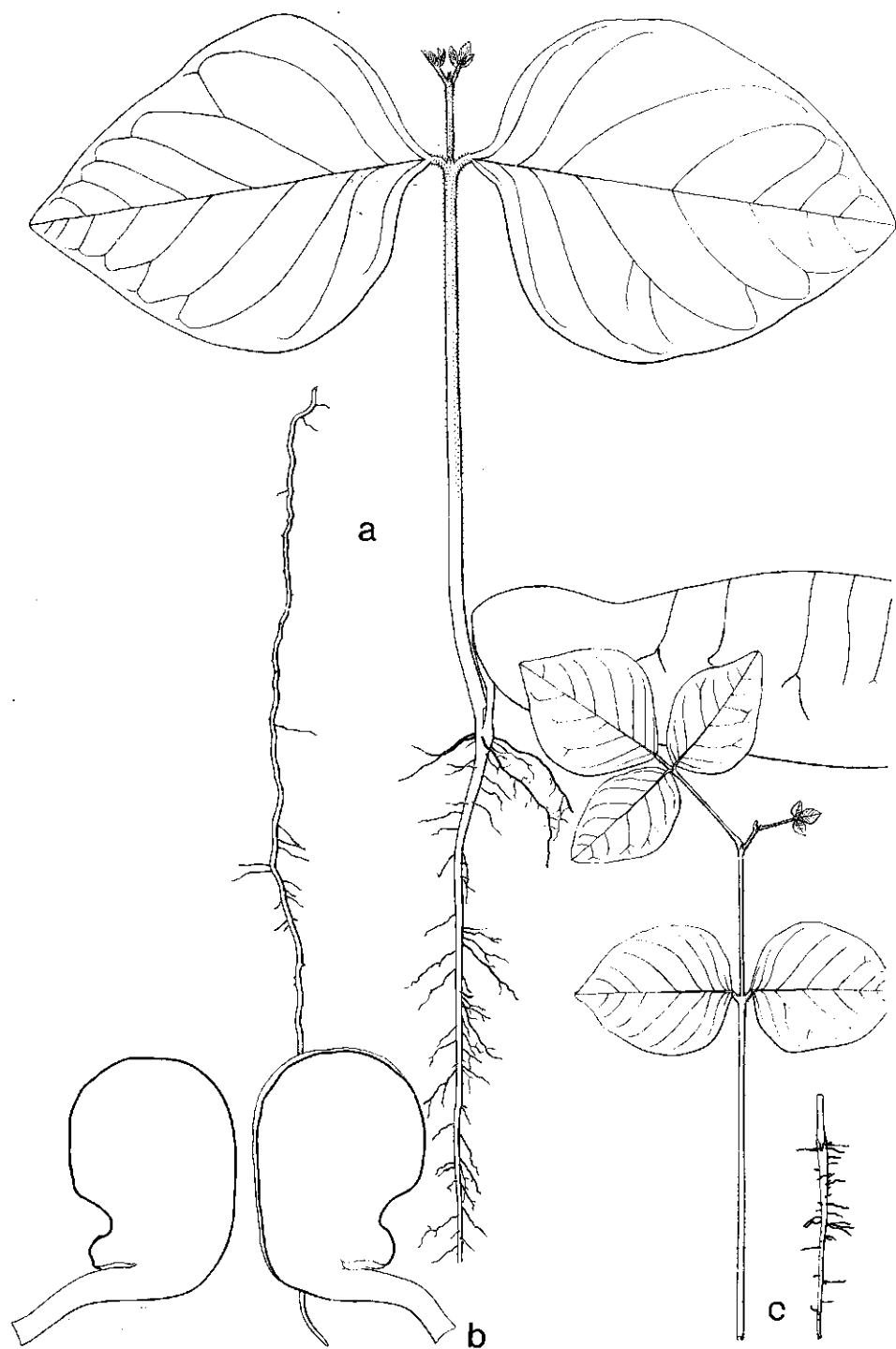


Fig. 75. *Butea monosperma* a. young seedling, $1/2\times$; b. cotyledons, $1/1\times$; c. older seedling, $1/4\times$.

dense simple patent colourless hairs. *Stem* at 2nd stage spiral owing to obtusangular connection of internodes, other characters like those of epicotyl. *Phyllotaxy* spiral but 1st 2 leaves usually opposite, rarely some leaves between the others opposite. *Leaves* stipulate; 1st or 1st 2 leaves simple, following ones imparipinnate, 3-foliolate, sometimes next one or two 2-foliolate; stipules 3-angular (TROUP: sub-falcate or triangular acuminate), green, hairy. *1st Leaf* petiole $\frac{1}{2}$ cm, 2 mm thick, terete, green, hairy like stem, blade ovate, with index ± 1 , $7-13\frac{1}{2}$ by 6-14 cm, thin, having a slightly acuminate acute or obtuse mucronate top and a shortly acuminate acute or obtuse base, pinninerved, prominently nerved on both sides, entire, on both surfaces hairy like stem, rough to touch. *3rd Leaf* rarely 2-foliolate, rarely simple, usually imparipinnate 3-foliolate; rachis $3\frac{1}{2}-9$ cm, $1\frac{1}{2}$ mm thick, thickened at base, terete, other characters like those of stem; leaflets opposite, shortly petiolulate; lateral ones sometimes together possessing 2 stipels; terminal leaflet whether or not stipellate; blades in lateral leaflets ovate, usually asymmetrical, with index $1\frac{1}{4}-2$, $4\frac{1}{2}-10$ by $2\frac{1}{2}-7$ cm, thin, hispid, having an obtuse whether or not mucronate top (TROUP: mucronate) and a rounded base, pinninerved, prominently nerved beneath, entire, dark dull green above, dull greyish green beneath, both surfaces hairy like stem; terminal leaflet like lateral ones but: larger, more rhomboid, top acuminate obtuse or acute whether or not mucronate. *Top of plant* with silvery white hairs.

Seeds from 4 motherplants from different localities.

CLITORIA L.

B. I: 570, 574, 622

Clitoria laurifolia POIR. (*C. cajanifolia* BTH.)

B. I: 623

Mal.: lengket — lengket (*Djakarta*). *Sund.*: katjang-katjangan, katjang tjepel. *Jav.*: urek-urekan

Fig. 76

Size at 1st stage (2 leaves only) ± 33 cm, 5 cm above collet; at 2nd stage ($\pm 7-10$ leaves) 15-40 cm above collet. *Roots* yellowish white, tubercled; primary root at 1st stage very flexuous, moderately thicker than lateral ones; collet gradually and slightly thickened; lateral roots at 1st stage moderate in number, very flexuous, moderately branched. *Hypocotyl* hypogeous, very short. *Cotyledons* hypogeous, 2, equal or unequal, together at side of stem covered with testa, petiolate; petiole $\pm 2\frac{1}{2}$ mm; blade irregular, ± 6 by 4 mm, fleshy, yellow. *Epicotyl* erect, straight, $\pm 3\frac{1}{2}$ cm; at 1st stage $1\frac{1}{2}$ mm thick, terete, smooth, green, base white, with sparse simple very short colourless hairs. *Stem* erect, hairy. *Phyllotaxy* spiral, but 1st 2 leaves opposite. *Leaves* stipulate, 1st 2 leaves simple; next ones imparipinnate, 3-foliolate. *1st 2 Leaves* petiolate; stipules slightly or more distinctly connate, 3-angular, green; petiole 2 mm,



Fig. 76. *Clitoria laurifolia* a. young seedling, $1/2\times$; b. first 2 leaves, $1/1\times$; c. older seedling, $1/1\times$.

green, with very sparse simple very short colourless hairs; blade ovate, having a notched mucronate top and a rounded base, pinninerved, entire, green, glabrous. *3rd Leaf* stipules 3-angular or ovate, 3 mm long, pale green; rachis ± 4 mm, thickened at base, terete, smooth, green, hairy like petiole of 1st 2 leaves; leaflets opposite, petiolulate; petiolules 2 mm; other characters like those of rachis; blades obcordiform, with index $\pm 1\frac{1}{2}$, up to 2 by $1\frac{1}{2}$ cm, in terminal leaflet largest, thin, having a notched mucronate top and an acute base, pinninerved, prominently nerved beneath, entire, green, glabrous. *Higher leaves* (2nd stage) like lower ones, but: larger, blades obovate-lanceolate; small subulate stipels at posterior side of lateral leaflets and at base of terminal leaflet. *Top of plant* and young leaves hairy.

Seeds from 2 motherplants from different localities.

CROTALARIA L.

B. I: 565, 566, 578; III: 650

Crotalaria zanzibarica BTH. (*C. usaramoensis* BAKER)

B. I: 584; III: 650

Fig. 77

Size at 1st stage (1 leaf only) up to ± 25 cm, up to 5 cm above collet; at 2nd stage (4 leaves) ± 8 cm above collet. *Roots* white turning yellowish white, tubercled; primary root at 1st stage: collet slightly thickened; lateral roots at 1st stage moderate in number, moderately branched. *Hypocotyl* epigeous, erect, straight, ± 4 cm; at 1st stage 1 mm thick, slightly thickened at base, tapering upwards, terete, smooth, red but green near top and white near base, with simple colourless hairs. *Cotyledons* epigeous, 2, asymmetrical, one another's mirror image, petiolate, petiole 1 mm, green, hairy like hypocotyl; blade asymmetrically-oblong, with index 2, ± 10 by $4\frac{1}{2}$ mm, thin, having an obtuse top and a rounded base, 1-nerved, prominently nerved beneath, entire, slightly glossy dark green above, dull light green beneath, hairy beneath like hypocotyl. *Epicotyl* $\pm \frac{1}{2}$ cm. *Stem* erect; at 1st stage terete, smooth, green, hairy like hypocotyl. *Phyllotaxy* spiral. *Leaves* exstipulate. *1st Leaf* 1-foliolate; rachis up to 1 cm, channelled above, green, hairy like hypocotyl; petiolate; petiole 1 mm, thicker than rachis, terete, green, hairy like rachis; blade oblong, with index $\pm 2-2\frac{1}{2}$, up to $\pm 2\frac{1}{2}$ by ± 1 cm, thin, having an obtuse mucronate top and a rounded base, pinninerved and midrib prominent beneath, entire, dull green above, dull light green beneath, midrib sparsely hairy beneath like hypocotyl. *Higher leaves* (2nd stage) 3-foliolate, terminal leaflet largest and sometimes obovate-oblong, other characters like those of 1st leaf but larger, index $\pm 2-2\frac{1}{2}$.

Seeds from 1 motherplant.

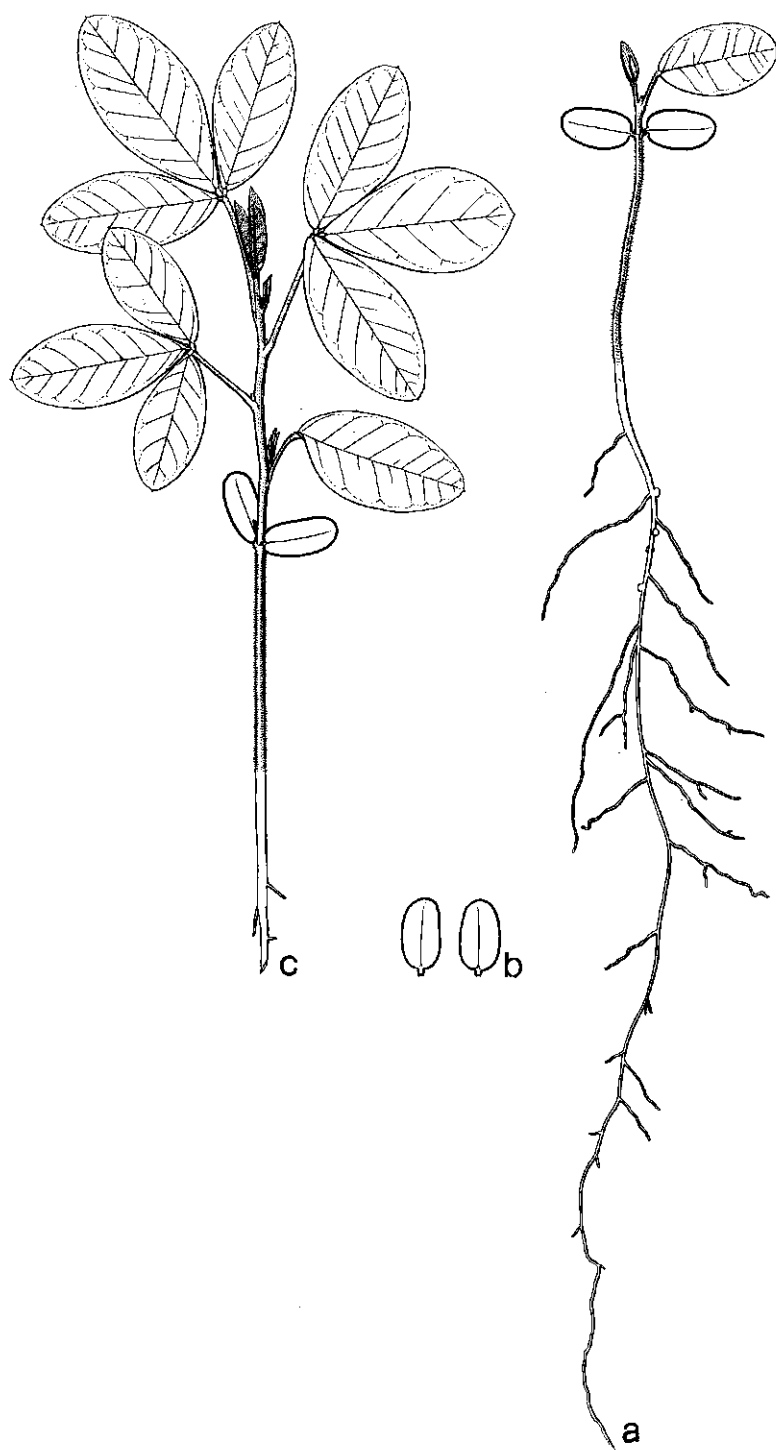


Fig. 77. *Crotalaria zanzibarica* a. young seedling, $1/1\times$; b. cotyledons, $1/1\times$; c. older seedling, $1/1\times$.

DALBERGIA L. f.

B. I: 574, 613; K. et V. II: 75; LUBB. I: 395; TROUP I: 294

Cotyledons epigeous, foliaceous, emarginate at one side, at the same side semi-hastate. *Phyllotaxy* spiral turning alternate. *Leaves* stipulate, imparipinnate; lowest leaf sometimes 1-foliolate; leaflets alternate, in lowest leaves sometimes opposite.

- a. cotyledons blade ± 15 –21 mm long, base semicordate; 1st leaf rachis glabrous, 3-foliolate, blade ± 25 mm long; higher leaves (2nd stage) stipules up to 2 mm long, leaflets blades top obtuse or notched or emarginate *D. latifolia*
 b. cot. blade 11–14 mm long; base cordate; 1st leaf rachis hairy, 1–3-foliolate, blades up to 12 mm long; higher leaves (2nd stage) stipules up to 4 mm long, leaflets blades top shortly acuminate acute *D. sissoo*

***Dalbergia latifolia* ROXB.**

B. I: 615; K. et V. II: 77; TROUP I: 318, fig. 133

Dutch: zonnehout. *Jav.:* sana keling, sana sungu

Fig. 78

Size at 1st stage (1 leaf only) ± 27 cm, ± 8 cm above collet; at 2nd stage (± 6 leaves) ± 15 cm above collet. *Roots* yellow or whitish yellow turning brown; tips pure yellow. *Hypocotyl* epigeous, erect, straight, $2\frac{1}{2}$ – $6\frac{1}{4}$ cm; at 1st stage 4-angular and grooved, slightly tapering upwards, greenish white turning green, glabrous. *Cotyledons* epigeous, 2, asymmetrical, one another's mirror image, shortly petiolate; blade asymmetrical-oblong, $1\frac{1}{2}$ – $1\frac{3}{4}$ by 1 – $1\frac{1}{4}$ cm, coriaceous, having a rounded obtuse top and an at emarginate side of blade semi-cordate sideways and acutely lobed but at the other side rounded base, green, glabrous. *Epicotyl* ± 2 – $2\frac{1}{2}$ cm. *Stem* erect; at 2nd stage feather-shaped with a sideward bend, spiral owing to obtusangular connection of internodes, terete, smooth, green but near base grey and possessing numerous yellowish white lenticels, glabrous. *Phyllotaxy* alternate. *Leaves* stipulate, imparipinnate; 1st leaf 3-foliolate; number of leaflets increasing with succeeding leaves; ± 6 th leaf 4–5-foliolate (TROUP: sometimes 9-foliolate in 1st season). *1st Leaf* rachis ± 2 cm, thickened at base, green glabrous; lateral leaflets opposite, sometimes alternate, petiolulate; petiolule 2 mm, green, glabrous; blades orbicular or ovate, sometimes obovate or elliptic, with index $\pm 1\frac{1}{2}$, up to ± 25 by ± 17 mm, having a rounded obtuse or notched or emarginate top and a rounded base, pinninerved, entire, dull dark glaucous above, dull light greyish green beneath, glabrous; terminal leaflet obovate, largest. *4th–5th Leaf* stipules 3-angular or ovate (TROUP: linear, falcate), ± 2 by 1 mm, fugacious, top acute, with simple colourless hairs (TROUP: hairs not mentioned); rachis up to ± 6 cm; leaflets alternate, other characters like those of 1st leaf but blade larger and base in terminal leaflet sometimes acute.

Seeds obtained from the Forest Research Institute at Dehra Dun, by courtesy of M. DR. C. HARTLEY.

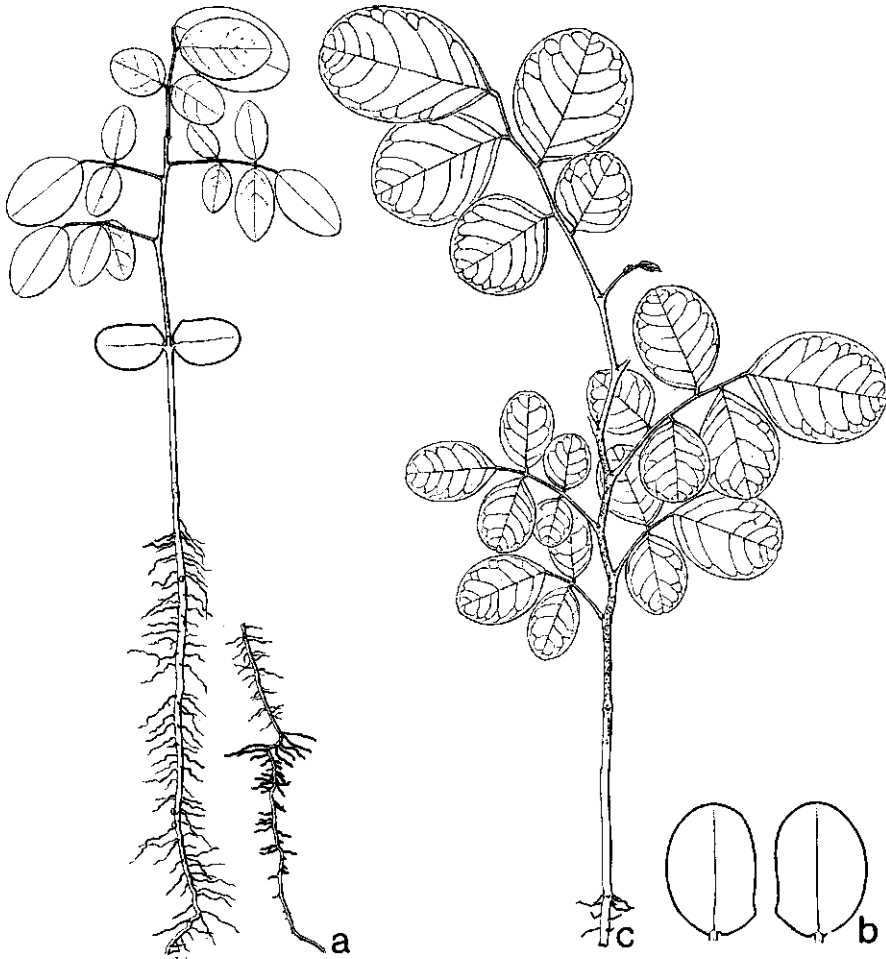


Fig. 78. *Dalbergia latifolia* a. young seedling, $1/2 \times$; b. cotyledons, $1/1 \times$; c. older seedling, $1/2 \times$.

***Dalbergia sissoo* ROXB. ex DC.**

B. I: 615; III: 651; TROUP I: 294, fig. 122

Fig. 79

Size at 1st stage (1 leaf only) 10–18 cm, $3\frac{1}{2}$ – $6\frac{1}{2}$ cm above collet; at 2nd stage (15–28 leaves) 28–72 cm above collet. *Roots* white turning pale yellow, sometimes tubercled; primary root at 1st stage very flexuous, moderately thicker than lateral ones; collet gradually and moderately thickened; lateral roots at 1st stage moderate in number, very flexuous, moderately branched. *Hypocotyl* epigeous, erect, straight, $2\frac{1}{2}$ – $4\frac{1}{2}$ cm; at 1st stage 1 mm thick, terete, smooth, green, base white, near top curved simple colourless hairs. *Cotyledons* epigeous, 2, asymmetrical, petiolate, one another's mirror image; petiole $\frac{1}{2}$ –1 mm; blade asymmetrically oblong, with index $1\frac{1}{2}$ –2, 11–14 by 6–8 mm, coriaceous, having a rounded obtuse top and a cordate base, at emarginate side of blade sideways and obtusely lobed and at the other side minutely and acutely or obtusely downwards lobed, palmately 3–5-nerved, entire but emarginate at one side, both surfaces dull green, glabrous. *Epicotyl* 14–27 m. *Stem* erect; at 2nd stage zigzag owing to obtusangular connection of internodes, not or not much feather-shaped with a sideward bend notwithstanding a distichous-alternate phyllotaxy, terete, smooth, green, brown near base, with sparse simple colourless hairs. *Phyllotaxy* distichous-alternate but lowest leaves spirally arranged; sometimes the plane in which the leaves are situated abruptly twisting over a right angle. *Leaves* stipulate, imparipinnate; 1st leaf 1-foliate or imparipinnate 2–3-foliate; number of leaflets increasing with succeeding leaves; as from 9th or 18th leaf 5-foliate. *1st Leaf* stipules linear (TROUP: subfalcate), ± 2 mm long, green, with simple appressed colourless hairs; rachis 3–5 mm, very thin, green, hairy like stem; leaflets opposite or subopposite, shortly petiolulate; terminal leaflet largest; blades in 1-foliate leaves larger than in those having more leaflets; blades oblong-ovate or oblong or obovate-oblong, with index $1\frac{1}{2}$ – $2\frac{1}{3}$, $4\frac{1}{2}$ –12 by 3–8 mm, thin, having an abruptly acuminate or rounded or emarginate top and a rounded or acute base, pinninerved, prominently nerved beneath, entire, dull green above, finely grey dotted, dull greyish green beneath, glabrous. *5-Foliate leaves* stipules ovate or 3-angular, up to 4 mm long, having an acute top, green, hairy like stem, caducous; rachis up to $5\frac{1}{2}$ cm, zigzag, slightly laterally compressed, thickened at base, green, hairy like stem especially above; leaflets distichous-alternate, petiolulate; petiolules up to 2 mm, green; very sparsely hairy like stem; blades obovate but sometimes slightly or more distinctly orbicular, in lowest leaflets sometimes elliptic, with index 1 – $1\frac{1}{2}$, 1 – $4\frac{1}{2}$ by 1–4 cm, in lowest leaflets smallest, in terminal leaflets largest, thin, having a rounded or slightly taperpointed abruptly acuminate sometimes emarginate top and a cuneate but in lowest leaflets sometimes rounded base, pinninerved and midrib prominent beneath, entire, glabrous, in young leaflets on margin appressed hairs like those on stem. *Top of plant* hairy, light green.

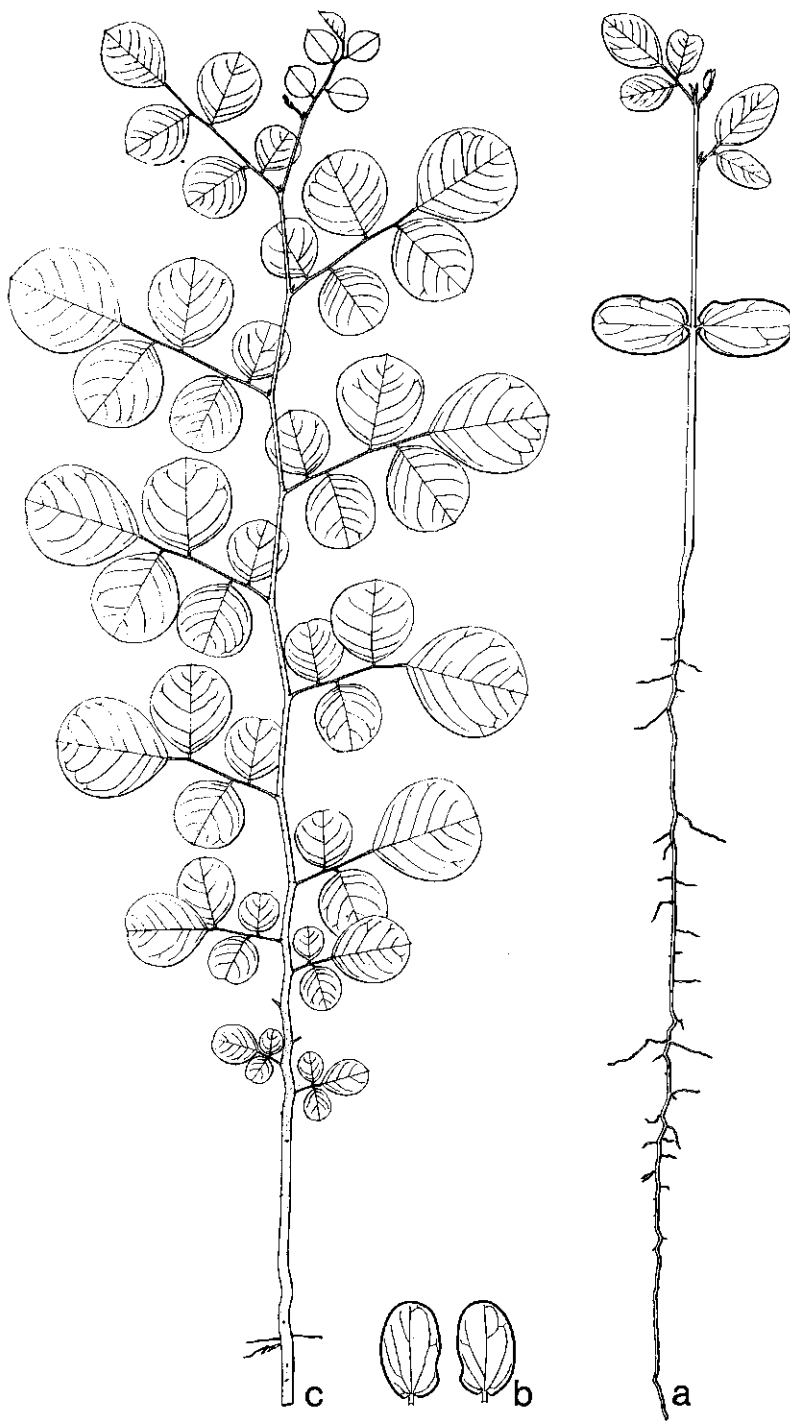


Fig. 79. *Dalbergia sissoo* a. young seedling, $1/1 \times$; b. cotyledons, $1/1 \times$; c. older seedling, $1/2 \times$.

Seeds obtained by courtesy of the Forest Research Institute at Dehra Dun (without herbarium of the motherplant).

ERYTHRINA L.

B. I: 570, 626; K. et V. II: 56; LUBB. I: 444; TROUP I: 264

Erythrina subumbrans (HASSK.) MERR. (*E. lithosperma* MIQ.)

B. I: 628; K. et V. II: 64

In Java, the spinous form: Sund.: dadap rangrang, d. tjutjuk; *Jav.:* dadap ri; *Mad.:* dadap, theuntheuk tjankring. *In Java, the inermous form: Mal.:* dadap minjak; *Sund.:* dadap lesang, d. minjak; *Jav.:* dadap lenga, d. lisah, d. serep; *Mad.:* theuntheuk oleng

Fig. 80

Size at 1st stage (2 leaves only) 8–23 cm, 3–10 cm above collet; at 2nd stage (5–7 leaves) 13–21 cm above collet. *Roots* off white turning yellowish white, tubercled; primary root at 1st stage slightly flexuous, moderately thicker than lateral ones; collet gradually much thickened; lateral roots at 1st stage moderate in number, sparsely branched. *Hypocotyl* hypogeous, 2–10 mm. *Cotyledons* hypogeous, 2, asymmetrical, one another's mirror image, sessile; blade elliptic-falcate, with index almost 2, 11–15 by 7–8 mm, thick-fleshy, flattened above, convex beneath, having a rounded obtuse sometimes emarginate top and a rounded obtuse base, yellow. *Epicotyl* erect, straight, 1½–11 cm; at 1st stage 2 mm thick, tapering upwards, slightly and laterally compressed near top, green, glabrous. *Stem* erect. *Phyllotaxy* spiral but 1st 2 leaves opposite. *Leaves* stipulate, imparipinnate; 1st 2 leaves and sometimes 3rd one 1-foliolate; higher ones imparipinnate 3-foliolate; stipules small, broad, membranous. *1st 2 Leaves* rachis 1–3 cm, 1½ mm thick, channelled above, green, glabrous; leaflets stipellate, petiolulate; petiolule 3 mm, green, glabrous; blade ovate or cordiform, 3–5½ by 3–5½ cm, thin, having an acuminate acute top and a cordate or rounded base, palmately 5-nerved and nerves sunk above and prominent beneath, entire, dull green above, dull light green beneath, glabrous. *3-Foliolate leaves* stipels only in lateral leaflets; blade ovate, in terminal leaflet largest, with index slightly > 1, considerably varying in size, pin-nerved but palmately 3-nerved at base, other characters like those of 1st leaf.

Seeds from 2 motherplants from different localities.

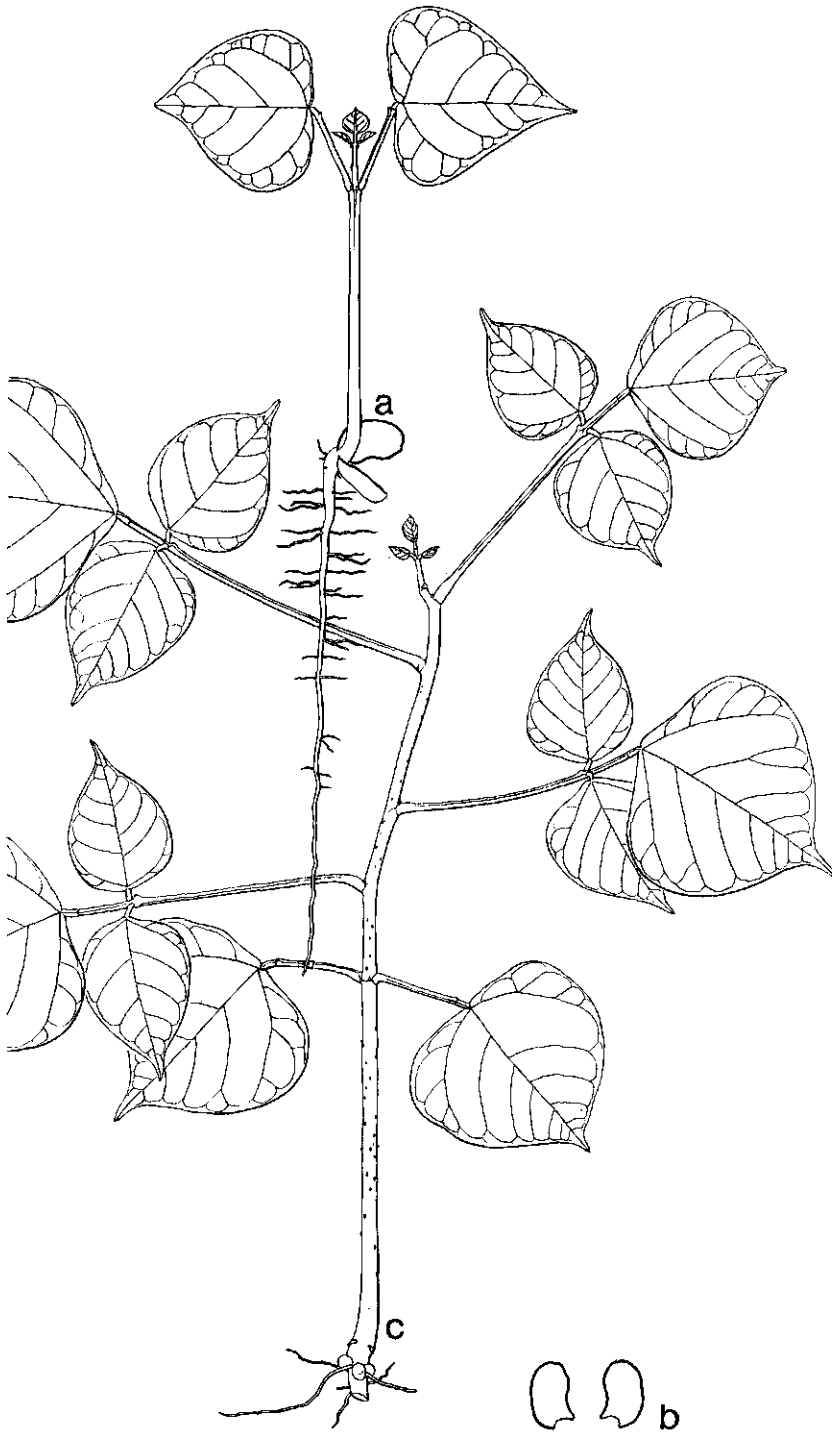


Fig. 80. *Erythrina subumbrans* a. young seedling, $1/2\times$; b. cotyledons, $1/2\times$; c. older seedling, $1/2\times$.

INDIGOFERA L.**B. I:** 566, 567, 569, 570, 574, 589; **LUBB. I:** 420; **TROUP I:** 250***Indigofera galeoides* DC.****B. I:** 592*Mal.*: tarum utan. *Jav.*: enteng-enteng djamprah, tom wanang, tomtoman, wedusan
Fig. 81

Size at 1st stage (2 leaves only) up to ± 25 cm, ± 2 cm above collet; at 2nd stage (± 10 leaves) ± 20 cm above collet. *Roots* white turning yellow; tips white; tubercled; collet gradually and slightly thickened; lateral roots present. *Hypocotyl* epigeous, erect, straight, $\pm 1\frac{1}{2}$ cm; at 1st stage $\frac{3}{4}$ mm thick, gradually and slightly thickened at base, terete, smooth, green, white at base, near top simple appressed colourless hairs. *Cotyledons* epigeous, stipulate, 2, equal, sometimes slightly asymmetrical and one another's mirror image, shortly petiolate; stipules subulate, $\frac{1}{2}$ mm long, green, top black; petiole 1 mm, green; blade with index 2, ± 9 by $4\frac{1}{2}$ mm, coriaceous, having an obtuse top and a rounded base, palmately 3-nerved, entire, dull green above, light dull green beneath, glabrous. *Epicotyl* ± 1 cm. *Stem* erect; at 2nd stage spiral owing to obtusangular connection of internodes; near top angular and with simple appressed colourless hairs. *Phyllotaxy* spiral but 1st 2 leaves opposite. *Leaves* stipulate, imparipinnate; 1st 2 leaves 1-foliolate, next ones more leaflets; ± 10 th leaf 4 pairs of leaflets; stipules subulate, up to $1\frac{1}{2}$ mm long, green, hairy. *1st 2 Leaves* rachis ± 4 mm, thickened at base, green, with simple appressed colourless hairs; petiolule 1 mm; blade elliptic, ± 10 by 7 mm, thin, having an obtuse top and a rounded base, pinninerved and midrib prominent beneath, entire, both surfaces hairy like rachis. *Leaves with 4 pairs of leaflets* rachis ± 7 cm, channelled above, green, hairy; leaflets opposite, 2 stipels near each pair, petiolulate; terminal leaflet often undeveloped, with 2 caducous stipels; petiolule 3 mm, green, hairy; blade elliptic-oblong, with index $\pm 1\frac{1}{2}$, up to 3 by 2 cm, having an obtuse or acute mucronate top and an acute rarely rounded base, dull green on both surfaces, light greyish green beneath, other characters like those of 1st leaf. *Top of plant* with dense appressed hairs.

Seeds from 1 motherplant.



Fig. 81. *Indigofera galegoides* a. young seedling, $1/1 \times$; b. cotyledons, $1/1 \times$; c. older seedling, $1/1 \times$.

PTEROCARPUS L.

B. I: 574, 615; K. et V. II: 82; LUBB. I: 451; TROUP I: 265

***Pterocarpus indicus* WILLD.**

B. I: 615; K. et V. II: 83; TROUP I: 292, fig. 116

Mal.: lingua (*Mol.*), lonsono (*S. W. C. Sum.*), sena (*S. E. C. Sum.*). *Sund.*: angšana. *Jav.*: sana kapur, sana kembang (*Mad.*). *Mak.*: patene (?). *Bug.*: tjenrana. *Bima*: nara. *Timor*: kaju merak, sana. *Key.*: a-i-ing. *Alf. Minah.*: acha, saga. *Gorontalo*: tonala

Fig. 82

Size at 1st stage (1 leaf only) up to ± 12 cm, 6 cm above collet; at 2nd stage (6–15 leaves) 11–38 cm above collet. *Roots* dirty yellow; tips white turning off white; tubercled; primary root at 1st stage slightly flexuous, slightly thicker than lateral ones; collet gradually and slightly thickened; lateral roots at 1st stage moderate in number, very flexuous, not or sparsely branched. *Hypocotyl* epigeous, erect, straight, 4–5 cm; at 1st stage 3 mm thick, tapering upwards, laterally compressed near top, terete near base, near top 2 opposite longitudinal ridges between cotyledons, green, white at base, glabrous (TROUP: glabrous or very minutely pubescent; glands on hypocotyl between cotyledons). *Cotyledons* 2, epigeous, stipulate, asymmetrical, one another's mirror image, sessile or very shortly petiolate; stipules subulate, small, green or red; blade asymmetrically ovate-oblong, with index $1\frac{3}{4}$, ± 21 by 12 mm (TROUP: 0.9–1.2 inch by 0.3–0.5 inch), coriaceous, having a rounded obtuse top, entire but possessing a base slightly exculptate and broadly and obtusely lobed at one side, pinninerved, slightly glossy dark green above, dull green beneath, glabrous. *Epicotyl* $1\frac{1}{2}$ – $3\frac{1}{2}$ cm. *Stem* erect; at 2nd stage feather-shaped with a sideward bend, zigzag, terete, smooth, green, with simple colourless hairs. *Phyllotaxy* alternate but 1st 2 or 3 leaves spirally arranged. *Leaves* stipulate, imparipinnate, 1st–3rd or 6th one 1-foliolate (TROUP: simple), as from 3rd or 6th one 3- rarely 2-foliolate, as from 6th or 13th one 4-foliolate; among higher leaves sometimes a 1-foliolate one. *1st Leaf* stipules linear, 2 mm long, green, hairy; rachis 7–10 mm, thickened at base, green, hairy like stem; petiolule 1 mm, hairy; blade ovate-oblong; with index 2, 20–28 by 12–18 mm, thin, having an acuminate acute mucronate top and a rounded or cuneate base, pinninerved, prominently nerved beneath, entire, dull green, hairy beneath and on margin like stem. *4-Foliolate leaves* stipules lanceolate, 5 mm long, green, hairy; rachis $2\frac{1}{2}$ – $6\frac{1}{2}$ cm, other characters like those of 1st leaf; leaflets distichous-alternate, petiolulate; terminal ones largest and whether or not minutely subulate stipellate; blades ovate or orbicular; with index $1-1\frac{1}{2}$, $\frac{1}{2}$ – $7\frac{1}{2}$ by $\frac{1}{2}$ –5 cm, base rounded or acute sometimes acuminate; other characters like those of 1st leaf. *Top of plant* densely hairy, green.

Seeds from 3 motherplants from different localities.

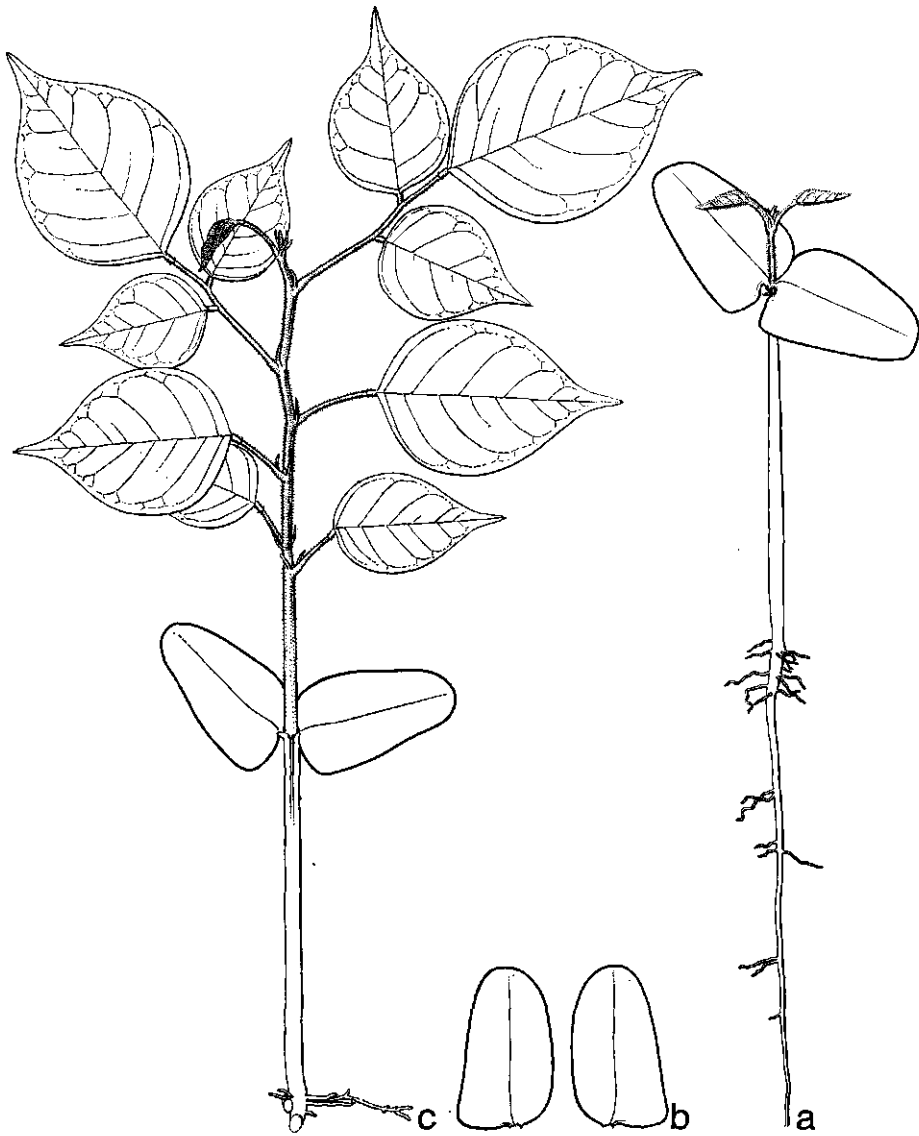


Fig. 82. *Pterocarpus indicus* a. young seedling, $1/1 \times$; b. cotyledons, $1/1 \times$; c. older seedling, $1/1 \times$.

TEPHROSIA PERS.

B. I: 574, 593

***Tephrosia candida* (ROXB.) DC.**

B. I: 595

Sund.: kapeping badak (?)

Fig. 83

Size at 1st stage (1st leaf only) ± 20 cm, ± 8 cm above collet; at 2nd stage (6–8 leaves) 17–30 cm above collet. *Roots* white, sometimes tubercled; collet at 1st stage gradually thickened. *Hypocotyl* epigeous, erect, straight, $\pm 4\text{--}5\frac{1}{2}$ cm; at 1st stage ± 1 mm thick, tapering upwards, thickened at base, terete, brownish red, white at base, with simple colourless hairs. *Cotyledons* epigeous, 2, asymmetrical, one another's mirror image, petiolate; petiole $1\frac{1}{2}$ mm, green, hairy like hypocotyl; blade oblong, with index $\pm 2\frac{1}{4}$, ± 18 by 8 mm, thin, having a rounded obtuse top and an asymmetrical at one side slightly or more distinctly exculptate at the other side rounded base, pinninerved, entire, dark green above, light green beneath, both surfaces sparsely hairy like hypocotyl. *Epicotyl* $\frac{1}{2}\text{--}1\frac{1}{2}$ cm. *Stem* erect; at 2nd stage spiral owing to obtusangular connection of internodes, green, with simple colourless hairs. *Phyllotaxy* spiral. *Leaves* stipulate, imparipinnate; 1st leaf and sometimes 2nd one 1-foliolate; 2nd and 3rd leaf 1 pair of leaflets; 4th–6th or 5th–6th 2 pairs, next leaves 3 pairs; stipules narrow, green, hairy. *1st Leaf* rachis 6–10 mm, green, hairy like stem, petiolule 1 mm; blade oblong or ovate or lanceolate, with index $2\text{--}6\frac{1}{2}$, 22–45 by 6–14 mm, thin, having an acute or obtuse mucronate top and a rounded base, pinninerved, prominently nerved beneath, entire, dull green above, dull greyish green beneath, simple colourless hairs beneath. $\pm 6\text{th--}8\text{th Leaf}$ (2nd stage) leaflets opposite, shortly petiolulate; blades \pm like those in 1st leaf but broader and sometimes obovate-oblong. *Top of plant* with silvery appressed hairs.

Seeds from 1 motherplant.

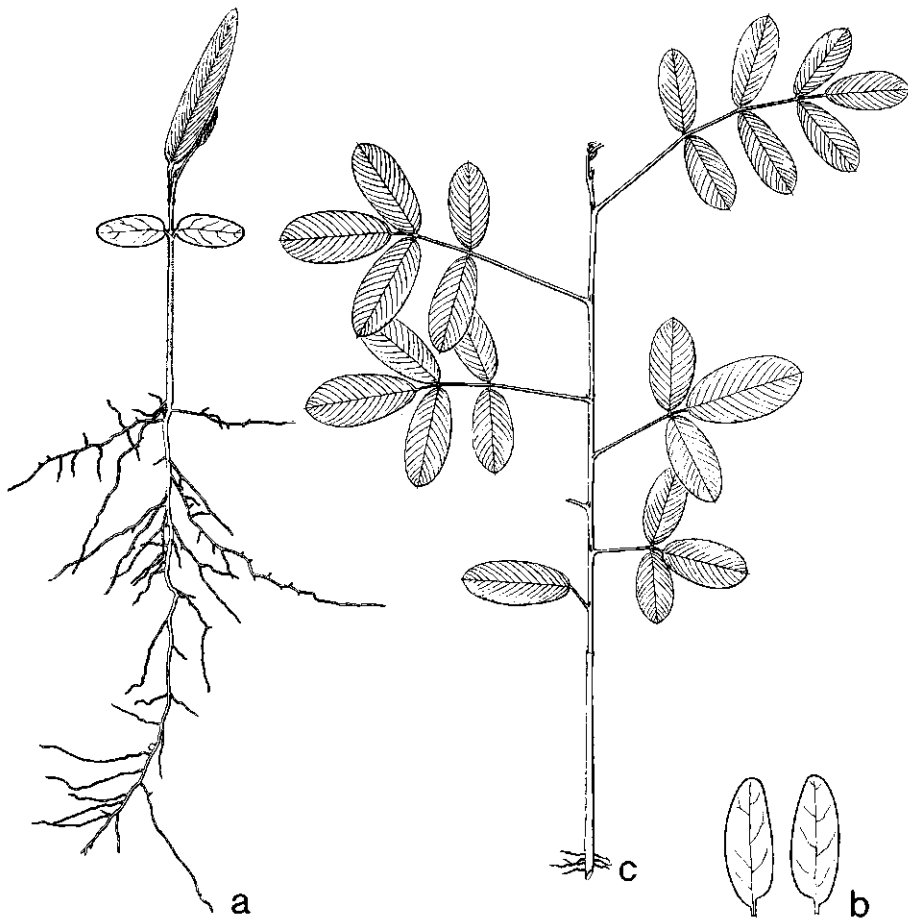


Fig. 83. *Tephrosia candida* a. young seedling, $1/2\times$; b. cotyledons, $1/1\times$; c. older seedling, $1/2\times$.

LOGANIACEAE

B. II: 206; K. et V. IX: 52; TROUP II: 673

FAGRAEA THUNB.

B. II: 206, 210; K. et V. IX: 71; TROUP II: 676

***Fagraea fragrans* ROXB. (*F. peregrina* (REINW.) BL.)**

B. II: 211; K. et V. IX: 86; TROUP II: 676

Mal.: tembesu, t. bukit, t. talang

Fig. 84

Size at 1st stage (1st pair of leaves only) 3–8 cm, 13–15 mm above collet; at 2nd stage (10–16 pairs of leaves) 8–60 cm above collet. *Roots* brown; tips white turning off white; primary root at 1st stage very flexuous, not thicker than lateral ones, often replaced by 1 or 2 lateral ones; collet gradually and slightly thickened; lateral roots at 1st stage few, flexuous, slightly or unbranched. *Hypocotyl* epigeous, erect, straight, 8–12 mm; at 1st stage $\frac{1}{2}$ mm thick, white. *Cotyledons* epigeous, 2, equal, petiolate; petiole ± 1 mm, breadth > thickness, pale green; blade ovate, with index slightly > 1, \varnothing 2–3 mm, having a rounded obtuse top and a rounded base, indistinctly nerved, entire, dull green. *Epicotyl* 5–8 mm; at 1st stage 4-angular, faintly 4-winged. *Stem* erect, straight; at 2nd stage terete, laterally compressed near nodes, annulately thickened at nodes, smooth, glossy green. *Phyllotaxy* decussate. *Leaves* stipulate, simple, petiolate; stipules intrapetiolar, connate, semi-amplexicaul, stipules of a pair of leaves together amplexicaul, very short, membranous; petiole green, blade thin, having an obtuse top, pinninerved, entire, both surfaces dull green. *1st Pair of leaves* petiole 1–2 mm, breadth > thickness; blade ovate, with index $1\frac{1}{4}$ – $1\frac{3}{4}$, 4–8 by $3\frac{1}{2}$ –5 mm, base rounded narrowed into petiole, midrib prominent beneath. *Highest leaves* (2nd stage) petiole up to $\pm 1\frac{1}{2}$ cm, 2-winged; blade oblong or lanceolate, with index ± 3 , up to 15 by 5 cm, having an acuminate obtuse top and an acuminate decurrent base, with midrib prominent on both surfaces but considerably so beneath and nerves prominent beneath, dull dark green above, resiniferous near base. *Top of plant* glossy green. *Plant* glabrous all over.

Seeds from 1 motherplant.

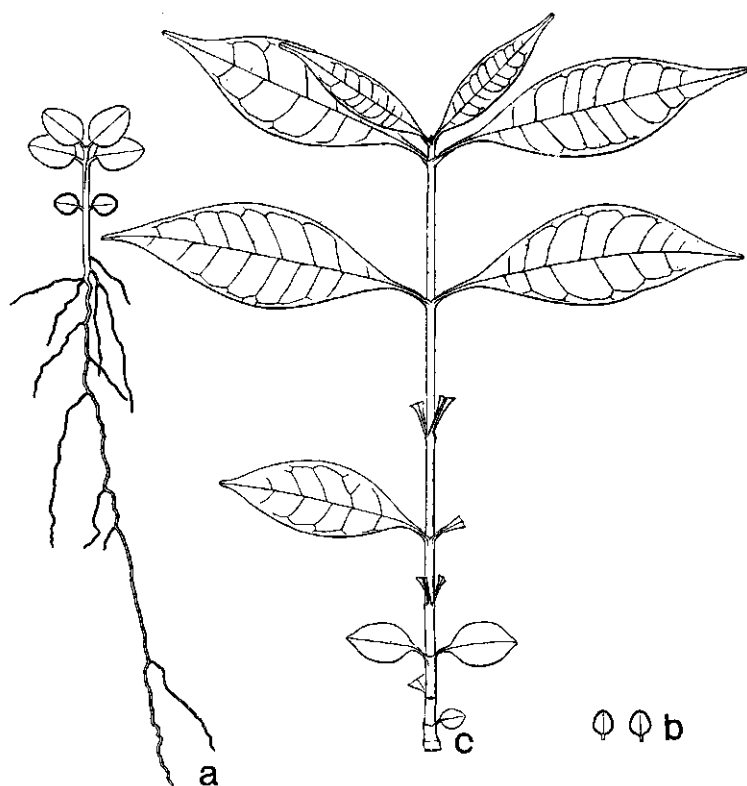


Fig. 84. *Fagraea fragrans* a. young seedling, $1/1 \times$; b. cotyledons, $1/1 \times$; c. older seedling, $1/2 \times$.

LYTHRACEAE

B. I: 251, III: 644; K. et V. I: 186; LUBB. I: 547; TROUP II: 593

LAGERSTROEMIA L.

B. I: 252, 255; K. et V. I: 189; TROUP II: 593

Lagerstroemia flos-reginae RETZ. (*L. speciosa* Auct. non ? (L.) PERS.)

B. I: 256; K. et V. I: 190; TROUP II: 598, fig. 226

Mal.: bungur, b. kuwal (*Lamp.*), b. tekujung (*Rawas*). *Sund.*: bungur. *Jav.*: ketangi, laban (*Pasuruan*), wungu. *Mad.*: bhungor

Fig. 85

Size at 1st stage (1st leaf only) 5–9 cm, $1\frac{3}{4}$ –3 cm above collet; at 2nd stage (± 20 –34

leaves) 12–60 cm above collet. *Roots* white or off white or yellowish white; primary root at 1st stage not conspicuous, very flexuous, not thicker than lateral ones; collet not or gradually and slightly thickened; lateral roots at 1st stage moderate in number, very flexuous, moderately branched. *Hypocotyl* epigeous, erect, straight, 1–2 cm; at 1st stage $\frac{1}{2}$ –1 mm thick, near top 4-angular, faintly 4-winged, near top green sometimes red-winged, at $\frac{1}{2}$ length red or green, white below, glabrous. *Cotyledons* epigeous, 2, equal, or asymmetrical and one another's mirror image, stipulate like leaves on stem but less distinctly so, petiolate; petiole \pm 2 mm, broadened, green, glabrous; blade obcordiform or obreniform or obovate, with index $\frac{8}{9}$ – $\frac{3}{4}$, thin, 5–9 by 6–11 mm, having a rounded obtuse or emarginate or notched top and an acute base decurrent into the petiole, palmately 3-nerved, prominently nerved beneath and middle nerve thickest, entire, dull green above, dull light green beneath, glabrous. *Epicotyl* 3–6 mm. *Stem* erect, spiral owing to obtusangular connection of internodes, 3-winged in lower part, in upper part 4-winged, green, glabrous. *Phyllotaxy* lowest leaves spirally arranged higher ones decussate or approximately so. *Leaves* stipulate (TROUP: exstipulate), simple, shortly petiolate; stipules small, subulate, black at top; blade having an acute top and an acute decurrent base, pinninerved and midrib prominent on both surfaces, dull green, glabrous. *1st Leaf* elliptic or oblong or obovate; with index $1\frac{1}{2}$ –2, $7\frac{1}{2}$ –18 by $4\frac{1}{2}$ –12 mm, thin, entire. *Highest leaves* (2nd stage) blade obovate-oblong or obovate-lanceolate, with index $\pm 2\frac{1}{2}$ –3, having a shortly acuminate acute top, prominently nerved beneath, intramarginally nerved, entire or slightly undulate; size increasing with succeeding leaves. *Top of plant* green, glabrous.

Seeds from 4 motherplants from different localities.

MAGNOLIACEAE

B. I: 96; K. et V. IV: 145; LUBB. I: 102; TROUP I: 4

Cotyledons epigeous, foliaceous. *Phyllotaxy* spiral. *Leaves* stipulate, simple, petiolate.

Cotyledons and (or) 1st leaf and (or) higher leaves present

- a. cot. usually 4–10 mm broad; stem glabrous; 1st leaf top rounded abruptly acuminate; leaves and stipules glabrous *Manglietia glauca*
- b. cot. usually 9–16 mm broad; stem hairy; 1st leaf top taperpointed acute; leaves and stipules hairy *Michelia champaca*

MANGLIETIA BL.

B. I: 96, 97; K. et V. IV: 150

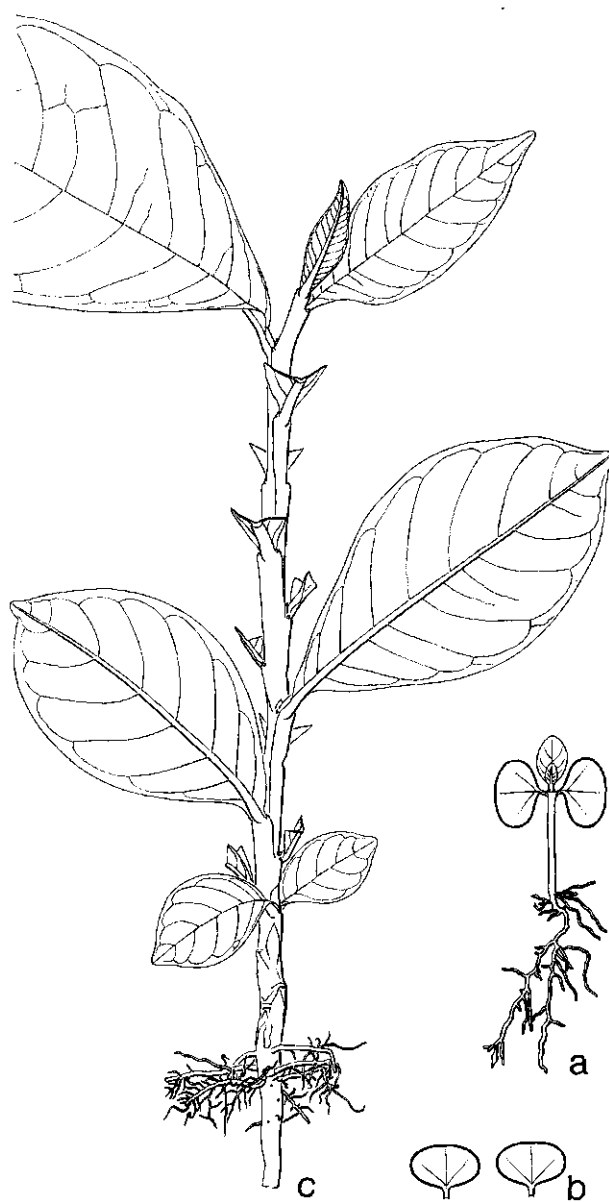


Fig. 85. *Lagerstroemia flos-reginae* a. young seedling, 1/1 \times ; b. cotyledons, 1/1 \times ; c. older seedling, 1/1 \times .

***Manglietia glauca* BL. (*Magnolia blumei* PRANTL.)**

B. I: 96, 97; K. et V. IV: 150

Sund.: baros, manglid. *Jav.*: baros, tjempaka bulus

Size at 1st stage (1st leaf only) 5–20 cm, 3–6 cm above collet; at 2nd stage (19–25 leaves) 22–60 cm above collet. *Roots* off white turning brownish yellow; primary root at 1st stage moderately flexuous, not thicker than lateral ones; collet gradually and slightly thickened; lateral roots at 1st stage few, moderately flexuous, sparsely branched. *Hypocotyl* epigeous, erect, straight, 3–6 cm; at 1st stage $\pm 1\frac{1}{2}$ mm thick, tapering upwards, terete near base, lengthwise ridged near top, pale green, white at base, glabrous. *Cotyledons* epigeous, 2 or 3, equal, very shortly petiolate; blade oblong or ovate-oblong or ovate-lanceolate, with index 2–4, 13–30 by 4–10 mm, thin-coriaceous, having an obtuse top and a rounded base, palmately 3-nerved and central nerve thickest, entire (margin slightly revolute), dull green above, greyish pruinose beneath, glabrous. *Epicotyl* 0–3 mm. *Stem* erect, straight; at 2nd stage terete, greyish greenish pruinose, glabrous. *Phyllotaxy* spiral. *Leaves* stipulate, simple, petiolate; stipules partly adnate to petiole, fugacious, only present in top of stem and enclosing the top, green, membranous, leaving an annulate oblique scar on the stem and 2 linear scars on the base of the petiole, glabrous; petiole terete, smooth, greyish greenish pruinose; blade thin, having an acute narrowed base, pinninerved, prominently nerved beneath, entire, involute, dull green above, greyish pruinose beneath, glabrous. *1st Leaf* petiole 4–5 mm; blade orbicular or elliptic or ovate, with index 1–2, 9–23 by 8–15 mm, top abruptly acuminate obtuse. *Highest leaves* (2nd stage) stipules up to 8 cm long; petiole up to $2\frac{1}{2}$ cm long, 2 mm thick; blade obovate-oblong, with index up to 3, up to 23 by 9 cm, top shortly acuminate acute or obtuse. *Top of plant* glabrous, dull green.

Seeds from 6 motherplants from different localities.

MICHELIA L.

B. I: 96, 98; K. et V. IV: 153; TROUP I: 4

***Michelia champaca* L.**

B. I: 98; K. et V. IV: 159, 162; TROUP I: 7

Mal.: tjempaka kuning. *Sund.*: baros, mangli, manglid, tjempaka koneng. *Jav.*: kantil, petjari, baros, kadjeng sekar, kaju kembang, kembang. *Mad.*: kadjoe kempheung, kempheung manglen

Size at 1st stage (1st leaf only) 10–20 cm, $3\frac{1}{2}$ – $5\frac{1}{2}$ cm above collet; at 2nd stage (18–23 leaves) 23–46 cm above collet. *Roots* off white; primary root at 1st stage slightly flexuous, slightly thicker than lateral ones; collet abruptly and slightly thickened; lateral roots at 1st stage few, slightly flexuous, unbranched. *Hypocotyl* epigeous,

erect, straight, 3–6 cm; at 1st stage 2 mm thick, tapering to both ends, terete or slightly angular, pale green, glabrous. *Cotyledons* epigeous, 2, equal but sometimes asymmetrical and one another's mirror image, sessile or shortly petiolate; petiole broadened, green, glabrous; blade ovate-oblong, with index 2–3, 19–30 by 9–16 mm, thin-coriaceous, having an obtuse or acute top and a rounded base shortly narrowed into petiole, palmately 3–5-nerved and central nerve thickest, entire, dull green above, dull glaucous pruinose beneath, glabrous. *Epicotyl* 2–3 mm. *Stem* erect, straight, or spiral owing to obtusangular connection of internodes; at 2nd stage terete, smooth, green, grey beneath, near base yellowish white, with simple erecto-patent colourless hairs. *Phyllotaxy* spiral. *Leaves* stipulate, simple, petiolate; stipules partly adnate to petiole, fugacious, present in top of stem only, enclosing top, green, membranous, leaving an annulate oblique scar on stem and 2 linear scars on base of petiole, hairy like stem; petiole green, sparsely hairy like stem; blade oblong or lanceolate, having an acute top and base, pinninerved, prominently nerved beneath, entire, dull green above, glaucous or greyish-greenish pruinose beneath. *1st Leaf* petiole 4–5 mm; blade elliptic, with index $1\frac{3}{4}$ –2, 27–34 by 13–20 mm, thin, top taperpointed acute, midrib sparsely hairy beneath like stem; *Highest leaves* (2nd stage) petiole up to 3 cm, up to 3 mm thick, terete, thickened near base and upwards to $\pm\frac{3}{4}$ length, bearing stipule-scars at $\pm\frac{3}{4}$ length of petiole; blade with index up to 3, up to 21 by up to 7 cm, thin-coriaceous, having an acuminate acute top and an acute base narrowed into petiole, both surfaces hairy like stem. *Top of plant* hairy like stem, light green.

Seeds from 4 motherplants from 3 different localities (2 trees nr. XI.B. II.13 and XVI.A.17 in the Botanical Garden in Bogor, and the other 2 from different localities elsewhere).

MALVACEAE

B. I: 421, III: 467; K. et V. II: 102; LUBB. I: 243; TROUP I: 135

Cotyledons epigeous, 2, foliaceous. *Stem* terete, hairy. *Phyllotaxy* spiral. *Leaves* stipulate, simple, petiolate; stipules sometimes connate and separating later; blade palmately nerved, linear gland on one or more of main nerves beneath. *Plant* with simple and (or) stellate much or 2–4-branched hairs.

Cotyledons and (or) 1st leaf and (or) higher leaves present

1. a. cot. elliptic or ovate or reniform but with notched or emarginate top; top of plant and (or) young leaves having simple and stellate 2–4-branched hairs; higher leaves not lobed *Hibiscus*
- b. cot. obovate; top of plant and young leaves having simple and much branched hairs; higher leaves 3-lobed *Thespesia lampas*

HIBISCUS L.

B. I: 421, 422, 429; K. et V. II: 105; LUBB. I: 252

Plant having simple and (or) stellate 2–4-branched hairs. Other characters like those of the family.

Cotyledons and (or) higher leaves present

1. a. cot. blade elliptic or ovate, hairy; higher leaves: gland on middle nerve beneath at $\frac{1}{2}$ length or higher *H. macrophyllus*
 b. cot. blade ovate, or reniform, but top notched or emarginate; glabrous; higher leaves: gland on middle nerve beneath near base 2
2. a. cot. ovate; stipules of higher leaves lanceolate . . . *H. tiliaceus* ssp. *similis*
 b. cot. reniform but top notched or emarginate; stipules of higher leaves ovate-lanceolate *H. tiliaceus*

***Hibiscus macrophyllus* ROXB. ex HORNEM.**

B. I: 430; K. et V. II: 112

Mal.: baru kesi, b. Selasa. *Sund.*: tesuk, tisuk, t. tambaga. *Jav.*: waru djembut, w. gunung, w. gombong, w. lanang, w. pajung, w. songsong, w. watang
 Fig. 86

Size at 1st stage (1st leaf only) $2\frac{1}{2}$ –8 cm, $1\frac{1}{2}$ –3 cm above collet; at 2nd stage (10–14 leaves) 13–55 cm above collet. *Roots* white or off white; primary root at 1st stage not conspicuous often soon disappearing, very flexuous, not thicker than lateral ones; collet gradually and slightly thickened; lateral roots at 1st stage few to very numerous, very flexuous, moderately branched. *Hypocotyl* epigeous, straight, 16–32 mm; at 1st stage $\frac{1}{2}$ –1 mm thick, terete, smooth, with simple patent colourless hairs, adventitious roots often present. *Cotyledons* epigeous, 2, equal, or asymmetrical and one another's mirror image, rarely unequal in size, petiolate; petiole 2–4 mm, $\frac{1}{2}$ mm thick, terete, green, hairy like hypocotyl; blade elliptic or ovate, with index $1\frac{1}{8}$ – $1\frac{1}{2}$, 6–10 by $4\frac{1}{2}$ –8 mm, thin, having a rounded obtuse or emarginate top and a rounded or exculptate base, palmately 3-nerved (middle nerve thickest), entire, dull green, on both surfaces hairy like hypocotyl, ciliate. *Epicotyl* 1–7 mm. *Stem* erect, straight; at 2nd stage terete, smooth, green, annulate scars of stipules, hairs like those on hypocotyl. *Phyllotaxy* spiral. *Leaves* stipulate, simple, petiolate; petiole terete, smooth, green, hairy like hypocotyl; blade cordiform, thin, especially later thick-feltly to touch owing to the hairs, palmately nerved, on both surfaces dull green and bristly hairy like hypocotyl, ciliate. *1st Leaf* petiole 4 mm; blade with index $1\frac{1}{9}$ – $1\frac{1}{3}$, 10–17 by 7–14 mm, having an acuminate obtuse top and a slightly cordate base, palmately 7-nerved and middle nerve thickest, prominently nerved beneath, coarsely serrate. *Highest leaves* (2nd stage) petiole up to ± 15 cm, 3 mm thick; blade with index ± 1 , ± 15 by 15 cm, having a shortly acuminate acute top and a cordate base, palmately 7–9-nerved and nerves on upper surface slightly but on under surface very

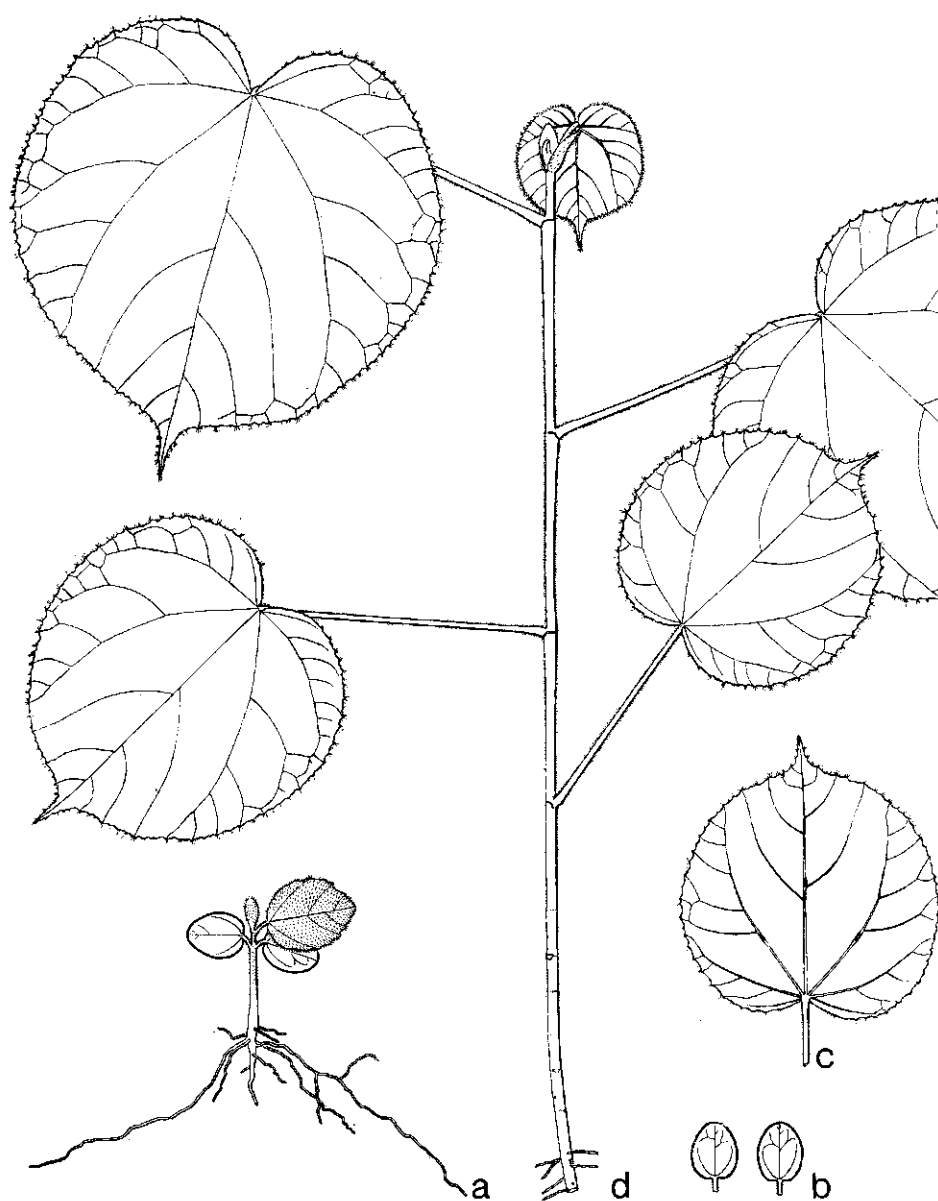


Fig. 86. *Hibiscus macrophyllus* a. young seedling, $1/1\times$; b. cotyledons, $1/1\times$; c. developed 1st leaf, $1/2\times$; d. older seedling, $1/2\times$.

prominent, linear gland beneath on middle nerve at $\pm \frac{1}{2}$ length and on other main nerves at $\pm \frac{1}{4}$ length, margin dentate. *Top of plant* covered with stipules; stipules connate, very large, ovate, pale green, hairy.

Seeds from 4 motherplants from different localities.

***Hibiscus tiliaceus* L.**

B. I: 429; K. et V. II: 106

Mal.: baru, beruk (*Bill.*), melanding (*Bangka*), waru. *Sund.*: waru la-ut, w. lot. *Jav.*: waru la-ut, w. lenga, w. lengis, w. lisah, w. rangkang. *Mad.*: baru. *Alf. Minah.*: baru, kalimba, kuwang, molombagu, wahu

Fig. 87

Size at 1st stage (1st leaf only) 6–26 cm, 3–5 cm above collet, at 2nd stage (12–24 leaves) 14–60 cm above collet. *Roots* white turning off white; primary root at 1st stage usually very flexuous, slightly thicker than lateral ones, collet gradually and slightly thickened; lateral roots moderate in number, very flexuous, moderately branched. *Hypocotyl* epigeous, erect, straight, $2\frac{1}{2}$ – $3\frac{1}{2}$ cm; at 1st stage 1 mm thick, having a gradually and slightly thickened base, terete, smooth, green, white at base, near top simple patent very short colourless hairs. *Cotyledons* epigeous, 2, equal, petiolate; petiole 4–7 mm, $\frac{1}{2}$ mm thick, terete, flattened above, convex beneath, green, hairy like hypocotyl; blade reniform, with index $\frac{4}{5}$ –1, 7–10 by 7–11 mm, thin, but with notched or emarginate top and exculptate base, palmately 3-nerved and middle nerve thickest, usually entire, rarely slightly crenate, dull green above, dull light green beneath, glabrous. *Epicotyl* 8–13 mm. *Stem* erect, straight, terete, smooth, on upper part annulate stipular scars, hairy like hypocotyl. *Phyllotaxy* spiral. *Leaves* stipulate, simple, petiolate; petiole terete, smooth, green, hairy like hypocotyl; blade cordiform, thin, having an obtuse top and a cordate base, palmately 5–9-nerved and middle nerve thickest, prominently nerved beneath, crenate or undulate, on both surfaces dull green, on both surfaces simple and 2–4-branched colourless fugacious hairs. *1st Leaf* petiole 8–13 mm, $\frac{3}{4}$ mm thick; blade with index ± 1 , 10–21 by 10–22 m, palmately 5-nerved. *Highest leaves* (2nd stage) stipules large, membranous, green, ovate, semi-amplexicaul; petiole up to ± 14 cm; blade up to ± 9 by 9 cm, having an acuminate obtuse top, palmately 5–9-nerved, near base beneath a linear gland on middle nerve. *Top of plant* with simple and stellate 2–4-branched hairs, green.

Seeds from 2 motherplants from different localities.

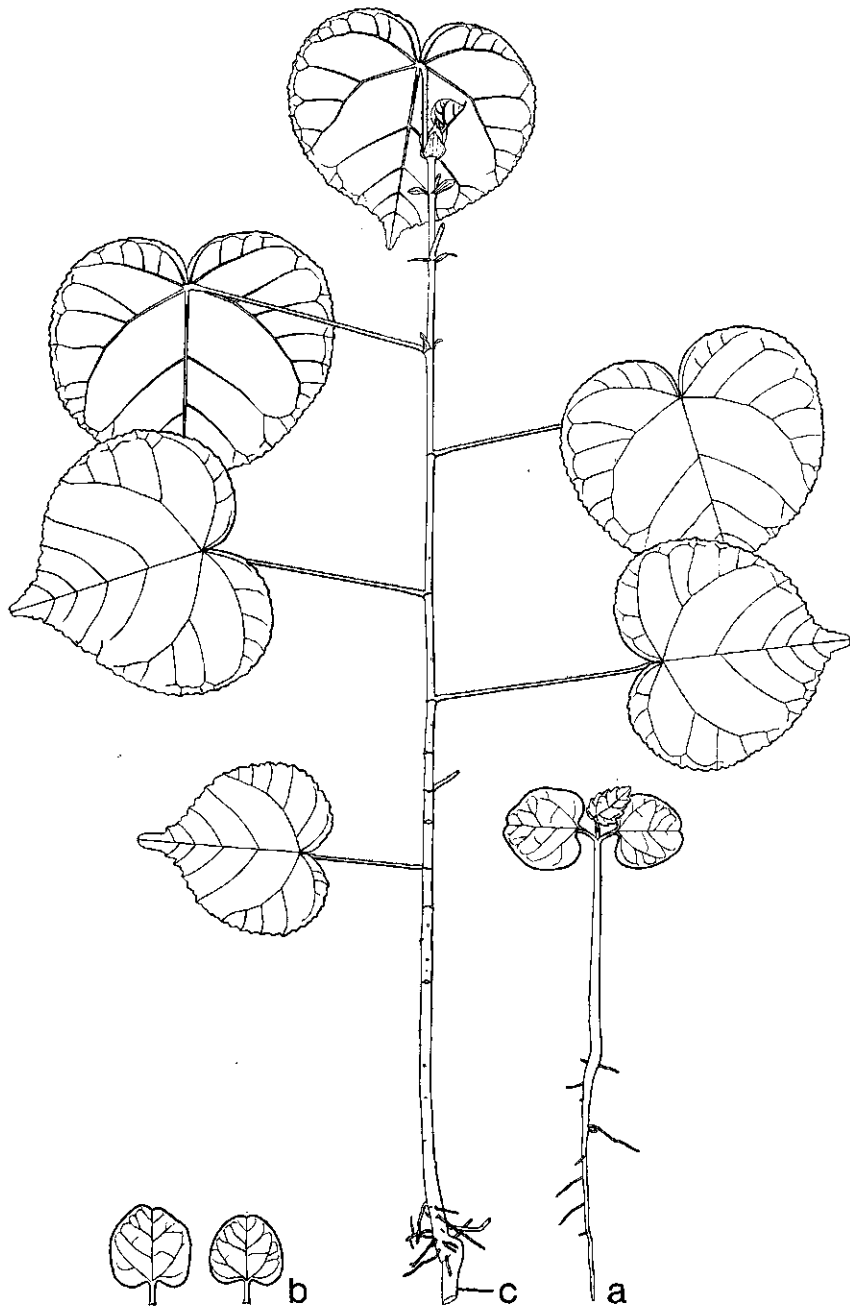


Fig. 87. *Hibiscus tiliaceus* a. young seedling, $1/1 \times$; b. cotyledons, $1/1 \times$; c. older seedling, $1/2 \times$.

***Hibiscus tiliaceus* L. ssp. *similis* (L.) BORSS. (*H. similis* L.)**

B. I: 430, III: 648; K. et V. II: 110

Mal.: waru. *Sund.*: waru gunung. *Jav.*: waru gombong, w. kopek, w. rangkang.*Mad.*: baru kheutjheu

Fig. 88

Size at 1st stage (1st leaf only) up to 13 cm, up to 2½ cm above collet; at 2nd stage (± 14 leaves) ± 20 cm above collet. *Roots* white turning yellowish white; primary root at 1st stage very flexuous, much thicker than lateral ones; collet gradually and slightly thickened; lateral roots at 1st stage moderate in number, very flexuous, moderately branched. *Hypocotyl* epigeous, erect, straight, up to 2 cm; at 1st stage 1 mm thick at top and 1½ mm at base, terete, smooth, green, with simple patent colourless hairs. *Cotyledons* epigeous, 2, equal, petiolate; petiole 2–3 mm, ¾ mm thick, smooth, green, hairy like hypocotyl; blade ovate, with index $\pm 1½$, ± 10 by 7 mm, thin-coriaceous, having an emarginate or notched top and an exculptate base, palmately 3-nerved and middle nerve thickest, entire, dull green, glabrous. *Epicotyl* $\pm ½$ cm. *Stem* erect; at 2nd stage straight but sometimes spiral owing to obtusangular connection of internodes, terete, smooth, green, hairy like hypocotyl. *Phyllotaxy* spiral. *Leaves* stipulate, simple, petiolate; petiole terete, smooth, green, with hairs like those on hypocotyl and, besides, stellate 2–4-branched ones; blade cordiform, having an obtuse but in higher leaves sometimes acute top and a cordate base, thin, palmately nerved, prominently nerved beneath, crenate and undulate, dull green on both surfaces, with stellate 2–4-branched hairs beneath. *1st Leaf* petiole ± 4 mm; blade with index $1½$, ± 10 by 7 mm, palmately 5-nerved and middle nerve thickest, on both surfaces simple and stellate 2–4-branched colourless hairs. *Highest leaves* (2nd stage) petiole up to ± 9 cm and 1½ mm thick; blade with index slightly < 1 , ± 6 by 6 cm, having a shortly acuminate obtuse top, palmately 7-nerved, prominently nerved on both surfaces, with sparse simple hairs above, stellate 2–4-branched ones beneath; linear gland on main nerves beneath near base. *Top of plant* with dense stellate 2–4-branched hairs; stipules still present in highest still undeveloped leaves; these stipules elliptic, up to ± 7 mm long, having an obtuse top, dull green.

Seeds from 1 motherplant.**THESPESIA SOLAND. ex CORREA**

B. I: 421, 435; K. et V. II: 117; TROUP I: 150

***Thespesia lampas* (CAV.) DALZ. et GIBS. (*Bupariti lampas* (CAV.) ROTHM.)**

B. I: 435

Mal.: kapas utan. *Jav.*: kapasan, kemiren, miren, paskapasan, puret

Fig. 89

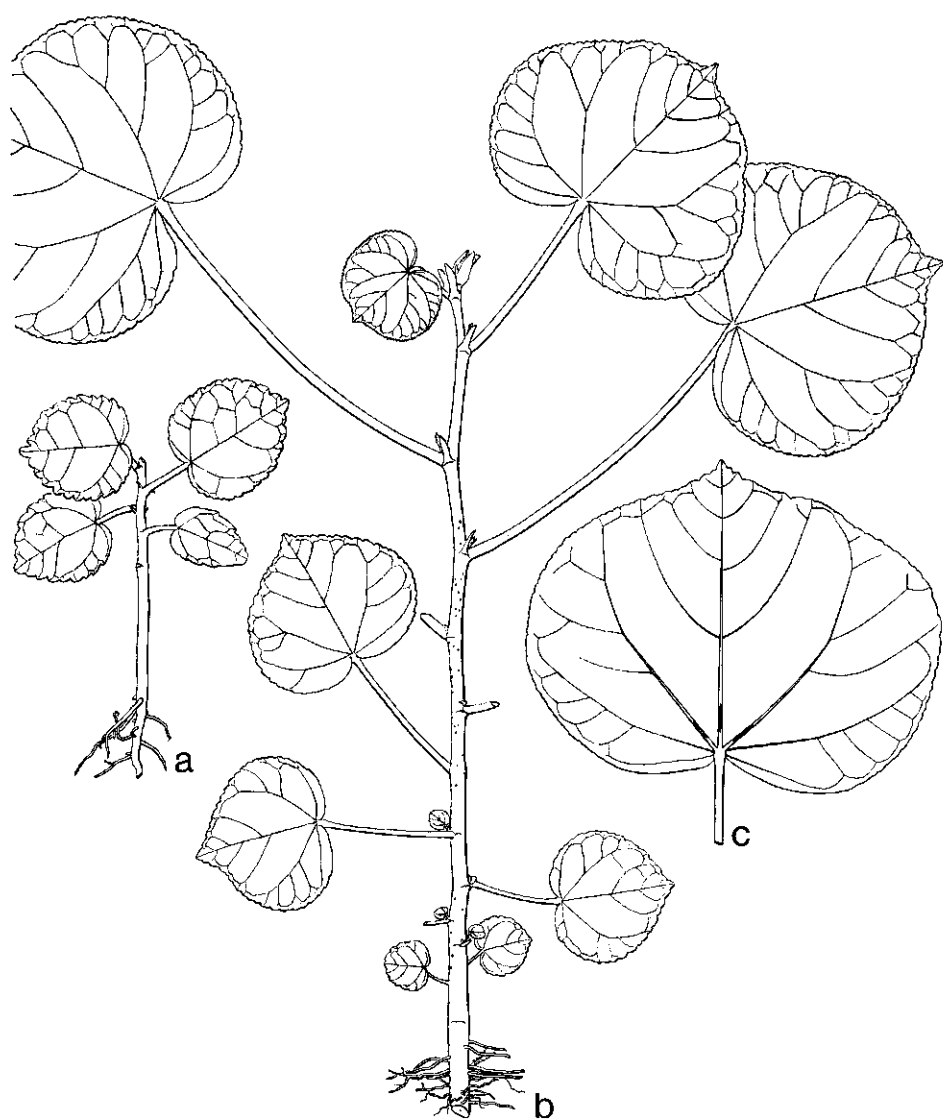


Fig. 88. *Hibiscus tiliaceus* ssp. *similis* a. young seedling, $1/1\times$; b. older seedling, $1/2\times$; c. leaf with glands, $1/1\times$.

Size at 1st stage (1st leaf only) 14–27 cm, 1–8 cm above collet; at 2nd stage (9–13 leaves) 17–31 cm above collet. *Roots* yellow or off white turning whitish yellow; primary root at 1st stage slightly to very flexuous slightly thicker than lateral ones; collet not thickened or gradually and slightly thickened; lateral roots at 1st stage few, moderately flexuous, whether or not branched. *Hypocotyl* epigeous, erect, straight, 7–35 mm; at 1st stage 1–1½ mm thick, terete, smooth, pale green, white or yellow at base, glabrous. *Cotyledons* epigeous, 2, equal, petiolate; petiole 6–12 mm, 1 mm thick, flattened above, convex beneath, pale green, with simple patent colourless hairs; blade broadly obovate, with index ± 1 , 12–19 by 14–17 mm, thin, having a rounded obtuse sometimes slightly exculptate top and a cuneate or rounded base, palmately 5-nerved, entire or slightly undulate, dull green, glabrous. *Epicotyl* 1–6 cm. *Stem* erect; at 2nd stage spiral owing to obtusangular connection of internodes, terete, smooth, green, with stellate much branched yellowish white hairs which come off easily. *Phyllotaxy* spiral. *Leaves* stipulate, simple, petiolate; petiole terete or slightly flattened above, smooth, green, sometimes reddish brown on upper part, hairy like stem; blade cordiform, thin, having a shortly acuminate acute top and a cordate base, palmately nerved, prominently nerved on both surfaces, dull green above, dull greyish green beneath, on both surfaces simple hairs and ones like those on stem, but more simple ones above and more stellate hairs beneath. *1st Leaf* petiole $\frac{3}{4}$ –2 cm, 1–1½ mm thick; blade with index 1–2, 2–4½ by 1½–3½ cm, palmately 5-nerved, entire, hairy like petiole of cotyledons. *Highest leaves* (2nd stage) stipules subulate, up to 7 mm long, green, hairy like stem; petiole up to 17 cm, 4 mm thick; blade with index up to 1½, up to 15 by 18 cm, having a usually shortly acuminate acute top, palmately 3-lobed, thickly hispid to touch, palmately 7-nerved, linear gland $\pm \frac{1}{2}$ cm long beneath on middle nerve ± 1 cm above the base. *Top of plant* with dense green hairs turning densely white and woolly.

Seeds from 4 motherplants from different localities.

MELIACEAE

B. II: 116; K. et V. III: 1; LUBB. I: 334; TROUP I: 178

Cotyledons hypogeous, semi-hypogeous or epigeous; together at side of stem, their upper surfaces in close contact and together covered with testa, or one cotyledon at either side of stem and their upper surfaces facing, or diverging; fleshy or coriaceous or thin; fleshy if hypogeous or semi-hypogeous; sessile or petiolate. *Stem* terete, glabrous or hairy. *Phyllotaxy* spiral but 1st leaves sometimes opposite. *Leaves* exstipulate; pari- or imparipinnate, sometimes imperfectly impari-bipinnate; lowest leaves often simple or 1-foliate or 3-foliate, sometimes scale-shaped.

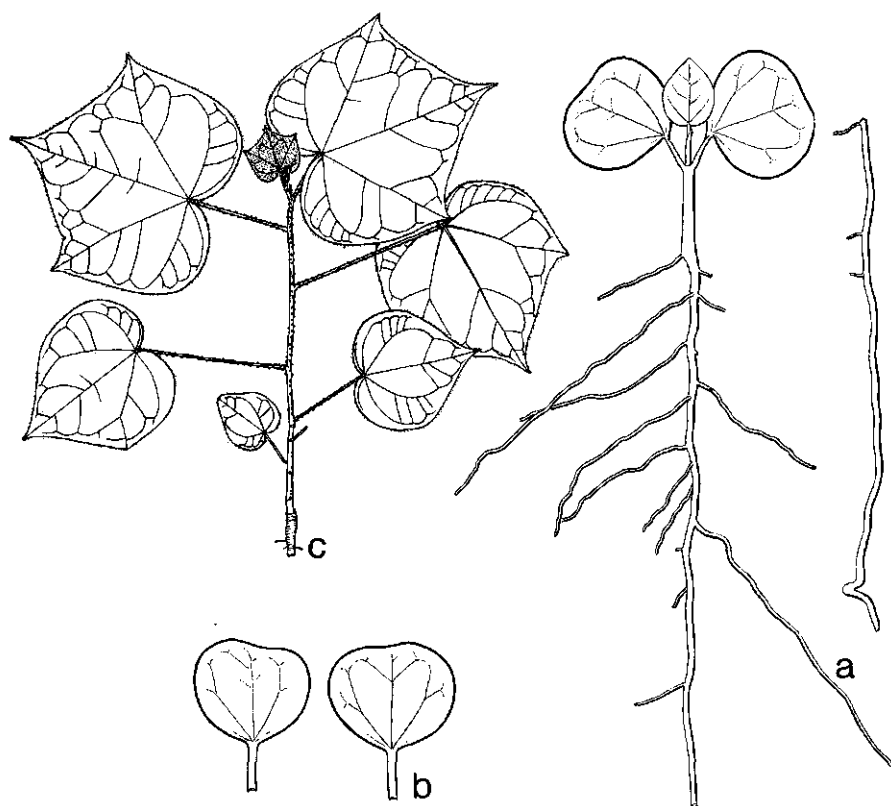


Fig. 89. *Thespesia lampas* a. young seedling, $1/1 \times$; b. cotyledons, $1/1 \times$; c. older seedling, $1/4 \times$.

- | | |
|--|---------------------------|
| 1. A. cotyledons present | 2 |
| B. 1st leaf present | 8 |
| C. higher leaves (with 2–4 pairs of leaflets) present ¹ | 15 |
| 2. a. cot. diverging, epigeous | 3 |
| b. cot. flattened, upper sides facing, hypogeous or semi-hypogeous or epigeous | 4 |
| 3. a. cot. fleshy | <i>Azadirachta indica</i> |
| b. cot. coriaceous | <i>Melia azedarach</i> |
| c. cot. thin | <i>Toona</i> |

¹ *Aglaia* sp., *Dysoxylum densiflorum* and *Xylocarpus granatum* not in this key because no higher leaves were present.

4. a. cot. peltate 5
b. cot. not peltate 6
5. a. stem peltately hairy *Aglaia*
b. stem not peltately hairy *Dysoxylum*
6. a. cot. blade largest dimension < 3 cm 7
b. cot. blade largest dimension > 3½ cm *Xylocarpus granatum*
7. a. cot. blade index > 1 *Swietenia*
b. otherwise *Dysoxylum*
8. a. 1st leaf scale-shaped or simple or 1-foliolate (not: pinnati-lobate, -fid or -partite) 9
b. 1st leaf imparipinnate having 1 pair of leaflets (3-foliolate), or simple and pinnati-lobate or -partite 12
9. a. stem glabrous *Swietenia*
b. stem scaly or hairy 10
10. a. stem peltately hairy *Aglaia*
b. otherwise 11
11. a. 1st 10–20 leaves scale-shaped, no green blade . . . *Xylocarpus granatum*
b. not more than 5 leaves very small, undeveloped, next ones developed possessing a green blade *Dysoxylum*
12. a. blade serrate or crenate 13
b. otherwise *Dysoxylum*
13. a. top of plant mealy with much branched stellate hairs . . . *Melia azedarach*
b. otherwise 14
14. a. stem glabrous *Azadirachta indica*
b. stem hairy *Toona*
15. a. higher leaves imperfectly impari-bipinnate *Melia azedarach*
b. otherwise 16
16. a. blades serrate or crenate 17
b. blades entire 18
17. a. rachis slightly 2-winged; top of plant glabrous or hairy
Azadirachta indica
b. rachis otherwise; top of plant hairy *Toona*
18. a. top of plant glabrous *Swietenia*
b. top of plant hairy 19
19. a. blades of all lateral leaflets largest beneath centre *Toona*
b. in every specimen some lateral leaflets with blades largest in or above centre
Dysoxylum

AGLAIIA LOUR.

B. II: 116, 126; K. et V. III: 125

Cotyledons 2, hypogeous, at either side of stem, their under surfaces facing but not in contact, sessile, peltate, thick-fleshy. *Stem* terete, peltately hairy, shields brown-ciliate. *Phyllotaxy* spiral but 1st 2 leaves usually opposite. *Leaves* exstipulate; lowest ones simple, petiolate, transparently punctate when fresh, in sicco this is not always observable, especially under surfaces peltately hairy like stem.

Cotyledons and (or) 1st leaf present

1. a. cot. under surface $\varnothing \pm 1\frac{1}{2}$ cm; epicotyl ± 19 cm; 1st 2 leaves if developed: blade > 8 cm long, sometimes 1 of the 2 incompletely developed

A. eusideroxylon

b. cot. under surface $\varnothing \pm 1$ cm; epicotyl 4–7 cm; 1st leaves blade < 7 cm long.

A. odoratissima

Aglaiia eusideroxylon K. et V.

B. II: 127; K. et V. III: 128

Jav.: langsung lutung. *Mad.*: lotong, satlotong, lotong pote

Fig. 90

Size at 1st stage (1st 2 leaves) ± 32 cm, ± 22 cm above collet. *Roots* at 1st stage brown; tips white; primary root at 1st stage slightly flexuous, much thicker than lateral ones; collet gradually and slightly thickened; lateral roots moderate in number, moderately flexuous, unbranched. *Hypocotyl* hypogeous, very short. *Cotyledons* hypogeous, 2, at either side of stem, sessile, their under surfaces facing but not in contact; blades peltate, thick-fleshy, flat beneath, convex above, irregularly orbicular beneath, $\varnothing \pm 1\frac{1}{2}$ cm, in centre $\pm 1\frac{1}{4}$ cm thick. *Epicotyl* erect, ± 19 cm; at 1st stage terete, smooth, green, peltately hairy, shields brown ciliate. *Stem* when developing ± 8 leaves: spiral owing to obtusangular connection of internodes, other characters like those of epicotyl but brown hair-shields irregularly ciliate. *Phyllotaxy* spiral but 1st 2 leaves opposite or subopposite. *Leaves* exstipulate; one of 1st 2 leaves sometimes not completely developed, transparently punctate when fresh (in sicco this is indistinct). *1st Developed leaves* simple, petiolate; petiole $1-1\frac{1}{2}$ cm, $1\frac{1}{2}$ mm thick, flattened above, convex beneath, slightly thickened at base, green, hairy like stem; blade oblong, with index slightly > 2 , $10\frac{1}{2}-12$ by $4-5\frac{1}{2}$ cm, thin, having a short-acuminate acute top and an acute base, pinninerved, prominently nerved beneath, repand near top, both surfaces slightly glossy green, both surfaces especially on midrib hairy like stem. *Next 6 developed leaves* 1-foliolate; rachis like petiole of 1st leaf but longer; blade like that in 1st leaf but in lowest leaves smaller than blade in 1st developed leaf, top obtuse; succeeding leaves larger. *Top of plant* hairy like epicotyl.

Seeds from 1 motherplant.

N.B. Only 2 specimens were available and none at an older stage.

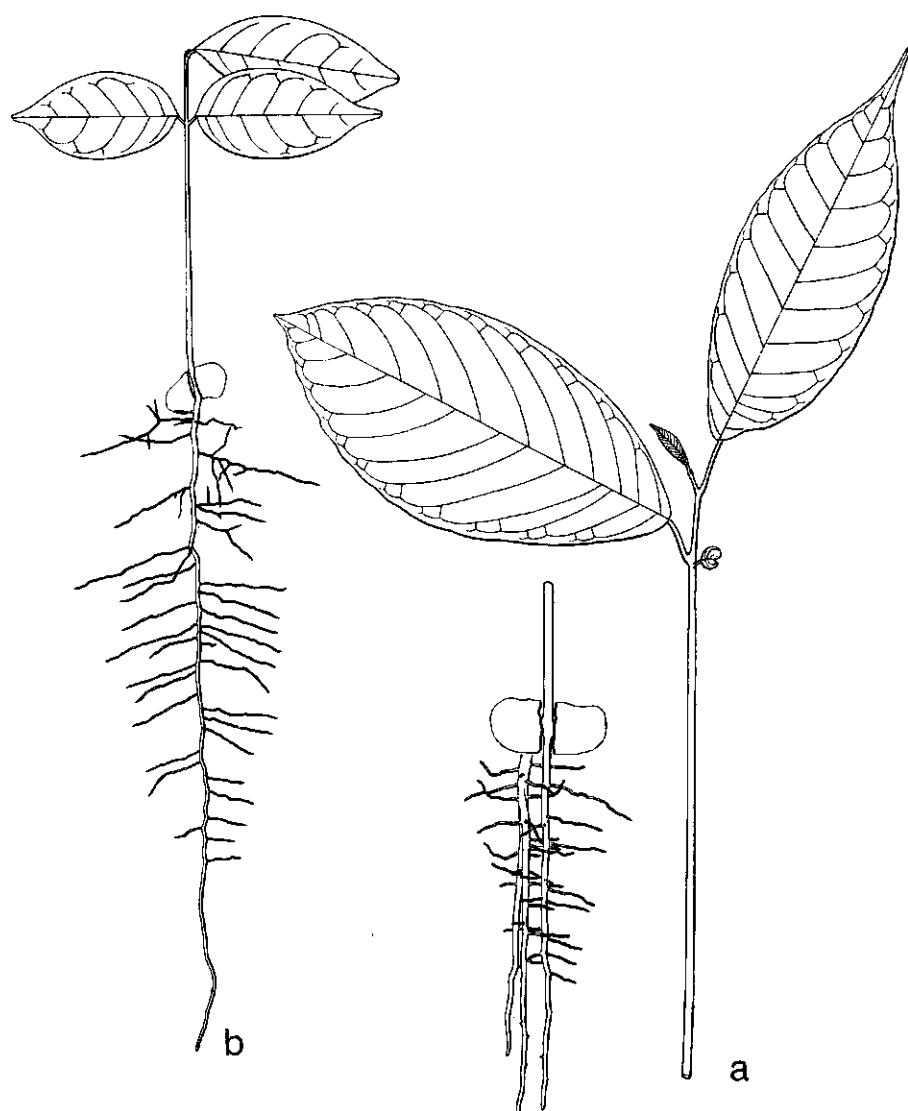


Fig. 90. *Aglaia eusideroxylon* a. young seedling, $1/2 \times$. *Aglaia odoratissima* b. young seedling, $1/2 \times$.

***Aglaia odoratissima* BL. (*A. diepenhorstii* MIQ.)**

B. II: 128; K. et V. III: 148

Mal.: tanglu (*Lamp.*). *Jav.*: pantjal kidang. *Mad.*: pikopijan. *Alf. Minah.*: pisek

Fig. 90

Size at 1st stage (1st 2 leaves only) ± 19 –27 cm, $\pm 4\frac{1}{2}$ –9 cm above collet. *Roots* at 1st stage dirty yellow soon turning black when placed in water; tips white; primary root at 1st stage little flexuous, much thicker than lateral ones; collet gradually and slightly thickened; lateral roots moderate in number, moderately flexuous, sparsely branched. *Hypocotyl* hypogeous, very short. *Cotyledons* hypogeous, 2, almost equal, at either side of stem, sessile, their under surfaces facing but not in contact; blade peltate, semi-globular, flat beneath, convex above, with index slightly > 1 , in centre thickness almost = breadth, ± 1 by $\frac{3}{4}$ cm. *Epicotyl* erect, 4–7 cm long, terete, smooth, green, dirty yellow at base, peltately hairy, shields brown ciliate. *Stem* (when already possessing some leaves) characters, apart from length, like those of epicotyl. *Phyllotaxy* spiral but 1st 2 leaves usually opposite. *Leaves* exstipulate, lower ones simple, higher ones 1-foliolate, petiolate; leaflets petiolulate. *1st Leaf* (if 1st 2 leaves opposite) petiole 2–5 mm, 1 mm thick, green, flattened above, convex beneath, other characters like those of stem; blade ovate or oblong or ovate-oblong, 3 – $5\frac{1}{2}$ by $1\frac{1}{2}$ – $2\frac{1}{2}$ cm, thin-coriaceous, having a shortly acuminate obtuse top and a rounded or acute base, pinninerved and midrib prominent beneath, entire, slightly glossy green above, dull beneath, glabrous above or sparsely and peltately hairy, hairy beneath like epicotyl, very finely and transparently punctate. *Succeeding leaves* petiole (rachis) as in 1st leaf but longer; blade as in 1st leaf but oblong, larger, base in lower leaves rounded in higher ones acute. *Top of plant* brown peltately hairy.

Seeds from 1 motherplant.

N.B. Not enough specimens at an older stage were available.

AZADIRACHTA JUSS.

B. II: 117, 120; K. et V. III: 20; TROUP I: 178

***Azadirachta indica* JUSS. (*Antelaea azadirachta* (L.) ADELB.)**

B. II: 120; K. et V. III: 21; TROUP I: 178, fig. 75

Mad.: mempheuh. *Bali*: intaran

Fig. 91

Size at 1st stage (2 leaves only) 23–47 cm, 5–11 cm above collet; at 2nd stage (16–22 leaves) 34–69 cm above collet. Smelling of garlic. *Roots* white, turning dirty yellow; primary root at 1st stage moderately flexuous, much thicker than lateral ones; collet

gradually thickened sometimes at one side only; lateral roots at 1st stage moderate in number or very numerous, very flexuous. *Hypocotyl* epigeous, erect, straight, $1\frac{1}{2}$ –5 cm; at 1st stage 2–3 mm thick, tapering upwards, terete, smooth, glabrous. *Cotyledons* epigeous, 2, unequal, usually subopposite, highest one shortly petiolate, lowest one sessile; blade elliptic or obovate or oblong or obovate-oblong, with index $1\frac{1}{3}$ – $2\frac{1}{4}$, 9–15 by 4–9 mm, ± 3 mm thick, fleshy, having a rounded obtuse rarely notched top and a cordate arrow-shaped base (lobes soon shriveling), entire, dull light green on both surfaces, glabrous. *Epicotyl* $1\frac{1}{2}$ – $3\frac{1}{2}$ cm, *Stem* erect; at 2nd stage spiral owing to obtusangular connection of internodes, terete, smooth, green or brown, possessing numerous small round yellowish white lenticels, glabrous. *Phyllotaxy* spiral but 1st 2 leaves opposite. *Leaves* exstipulate, imparipinnate; 1st 2–5 leaves 1 pair of leaflets, next 8–15 leaves 2 pairs, succeeding ones 3 pairs. *1st 2 Leaves* rachis $\frac{1}{2}$ – $\frac{3}{4}$ cm, channelled above, 1 mm thick, green, glabrous; leaflets sessile; blades oblong or lanceolate or ovate-oblong or ovate-lanceolate, pinnatifid or -partite, with index 2– $3\frac{1}{2}$, 20–40 by 8–15 mm, thin, having an acute top and an acute or rounded base, pinninerved and midrib prominent on both surfaces, coarsely bi-serrate, on both surfaces slightly glossy green, dark only above, glabrous; lateral leaflets usually 1-lobate at posterior side. *Leaves with 3 pairs of leaflets* rachis 6–14 cm, thickened at base, terete, slightly winged between the pairs, smooth, green, glabrous; leaflets opposite, petiolulate (TROUP: sessile or subsessile), those of middle or of highest pair largest (TROUP: terminal leaflet somewhat larger than lateral ones); petiolule 1–3 mm; blades ovate-oblong, with index 2–3, thin, having a taperpointed acute top and in lateral leaflets an asymmetrical at posterior side acute at anterior side rounded base at both sides narrowed into petiolule, in terminal leaflet an acuminate narrowed base, pinninerved, prominently nerved beneath, coarsely serrate or obliquely crenate, on both surfaces slightly glossy green, glabrous. *Top of plant* glabrous or having small colourless glands, green.

Seeds from 2 motherplants from different localities.

DYSOXYLUM BL. wrong spelling *Dysoxylon*

B. II: 116, 121; K. et V. III: 31; TROUP I: 204

Cotyledons 2, hypogeous or semihypogeous or epigeous but never far above the soil; thick-fleshy, together at side of stem and their upper surfaces facing in close contact, shortly petiolate, not peltate; or at either side of stem, sessile and under surfaces facing but not in contact, peltate. *Stem* terete, glabrous or with simple hairs. *Phyllotaxy* spiral but 1st 2 leaves often opposite. *Leaves* exstipulate; 1st 2 leaves simple undeveloped very small and spirally arranged, or imparipinnate with one pair of leaflets and opposite; followed by ones having more pairs but sometimes by 1-foliolate ones; higher leaves pari- or imparipinnate, sometimes in a transition between these two forms.

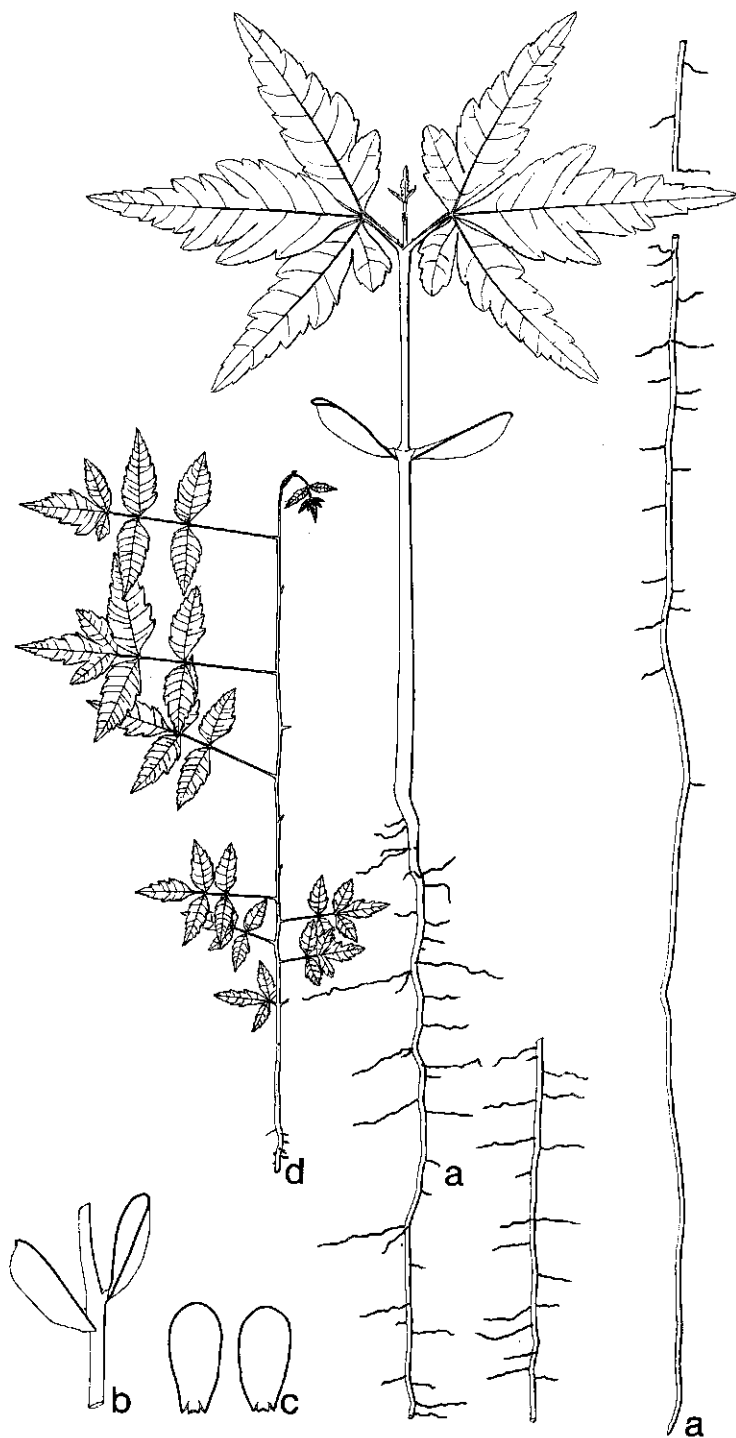


Fig. 91. *Azadirachta indica* a. young seedling, $1/1\times$; b-c. cotyledons, $1/1\times$; d. older seedling, $1/4\times$.

1. A. cotyledons present¹ 2
 - B. 1st leaf present 4
 - C. higher leaves with 3 pairs of leaflets present² 7
2. a. cot. hypogeous, together at side of stem, their flat surfaces in close contact, shortly petiolate *D. gaudichaudianum*
 - b. cot. hypo- or semihypogeous or epigeous, at either side of stem, their flat surfaces facing but not in contact, sessile 3
3. a. cot. semihypogeous or epigeous, rarely hypogeous; blade $\pm 1\frac{1}{2}$ cm long *D. densiflorum*
 - b. cot. epigeous; blade 4–4½ cm long *D. macrocarpum*
4. a. 1st leaf simple, undeveloped, very small; 1st leaves spirally arranged *D. gaudichaudianum*
 - b. 1st leaf imparipinnate, with 1 pair of leaflets; 1st 2 leaves opposite 5
5. a. blades of 1st leaf with index > 3 *D. macrocarpum*
 - b. blades of 1st leaf with index 2–3 6
6. a. blades of 1st leaf obtuse; 1st 2 or 3 leaves followed by 1-foliolate ones *D. densiflorum*
 - b. blades of 1st leaf acute; 1st 2 leaves followed by imparipinnate ones *D. caulostachyum* or *D. parasiticum*
7. a. higher leaves in transition from impari- to paripinnate and in the latter case with mucronate rachis *D. macrocarpum*
 - b. otherwise 8
8. a. blade top with bristle *D. parasiticum*
 - b. blade top without bristle *D. gaudichaudianum* or *D. caulostachyum*

***Dysoxylum caulostachyum* MIQ.**

B. II: 122; K. et V. III: 34

Sund.: kokosan, leuweung, mangir, tanglar. *Jav.*: kraminan, langsep alas, langsep re, langsep were, lolohan, tjempogan, welahan, were. *Mad.*: kapotren. *Timor*: keloh nasa Fig. 92

Size at 1st stage (1st 2 leaves only) 20–45 cm, 3–11 cm above collet; at 2nd stage (9–10 leaves) 14–17 cm above collet. *Roots* yellowish white, turning blackish brown; primary root at 1st stage moderately flexuous, moderately thicker than lateral ones; collet gradually and slightly thickened; lateral roots at 1st stage moderate in number, unbranched. *Hypocotyl* hypogeous, very short. *Cotyledons* hypogeous, fugacious.

1 In this part of the key *D. caulostachyum* and *D. parasiticum* are not present because no cotyledons were available.

2 In this part of the key *D. densiflorum* not present because of insufficiency of the material.

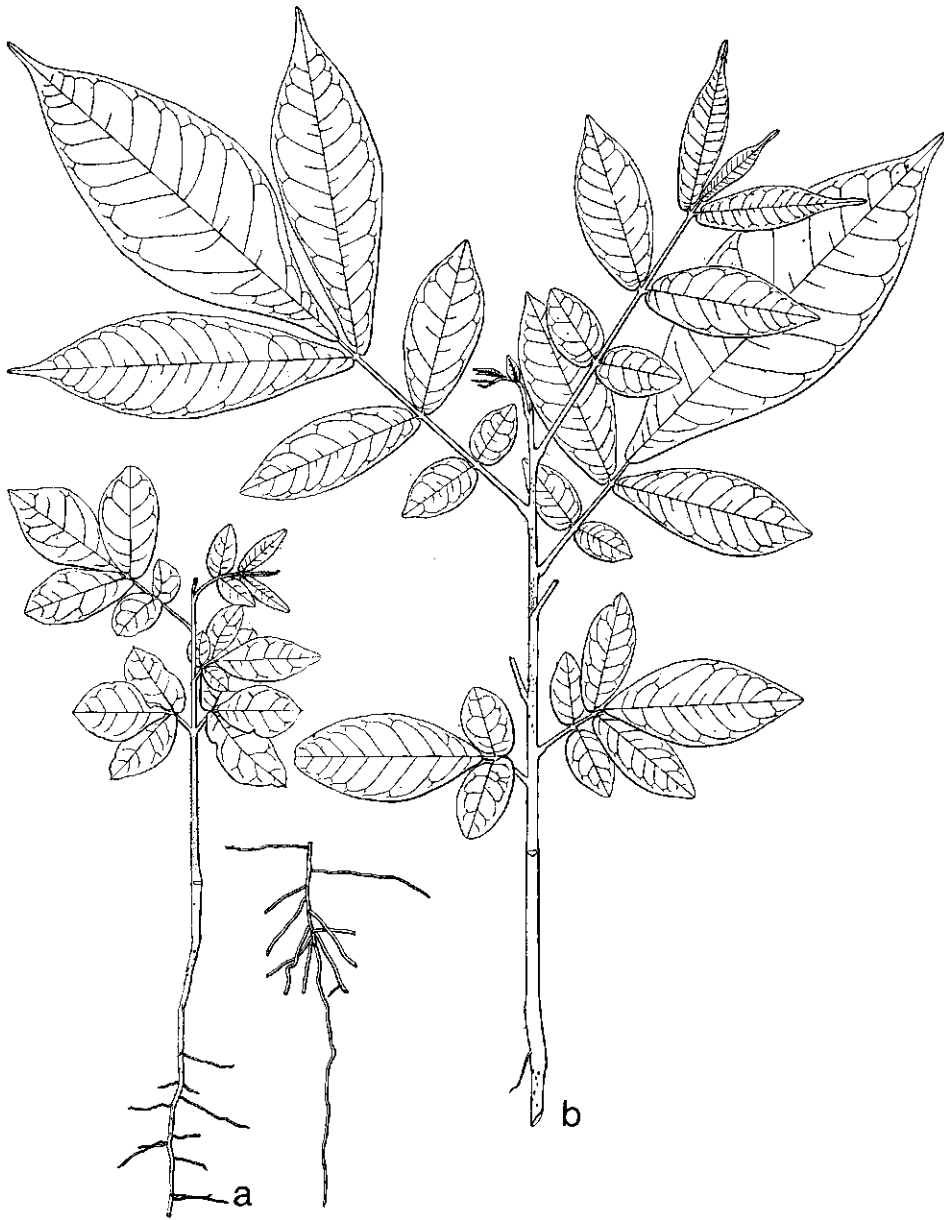


Fig. 92. *Dysoxylum caulostachyum* a. young seedling, $1/2\times$; b. older seedling, $1/2\times$.

Epicotyl erect, straight, 2–5 cm; at 1st stage terete, smooth, green or brown, with simple colourless hairs. *Stem* erect; at 2nd stage almost straight, terete, smooth, green near top, on lower parts brown and possessing numerous lengthwise-elliptic brownish grey lenticels, with simple appressed colourless hairs. *Phyllotaxy* spiral but 1st 2 leaves opposite. *Leaves* exstipulate, imparipinnate, 1st 2 leaves and sometimes some higher ones 1 pair of leaflets, sometimes irregular, next ones 2 pairs, as from 6th or 9th 3 pairs; leaves having 3 pairs sometimes alternating with ones with 2 pairs. *1st 2 Leaves* rachis 5–9 mm, 1–1½ mm thick, thickened at base, flattened above, convex beneath, green, hairy like stem; lateral leaflets opposite, shortly petiolulate; blades of lateral leaflets asymmetrically oblong, with index 2–3, 15–30 by 7–15 mm, thin, having an acute top and an asymmetrically rounded base, pinninerved and midrib prominently nerved on both surfaces, entire, both surfaces dull green and hairy like stem; terminal leaflet like lateral ones but blade obovate-oblong. *Leaves with 3 pairs of leaflets* rachis 2½–7½ cm, 1 mm thick, thickened at base, slightly tapering upwards, terete, smooth, green, hairy like stem but not all hairs appressed; lateral leaflets opposite, petiolulate, lowest pair smallest, terminal leaflet usually largest, petiolule ½–10 mm, in lowest pair shortest, in terminal leaflet longest, green, hairy like rachis; blades of lowest pair ovate, of higher pairs obovate-oblong sometimes oblong, with index 1½–3, 8–130 by 6–45 mm, thin, having an acute but in higher leaflets acuminate acute top and in lateral leaflets a cordate asymmetrically rounded at posterior side lower and at anterior side sometimes acute and in terminal leaflet acute base; lateral and terminal leaflets: blades pinninerved, prominently nerved on both surfaces, entire, sometimes slightly irregularly lobed, slightly glossy dark green above, dull green beneath, ciliate, on both surfaces simple colourless hairs. *Top of plant* hairy, green.

Seeds from 1 motherplant.

***Dysoxylum densiflorum* (BL.) MIQ.**

B. II: 122; K. et V. III: 41

Sund.: maranginan, pingko. *Jav.*: kraminan, tjèpaga. *Mad.*: ampeuluh, kleuruh.

Alf. Minah.: tumbawa

Fig. 93

Size at 1st stage (1st 2 leaves only) 18–27 cm, 7–13 cm above collet. *Roots* at 1st stage light brown; tips white; primary root at 1st stage slightly flexuous, much thicker than lateral ones; collet not thickened; lateral roots at 1st stage few, flexuous, patent, often with an upward bend, not or sparsely branched. *Hypocotyl* epi- or hypogeous, erect, straight, 1–2 cm; at 1st stage 2½ mm thick, terete, smooth, green or yellow. *Cotyledons* usually semi-hypogeous, sometimes epi- rarely hypogeous, 2, unequal, at either side of stem, their under surfaces facing but not in contact and often upper surfaces covered with testa, sessile; blade peltate, thick-fleshy, flat beneath, convex above, in centre ± ¾ cm thick, elliptic or oblong at flat side, with index ± 2, ± 1½ by

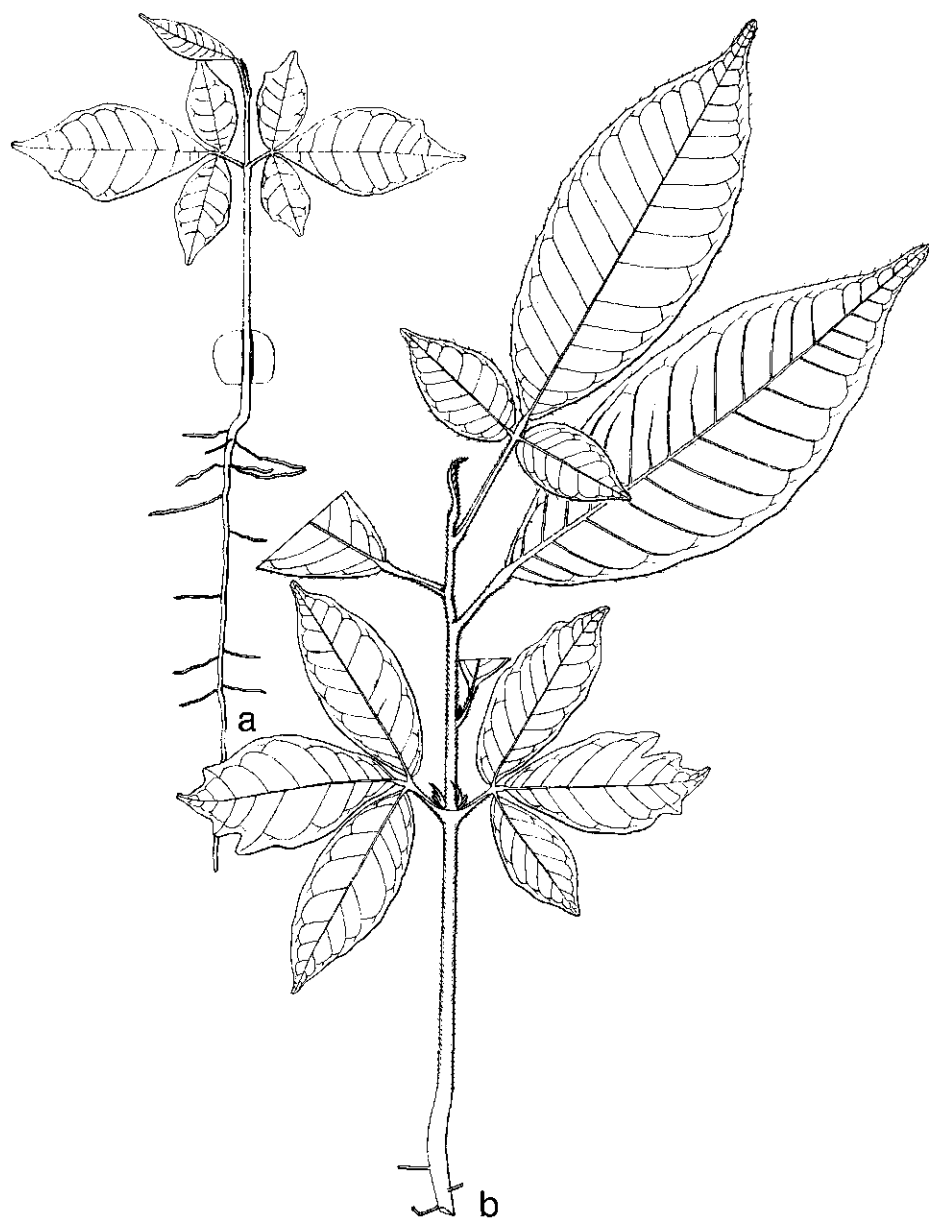


Fig. 93. *Dysoxylum densiflorum* a. young seedling, $1/2 \times$; b. older seedling, $1/1 \times$.

$\frac{3}{4}$ cm, green beneath. *Epicotyl* erect, straight, $5\frac{1}{2}$ –7 cm; at 1st stage terete, smooth, green, with simple patent colourless hairs. *Stem* at 1st stage erect, straight, smooth, green, hairy like epicotyl. *Phyllotaxy* spiral but 1st 2 leaves opposite. *Leaves* exstipulate; 1st 2 leaves imparipinnate, 1 pair of leaflets, sometimes irregular, sometimes one or two of the next ones also 1 pair of leaflets or irregular, succeeding leaves 1-foliolulate, followed by imparipinnate ones possessing 1 pair of leaflets, next ones usually 1-foliolulate again. *1st 2 Leaves* rachis $\pm\frac{1}{2}$ –1 cm, 1–1 $\frac{1}{2}$ mm thick, flattened above, convex beneath, thickened at top and base, green, hairy like epicotyl; leaflets opposite, petiolulate; petiolule \pm 1–3 mm, green, hairy like epicotyl; blades ovate-oblong or oblong, with index 2–3, 2–7 by 1–3 cm, thin-coriaceous, having an acuminate obtuse top and a rounded or asymmetrically rounded or acute base, with midrib prominent on both surfaces and lateral nerves prominent beneath, entire or repand or often irregularly lobate especially near top, often with margin waving up and down, slightly glossy dark green above, dark green beneath, upper surface especially on midrib and beneath all over hairy like epicotyl. *Higher leaves* most of the characters of rachis, petiolules and blades like those of 1st leaf but not lobate and larger. *Top of plant* densely hairy, green.

Seeds from 1 motherplant.

N.B. Seedlings at an older stage than the described one were not available.

***Dysoxylum gaudichaudianum* (Juss.) Miq. (*D. amooroides* Miq.)**

B. II: 121; K. et V. III: 84

Sund.: ki tahi. *Jav.*: doja, kedoja. *Mad.*: ketudjeuk. *Alf. Minah.*: mamalapa
Fig. 94

Size at 1st stage (1st developed leaf only) \pm 26–39 cm, \pm 6–10 cm above collet; at 2nd stage (\pm 10–14 developed leaves) \pm 26–34 cm above collet. *Roots* later brown; primary root at 1st stage very flexuous, moderately thicker than lateral ones; collet gradually and moderately thickened; lateral roots moderate in number, very flexuous, sparsely or unbranched. *Hypocotyl* hypogeous, very short. *Cotyledons* hypogeous, 2, asymmetrical, one another's mirror image, together at side of stem, their upper surfaces in close contact, shortly petiolate; blade asymmetrically-elliptic, $\frac{3}{4}$ –1 $\frac{1}{4}$ by $\frac{1}{2}$ –1 cm, thick-fleshy, flattened above, convex beneath, yellowish green. *Epicotyl* erect, straight, 3–20 cm long; at 1st stage terete, smooth, green or pale green or yellowish green, with simple patent colourless hairs. *Stem* erect; at 2nd stage spiral owing to obtusangular connection of internodes, terete, smooth, green, near base brown, hairy like epicotyl. *Phyllotaxy* spiral. *Leaves* exstipulate; 1st leaves undeveloped, very small, next ones simple, followed by imparipinnate ones, first of these possessing 1 pair of leaflets, succeeding ones having 2, 3 and more pairs of leaflets; as from \pm 9th or 13th developed leaf 3 pairs, sometimes a leaf possessing 2 alternating with ones with 3 pairs. *1st Developed leaf* petiolate; petiole 2–4 mm, green, hairy like



Fig. 94. *Dysoxylum gaudichaudianum* a. young seedling, $1/2\times$; b. older seedling, $1/4\times$.

epicotyl; blade elliptic or ovate, sometimes irregular, with index $1\frac{1}{3}$ –2, 9–29 by 5–18 mm, thin, having a notched or obtuse or acute top and a rounded base, pinninerved, prominently nerved beneath, dull green above, dull light green beneath, on both surfaces simple patent hairs. *Imparipinnate leaves* rachis thickened at base, terete, smooth, green, hairy like stem; leaflets opposite, petiolulate; petiolule green, hairy like stem, in terminal leaflet longest; blades in lowest pair cordiform or ovate, those in higher pairs ovate-lanceolate, in still higher pairs lanceolate, in highest pair and in terminal leaflet obovate-lanceolate, in lowest pair smallest, in highest pair and in terminal leaflet largest, thin, soft-velvety to touch, having an acuminate acute or obtuse top and a base in lowest pair rounded whether or not cordate sometimes

asymmetrical but in higher pairs asymmetrically rounded or acute and in terminal leaflet acuminate acute, pinninerved and midrib prominent on both surfaces but lateral nerves prominent beneath, entire or repand, dull green above, dull light green beneath, whether or not finely and transparently punctate, ciliate, both surfaces hairy like epicotyl. *Leaves with 3 pairs of leaflets* rachis 5–13 cm; petiolules 2–10 mm; blades with index 2–4, 2–16 by 1–5½ cm. *Top of plant* hairy, green.

Seeds from 5 motherplants from different localities.

***Dysoxylum macrocarpum* Bl.**

B. II: 123; K. et V. III: 69

Sund.: ki hadji. *Jav.*: kraminan, mentaos. *Mad.*: njan-minjanan

Fig. 95

Size at 1st stage (2 leaves only) 60–64 cm, 28–30 cm above collet; at 2nd stage (7 leaves) ± 38 cm above collet. *Roots* yellow, turning brown; primary root slightly flexuous, much thicker than lateral ones; collet gradually much thickened; lateral roots few, slightly flexuous, patent, sometimes with a slightly upward bend, unbranched. *Hypocotyl* epigeous, erect, straight or slightly curved, 6½–8 cm; at 1st stage ¾–1 cm thick at base, tapering upwards, ¼–¾ cm thick at top, slightly and laterally compressed, at base lens-shaped in transverse section, at top compression at right angles to the one at the base, dark green but yellowish green at base, glabrous or with very short hairs. *Cotyledons* epigeous, 2, asymmetrical, one another's mirror image, at either side of stem, their under surfaces facing but not in contact, sessile; blade peltate, thick-fleshy, at under surface half-moon-shaped or asymmetrically elliptic, flat and entire, 4–4½ by 2¼–2½ cm, convex above, in centre $\pm 1½$ cm thick, dull dark green above, dull green beneath, glabrous. *Epicotyl* erect, straight, 8–19½ cm; at 1st stage terete, near top slightly and laterally compressed, green, near top sparse very short hairs. *Stem* erect; at 2nd stage spiral owing to obtusangular connection of internodes, terete, smooth, green, near top sparse very short colourless hairs. *Phyllotaxy* spiral but 1st 2 leaves opposite. *Leaves* exstipulate; lower ones imparipinnate, higher ones in transition to paripinnate; 1st 2 leaves 1 pair of leaflets, higher ones 2 pairs. *1st 2 Leaves* rachis 6–7 cm, 2½ mm thick, thickened at base, tapering upwards, flattened above, convex beneath, hairy like stem; leaflets petiolulate; petiolule of terminal leaflet longest, ± 2 mm thick, slightly 2-winged, green, hairy like stem; blades oblong or lanceolate sometimes ovate-lanceolate or obovate-lanceolate, with index $\pm 2½$ –4, ± 4 –21 by 1–6 cm, thin-coriaceous, having an acuminate acute top and in terminal leaflets a taperpointed decurrent base, in lateral leaflets a rounded or acute base decurrent into petiolule, pinninerved, midrib prominent on both surfaces but lateral nerves prominent beneath, entire or repand, slightly glossy dark green above, slightly glossy green beneath, midrib on both surfaces hairy like stem. *Leaves with 2 pairs of leaflets* rachis up to 16 cm, ± 3 mm thick, thickened at base, largely mucronate but sometimes having a little developed terminal leaflet, near base flattened above, con-

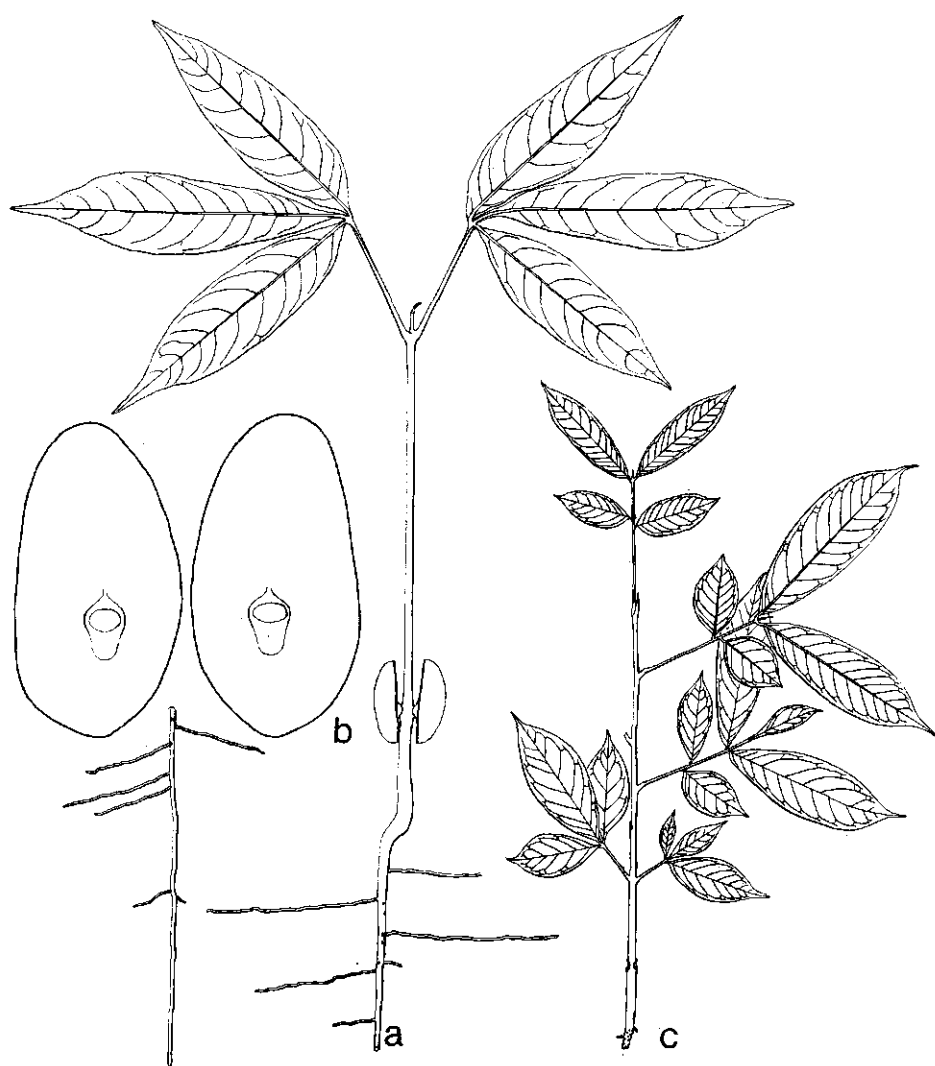


Fig. 95. *Dysoxylum macrocarpum* a. young seedling, $1/4\times$; b. cotyledons, $1/1\times$; c. older seedling, $1/8\times$.

vex beneath, green, hairy like stem; leaflets opposite but lowest pair subopposite, petiolulate; petiolule up to $\pm \frac{3}{4}$ cm, flattened above, convex beneath, green, hairy like stem; blades in lowest pair ovate or elliptic, in highest pair oblong or lanceolate or obovate-lanceolate, up to 22 by 7 cm, thin, having an acuminate acute top and an acute or rounded sometimes asymmetrical base narrowed into petiolule, pinninerved and midrib prominent on both surfaces but lateral nerves only prominent beneath, entire, both surfaces dull green, dark above, nerves hairy like stem. *Top of plant* hairy, green or greyish green.

Seeds from 1 motherplant.

N.B. Only 3 seedlings were available.

***Dysoxylum parasiticum* (OSB.) KOSTERM. (*D. sericeum* (BL.) ADELB.)**

B. II: 122, III: 654; K. et V. III: 39, *D. ramiflorum* MIQ.

Mal.: kulut (*S. Sumatra*). *Sund.*: maranginan, pingko, tanglar. *Jav.*: kraminan, langsep alas. *Lamp.*: re, were, tjempagan

Fig. 96

Size at 1st stage (2 leaves only) ± 25 cm, 5–10 cm above collet; at 2nd stage (7–10 leaves) 17–28 cm above collet. *Roots* yellowish white, turning brown; primary root at 1st stage moderately flexuous, slightly thicker than lateral ones; collet gradually thickened; lateral roots at 1st stage moderate in number, moderately flexuous, sparsely branched. *Hypocotyl* hypogeous, whether or not erect, whether or not straight, 12–15 mm, 3 mm thick, terete, brown or yellow or green, with simple colourless hairs. *Cotyledons* at 1st stage usually fallen; hypogeous, 2, unequal, covered with testa, sessile, thick-fleshy, very irregularly shaped. *Epicotyl* erect, straight, sometimes curved at base, 4–6 cm, 2 mm thick, tapering upwards, terete, smooth, green, possessing orbicular or lengthwise elliptic yellow lenticels, hairy like hypocotyl. *Stem* erect; at 2nd stage sometimes with internodes obtusangularly connected, terete, green near top, brown below, with lengthwise elliptic brown lenticels and simple colourless hairs. *Phyllotaxy* spiral but 1st 2 leaves usually opposite. *Leaves* exstipulate, imparipinnate; 1st 2 leaves 1 pair of leaflets; 3rd–5th or 6th usually 2; 6th or 7th–8th 3 pairs. *1st 2 Leaves* rachis 1–1½ cm, 1–1½ mm thick, thickened at base, flattened above, convex beneath, green, hairy like stem; leaflets petiolulate; lateral ones opposite; petiolule: in lateral leaflets 1–2 mm, in terminal one up to 5 mm, terete, green, hairy like stem; blades oblong or ovate-oblong or obovate-oblong, with index 2–3, 2½–5½ by 1½–2½ cm, in terminal leaflet largest, thin, having an acute top and in lateral leaflets a cordate or rounded or acute often asymmetrical base but in terminal leaflet an acute not asymmetrical base, pinninerved, slightly prominently nerved above but very prominently beneath, undulate, both surfaces dull green, on both surfaces especially on midrib simple brown or colourless hairs. *Leaves having 3 pairs of leaflets* rachis as in 1st leaf but 6–11 cm, 2 mm thick, terete;



Fig. 96. *Dysoxylum parasiticum* a. young seedling, $1/2\times$; b. cotyledons, $1/2\times$; c. older seedling, $1/2\times$.

leaflets petiolulate; lateral ones opposite; petiolule 1–13 mm long, hairy; blade like those in 1st leaf but in lowest pair cordiform-oblong or ovate-oblong or oblong, in terminal leaflet obovate-oblong, $2\frac{1}{2}$ – $15\frac{1}{2}$ by $1\frac{1}{4}$ –5 cm, thin, having a shortly acuminate obtuse bristled top and in lowest pair of leaflets a notched or rounded asymmetrical base but in highest pair usually an acute sometimes at posterior side rounded base, ciliate. *Top of plant* hairy, green.

Seeds from 1 motherplant.

MELIA L.

B. II: 116, 120; K. et V. III: 7; LUBB. I: 335; TROUP I: 183

Melia azedarach L.

B. II: 120; K. et V. III: 12; LUBB. I: 335, fig. 238; TROUP I: 183, fig. 76

Mal.: mindi ketjil. *Jav.*: gringing, mindi

Fig. 97

Size at 1st stage (1 leaf only) 9–30 cm, 3–8 cm above collet; at 2nd stage (11–13 leaves) 15–20 cm above collet. *Roots* white, turning off white or brown; primary root at 1st stage moderately flexuous, moderately thicker than lateral ones; collet whether or not gradually thickened at one side; lateral roots at 1st stage few, moderately flexuous, sparsely branched. *Hypocotyl* epigeous, erect, straight, sometimes curved at base, 13–60 mm; at 1st stage 1– $2\frac{1}{2}$ mm thick, tapering upwards, having a basal part whether or not gradually much thickened at one side, terete, smooth, green, near top sparse simple very short patent colourless hairs. *Cotyledons* epigeous, 2, equal, shortly petiolate (TROUP: sessile; LUBB.: narrowed to a short petiole); blade lanceolate (LUBB.: linear oblong; TROUP: plano convex, linear oblong, apex and base acute or slightly rounded), with index 3–5, 9–15 by $2\frac{1}{2}$ –4 mm, coriaceous, having a rounded obtuse top and a base narrowed into petiole, indistinctly nerved, entire, on both surfaces dull green, glabrous or on both surfaces near base hairy like hypocotyl. *Epicotyl* $\frac{1}{2}$ – $2\frac{1}{2}$ cm. *Stem* erect; at 2nd stage spiral owing to obtusangular connection of internodes, terete, smooth, green, hairy (TROUP: minutely stellate pubescent). *Phyllotaxy* spiral but 1st 2 leaves opposite or subopposite (LUBB.: 1st and 2nd and sometimes 3rd and 4th in almost opposite pairs). *Leaves* exstipulate; lower ones imparipinnate; higher ones imperfectly impari-bipinnate; 1st 2 leaves 1 pair of leaflets, next ones 2 pairs; 11th sometimes already 9th and higher ones 3 pairs 1st order. *1st 2 Leaves* rachis 6–9 mm, $\frac{1}{2}$ mm thick, smooth, green, with simple colourless hairs; leaflets opposite, very shortly petiolulate; petiolule of lateral leaflets 1–3 mm long, of terminal leaflet longer, breadth > thickness, slightly 2-winged, green, hairy like rachis; blades ovate-oblong (LUBB.: lateral segments oblong-lanceolate, terminal lobe cuneate-rhomboid), pinnati-lobate or -fid or -partite, with index slightly > 2, in terminal leaflet largest, \pm 10–30 by $3\frac{1}{2}$ –12 mm, thin, having an acute top and an

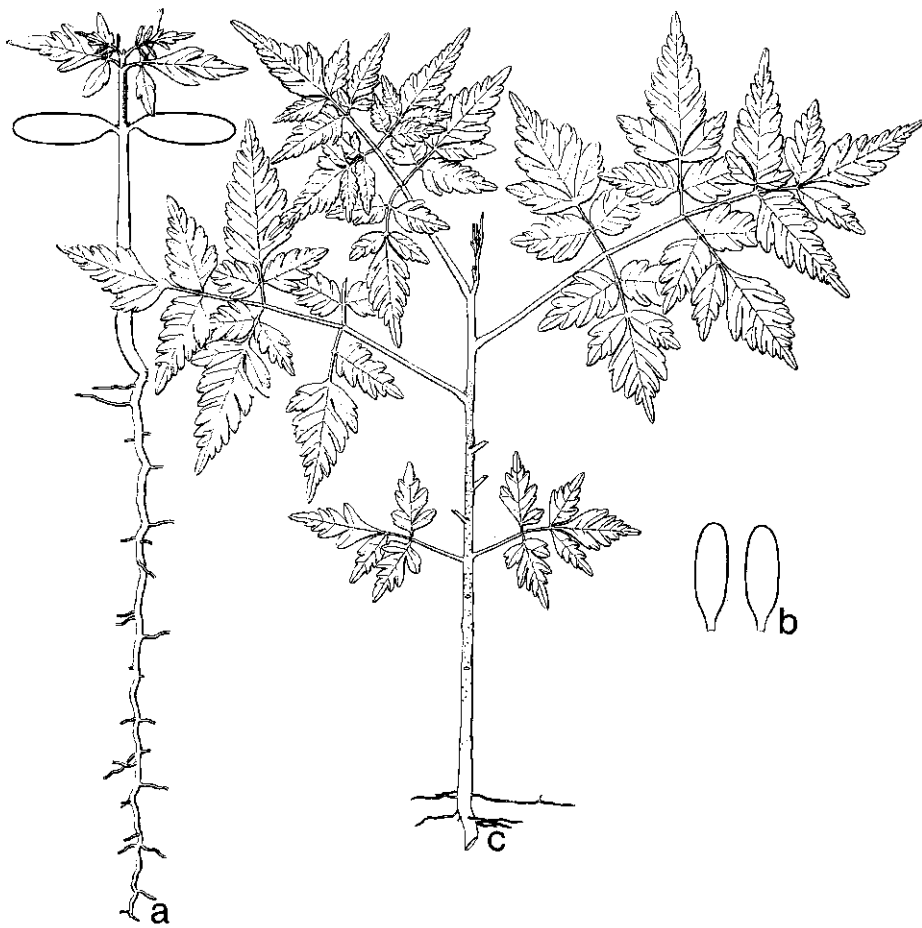


Fig. 97. *Melia azedarach* a. young seedling, 1/1 × ; b. cotyledons, 1/1 × ; c. older seedling, 1/2 × .

acute decurrent in terminal leaflet acuminate base, pinninerved, prominently nerved beneath, irregularly crenate or serrate, both surfaces dull green and with simple colourless hairs (LUBB.: glabrous beneath). Leaves with 3 pairs of leaflets 1st order common rachis $\pm 6\frac{1}{2}$ –8 cm, between 1st pair and terminal leaflet sometimes slightly 2-winged, green, with simple colourless hairs; leaflets 1st and 2nd order opposite; blades \pm like those in 1st leaf but larger. Top of plant with mealy simple colourless hairs and much branched yellowish white stellate hairs.

Seeds from 4 motherplants from different localities.

SWIETENIA JACQ.**B. II: 117; TROUP I: 205**

Cotyledons 2, hypogeous, together at side of stem and their upper surfaces in close contact, covered with testa, petiolate, fleshy, breadth > length. *Stem* glabrous. *Phyllotaxy* spiral but 1st leaves sometimes opposite. *Leaves* exstipulate; 1st 2 leaves scale-shaped or developed; 1st developed leaves simple or 1-foliolate, succeeding ones pari- or imparipinnate, first ones 1 pair of leaflets, number of pairs increasing with succeeding ones; developed leaves sometimes alternating with scale-shaped ones.

1. A. cotyledons and (or) 1st developed leaf present 2
 B. higher (pinnate) leaves present 3
2. a. cot. ± 22 mm broad, transversely oblong; 1st 2 leaves scale-shaped without a green blade *S. macrophylla*
 b. cot. 10–17 mm broad, half-moon-shaped or transversally elliptic or transversely oblong; 1st 2 leaves developed, always with a green blade . *S. mahagoni*
3. a. leaves with 3 pairs of leaflets: blade $4-7\frac{1}{2}$ by $1\frac{1}{4}-2\frac{1}{2}$ cm, base sometimes revolutely auricled *S. mahagoni*
 b. leaves with 2 pairs of leaflets: blade 8–19 by 3–7 cm, base not revolutely auricled. *S. macrophylla*

Swietenia macrophylla KING**B. II: 118; TROUP I: 208***Dutch:* grootbladige mahonie

Fig. 98

Size at 1st stage (1 developed leaf only) 43–58 cm, 18–21 cm above collet; at 2nd stage (15–26 developed leaves) 45–75 cm above collet. *Roots* persistently dirty yellow; tips white; primary root at 1st stage slightly flexuous, much thicker than lateral ones; collet gradually much thickened; lateral roots at 1st stage moderately flexuous, unbranched. *Hypocotyl* hypogeous, very short. *Cotyledons* hypogeous, 2, equal, or asymmetrical and one another's mirror image, together at side of stem, their upper surfaces in close contact, covered with testa, petiolate; petiole 5–6 mm, breadth > thickness, 2–3 mm broad, curved, dirty yellow; blades equal, or asymmetrical and one another's mirror image, transversely oblong, with index $\pm \frac{1}{3}$, ± 8 by 22 mm, fleshy, flattened above, convex beneath, with rounded sides, top and base truncate. *Epicotyl* erect, straight, 4–9 cm, terete, smooth, brownish green, yellow at base, glabrous. *Stem* erect, straight, or spiral owing to obtusangular connection of internodes, terete, smooth, usually red especially near top, sometimes green, brown near base, on lower part numerous round or lengthwise-line-shaped lenticels, glabrous. *Phyllotaxy* spiral but 1st developed leaves sometimes subopposite. *Leaves* exstipulate;

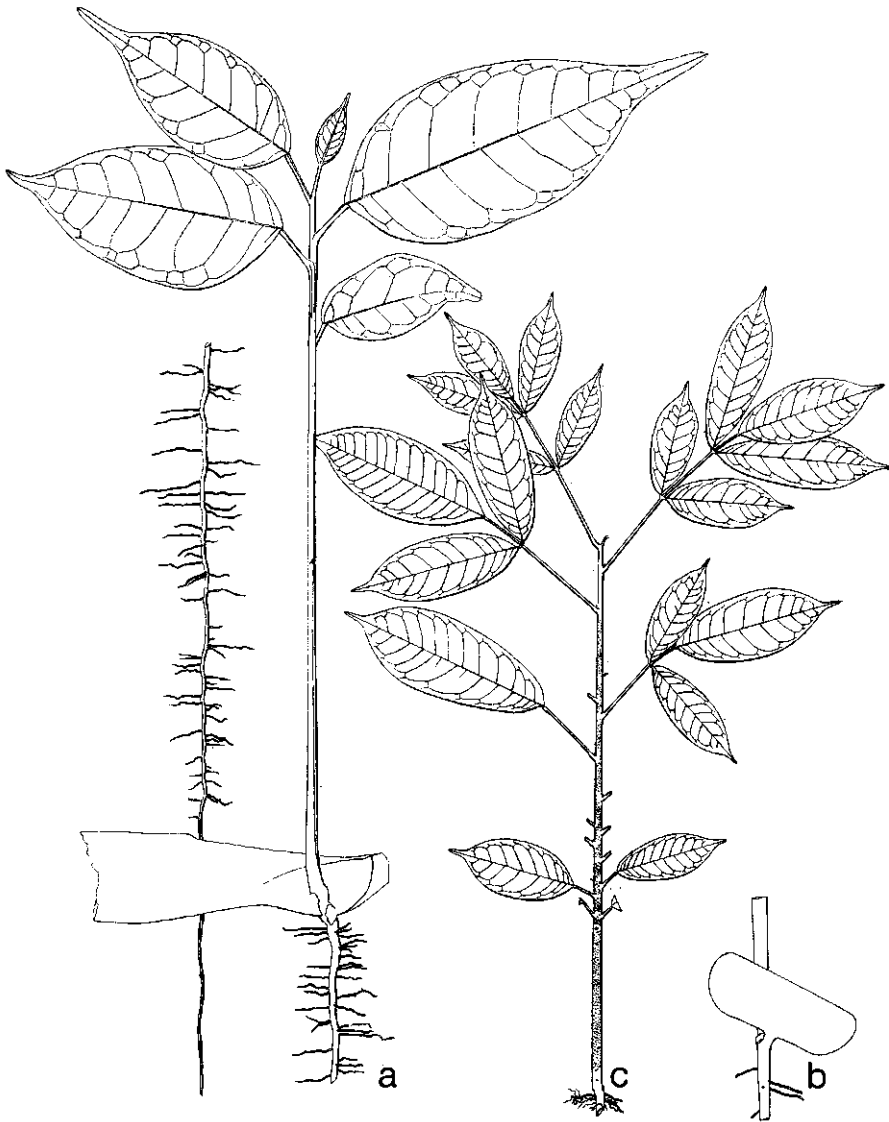


Fig. 98. *Swietenia macrophylla* a. young seedling, $1/2\times$; b. cotyledons, $1/1\times$; c. older seedling, $1/8\times$.

1st 2 leaves scale-shaped; 3rd–11th or 16th developed, sometimes slightly or more distinctly irregular, simple or 1-foliolate; next ones imparipinnate possessing 1 pair of leaflets; as from 14th or 24th leaf imparipinnate having 2 pairs; developed leaves sometimes alternating with scale-shaped ones. *1st Developed leaf* simple or 1-foliolate, petiolate; petiole (rachis) 7–12 mm, 1 mm thick, thickened at top and base, very slightly 2-winged, green, glabrous; blade ovate or ovate-oblong or ovate-lanceolate, with index $1\frac{1}{2}$ –3, 4–10 by $2\frac{1}{2}$ –5 cm, thin, having an acuminate acute top and a rounded or acute base, pinninerved, prominently nerved on both surfaces, entire, slightly glossy green above, dull light green beneath, glabrous. *Next leaves* about the same, but larger; sometimes slightly or more distinctly 1-foliolate, blades oblong or lanceolate, base acute or rounded. *Leaves with 2 pairs of leaflets* rachis 8–19½ cm, ± 2 mm thick, thickened at base, tapering upwards, flattened above, convex beneath, green, glabrous; leaflets opposite, petiolulate, those of utmost pair largest; petiolule 2–3 mm, flattened above, convex beneath, green, glabrous; blades oblong or lanceolate rarely ovate-oblong or ovate-lanceolate, but in terminal leaflet oblong or lanceolate or obovate-oblong or obovate-lanceolate, with index $2\frac{1}{2}$ –3½, 8–19 by 3–7 cm, thin, having an acuminate top often with a sideward bend and an acute base narrowed into petiole, pinninerved, slightly prominently nerved above but considerably so beneath, entire, slightly glossy dark green above, dull beneath, glabrous. *Top of plant* green or red, glabrous or with small white glands.

Seeds from 2 motherplants from different localities.

Swietenia mahagoni (L.) JACQ.

B. II: 118; III: 654; TROUP I: 205

Dutch: kleinbladige mahonie

Fig. 99

Size at 1st stage (1 developed leaf only) 10–52 cm, 3–21 cm above collet; at 2nd stage (20–26 leaves) 27–40 cm above collet. *Roots* yellowish white or yellowish brown turning brownish yellow or reddish brown; tips white; primary root at 1st stage moderately to very flexuous, moderately to much thicker than lateral ones; collet gradually and slightly thickened; lateral roots at 1st stage moderate in number to very numerous, very flexuous, sparsely to unbranched. *Hypocotyl* hypogeous, very short. *Cotyledons* hypogeous, 2, equal, or asymmetrical and one another's mirror image, together at side of stem, their upper surfaces in close contact, covered with testa, petiolate; petiole 3–6 mm, breadth > thickness, white to brown, glabrous; blade sometimes asymmetrically-half-moon-shaped and inserted in centre of rounded side, or transversely elliptic, or transversely oblong, with index $\frac{4}{3}$ – $\frac{5}{3}$, 6–9 by 10–17 mm, fleshy, ± 2 mm thick, rounded at sides, having a truncate top and a rounded base sometimes narrowed into petiole, outer surface reddish grey granular. *Epicotyl* epigeous, erect, straight, 3–9 cm; at 1st stage terete but near top laterally compressed, smooth, green or brown, glabrous. *Stem* erect; at 2nd stage spiral owing

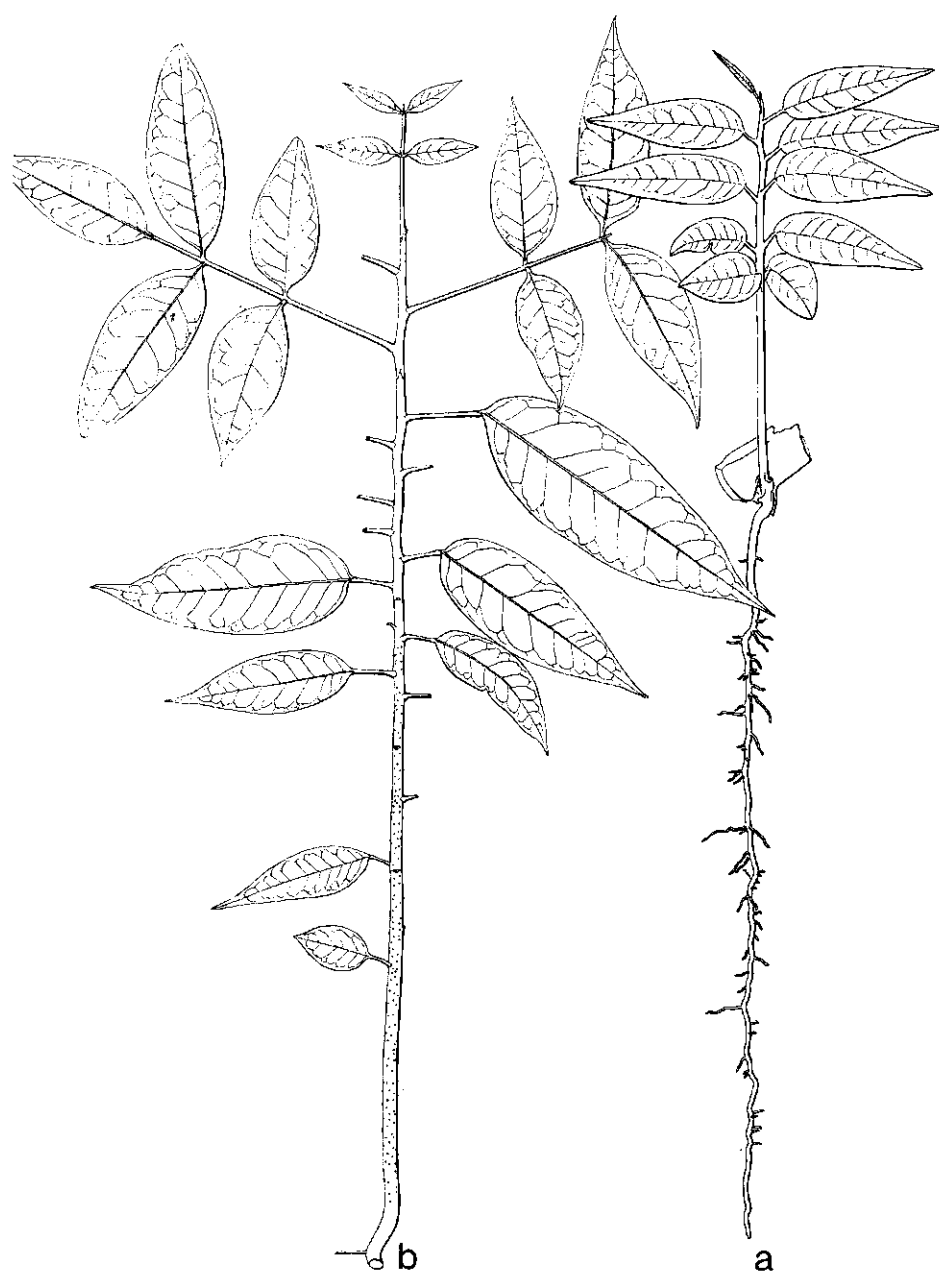


Fig. 99. *Swietenia mahagoni* a. young seedling, $1/2\times$; b. older seedling, $1/2\times$.

to obtusangular connection of internodes, terete or laterally compressed, greyish green, near base numerous orbicular or lengthwise elliptic brownish red lenticels, glandularly hairy. *Phyllotaxy* spiral but lower leaves sometimes decussate. *Leaves* exstipulate; lowest leaves developed, simple; next ones 1-foliolate; as from 11th or sometimes 22th leaf imparipinnate having 1 pair of leaflets, next ones pari- or imparipinnate having 2, and higher ones 3 pairs; sometimes succeeding ones 4 pairs; sometimes some leaves irregularly and transitionally shaped; sometimes developed leaves alternating with some scale-shaped ones, but 1st 2 leaves never scale-shaped. *1st Leaf* simple, petiolate; petiole 3–7 mm, 1 mm thick, channelled above, green, glabrous; blades cordiform-oblong or ovate-oblong or ovate-lanceolate or irregular, with index 2–4, 13–37 by 6–14 mm, thin, having an acute sometimes acuminate top and a rounded or exculptate sometimes asymmetrical sometimes revolutely auricled base, pinninerved and midrib prominent beneath, entire, dull green above, dull light green beneath, glabrous, yellowish green nerves. *Leaves with 3 pairs of leaflets* rachis 9–11½ cm, thickened at base, flattened above, convex beneath, smooth, green, glabrous, in paripinnate leaves mucronate; leaflets opposite, very shortly petiolulate; blades ovate-oblong or ovate-lanceolate, sometimes oblong or lanceolate, often curved to posterior side, sometimes broader at anterior side, with index 2½–5, 4–7½ by 1¼–2½ cm, having an acuminate acute top and a rounded sometimes acute revolutely auricled base sometimes narrowed into petiole, pinninerved, prominently nerved on both surfaces but beneath most, entire, slightly glossy green above, dull beneath, glabrous. *Top of plant* green or red or purple, with numerous small round white glands.

Seeds from 5 motherplants from different localities.

TOONA ROEM.

B. II: 116, 117; K. et V. III: 196, *Cedrela*; TROUP I: 194, *Cedrela*

Cotyledons 2, epigeous, equal, or asymmetrical and one another's mirror image, petiolate. *Stem* terete, glabrous or hairy. *Phyllotaxy* spiral but 1st 2 leaves often opposite. *Leaves* 1st 2 leaves simple and pinnatipartite or imparipinnate; higher ones imparipinnate.

1. A. cotyledons and (or) 1st leaf present 2
 - B. higher (pinnate) leaves present 3
2. a. cot. blade elliptic or ovate, 6–8 mm long, base rounded; epicotyl 2–5 mm; 1st leaf petiole 3–4 mm; root not stinking *Toona sureni*
 - b. cot. blade elliptic or obovate, 8–14 mm long, base shortly acuminate or rounded; epicotyl 4–15 mm; 1st leaf petiole ½–1 cm; root stinking *Toona sinensis*

3. a. root not stinking; leaflets not mucronate *Toona sureni*
b. root stinking; leaflets mucronate *Toona sinensis*

***Toona sinensis* (JUSS.) ROEM. (*Cedrela serrata* ROYLE, *C. sinensis* JUSS.)**
B. II: 117; K. et V. III: 204, *Cedrela serratum* ROYLE; TROUP I: 199, *Cedrela serratum* ROYLE
Mal.: surijan. *Jav.*: suren sabrang
Fig. 100

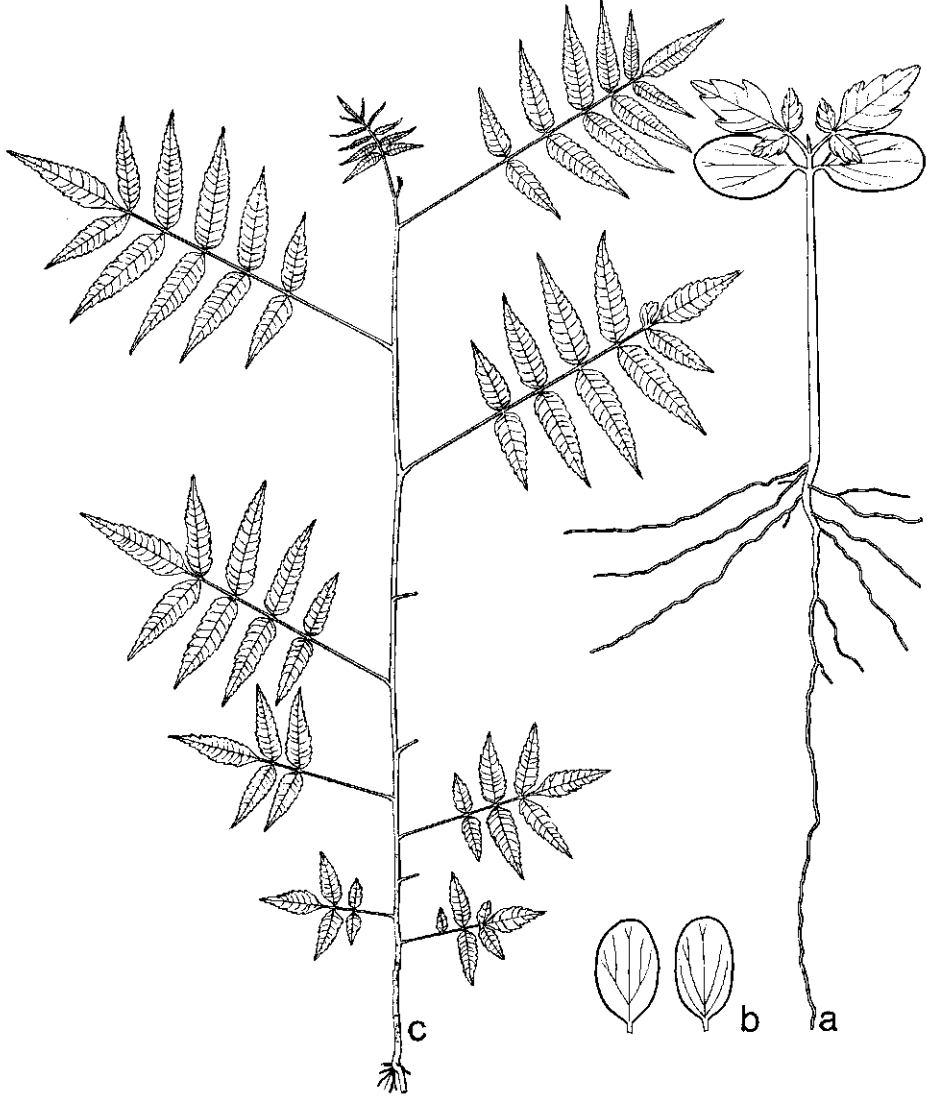


Fig. 100. *Toona sinensis* a. young seedling, 1/1 × ; b. cotyledons, 1/1 × ; c. older seedling, 1/4 × .

Size at 1st stage (1 or 2 leaves only) 8½–20 cm, 2½–6 cm above collet; at 2nd stage (\pm 14–17 leaves) 30–60 cm above collet. Especially roots stinking. *Roots* at 1st stage off white; primary root at 1st stage moderately flexuous, not thicker than lateral ones; collet gradually and slightly thickened; lateral roots few, moderately flexuous, especially near collet very long, sparsely branched. *Hypocotyl* epigeous, erect, straight, 2–5 cm; at 1st stage ½–1 mm thick, 4-angular, pale green or red, white at base, glabrous or near top simple hairs. *Cotyledons* epigeous, 2, equal, or asymmetrical and one another's mirror image, petiolate; petiole 2–4 mm, breadth > thickness, red or green, with simple curved colourless hairs; blade oval or obovate, with index 1½–2, 8–14 by 5–9 mm, thin, having a rounded obtuse top and a shortly acuminate or rounded base narrowed into petiole, indistinctly triplinerved or pinninerved, entire, dull or slightly glossy dark green above, dull light green beneath, glabrous. *Epicotyl* 4–15 mm. *Stem* erect; at 1st stage hairy; at 2nd stage spiral owing to obtusangular connection of internodes, terete, green, near top sparsely hairy, near base glabrous. *Phyllotaxy* spiral but 1st 2 leaves opposite or subopposite. *Leaves* exstipulate, 1st 2 leaves simple and pinnatifid, or imparipinnate and possessing 1–2 pairs of leaflets; higher ones imparipinnate, number of pairs increasing with succeeding leaves; \pm 12th–16th leaf 4–5 pairs. *1st 2 Leaves* petiole (rachis) ½–1 cm, green, sparsely hairy; leaflets opposite, sessile; blades in lateral leaflets irregular, pinnatifid, in terminal leaflet elliptic or ovate, with index 2, 6–12 by 4–6 mm, in terminal leaflet larger, thin, having an acute top and a rounded but in terminal leaflet acuminate acute narrowed base, pinninerved, prominently nerved beneath, near top serrate or crenate or pinnatifid or pinnatifid, dull green above, dull light green beneath, both surfaces especially on main nerves having sparse simple colourless hairs. *Leaves with 4 pairs of leaflets* rachis up to 13 cm, 1 mm thick, thickened at base, tapering upwards, green, near top simple colourless hairs; leaflets opposite, 1st pair smallest, 3rd pair largest, sessile or petiolulate; petiolule 0–2 mm, green, glabrous or sparsely hairy; blades ovate-lanceolate, with index 3–4, up to 7½ by 2 cm, thin, having a taper-pointed or acuminate acute mucronate top and an acute or rounded sometimes asymmetrical but in terminal leaflet sometimes acuminate base, pinninerved, prominently nerved beneath, serrate, dull green above, dull greyish green beneath, sparsely ciliate, both surfaces especially on midrib near base sparsely hairy like rachis. *Top of plant* hairy, green.

Seeds from 4 motherplants from different localities.

***Toona sureni* (BL.) MERR.**

B. II: 117, *Cedrela febrifuga* BL.; K. et V. III: 197; TROUP I: 194, fig. 80

Mal.: ingu, suren. *Sund.*: ki beureum. *Jav.*: laut (young plant), redani, suren

Fig. 101

Size at 1st stage (2 leaves only) \pm 2–4 cm above collet, at 2nd stage (\pm 17–23 leaves) 47–88 cm above collet. Not stinking. *Roots* off white, turning dirty yellow; primary

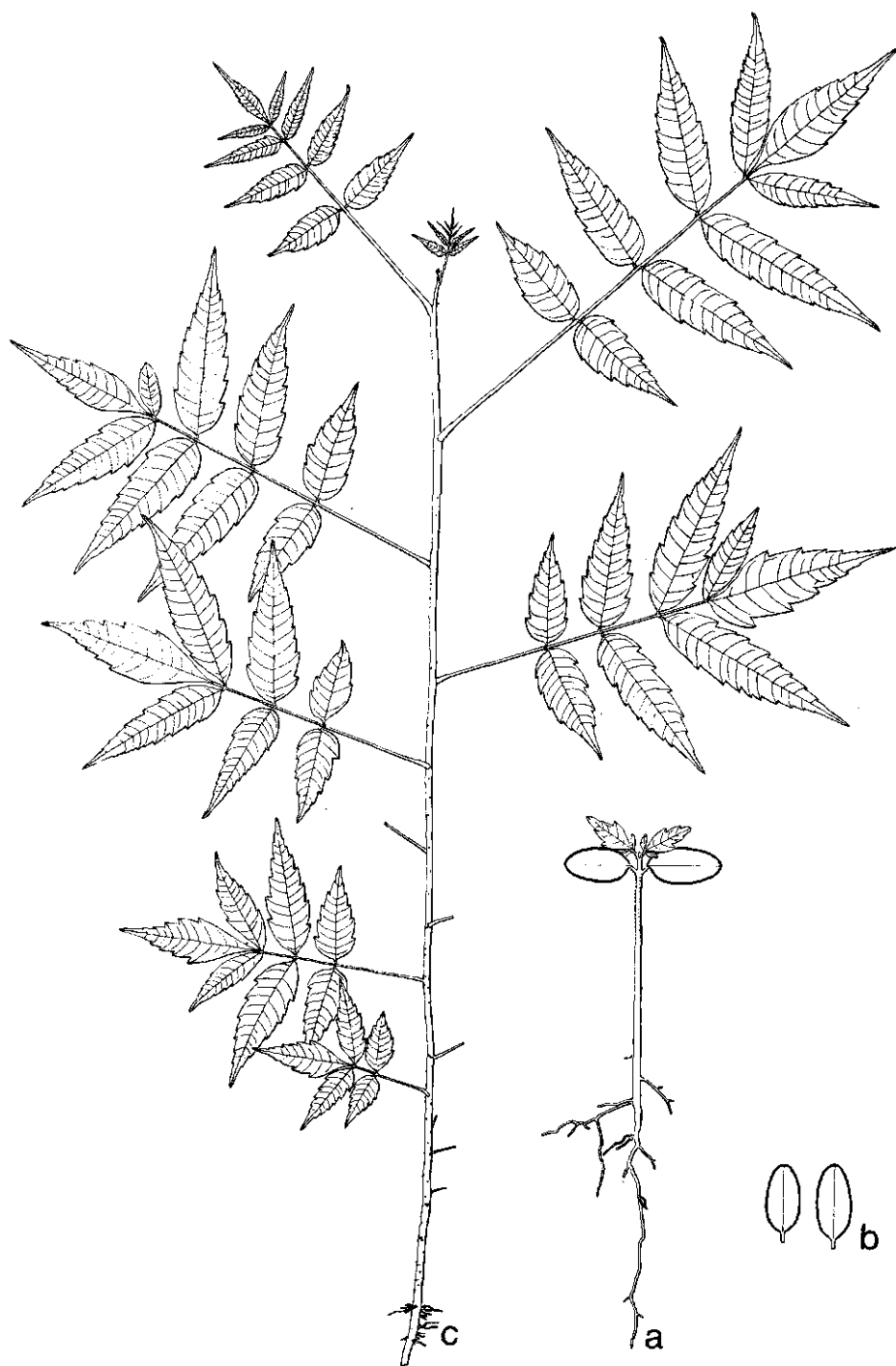


Fig. 101. *Toona sureni* a. young seedling, 1/1 × ; b. cotyledons, 1/1 × ; c. older seedling, 1/4 × .

root at 1st stage in most cases not much developed, very flexuous, not or only slightly thicker than lateral ones; collet gradually and slightly thickened; lateral roots at 1st stage moderate in number, very flexuous, moderately branched. *Hypocotyl* epigeous, erect, straight, sometimes curved at base, 2–3½ cm; at 1st stage 1 mm thick, terete, 4-angular at top (TROUP: terete), pale green, white at base, with simple very short colourless hairs. *Cotyledons* epigeous, 2, equal, petiolate; petiole \pm 2 mm, breadth > thickness, green, hairy like hypocotyl; blade elliptic or ovate, with index 1½–1¾, 6–8 by 3–6 mm, thin, having a rounded obtuse top and a rounded base narrowed into petiole (TROUP: base obtuse or acute), indistinctly nerved, entire, dull green above, dull light green beneath, glabrous (TROUP: minutely pubescent at base elsewhere glabrous). *Epicotyl* 2–5 mm. *Stem* erect; at 2nd stage spiral owing to obtusangular connection of internodes, terete, smooth, green, sometimes red or reddish brown at top, with simple colourless hairs. *Phyllotaxy* spiral but 1st 2 leaves opposite (TROUP: opposite or subopposite). *Leaves* exstipulate; lowest ones simple, pinnatipartite or almost 3-foliolate, petiolate; higher ones imparipinnate, number of pairs of leaflets increasing with succeeding leaves, as from \pm 16th or 20th leaf 4 pairs. *1st 2 Leaves* petiole 3–4 mm, green, hairy like stem; blade pinnatipartite, ovately lobate, 5–10 by 4–8 mm, thin, having an acute top and a notched base, palmately 3-nerved or pinninerved, prominently nerved beneath, serrate (TROUP: lobes entire or coarsely and irregularly serrate or crenate), dull green above, dull light green beneath, both surfaces hairy like stem. *Leaves with 4 pairs of leaflets* rachis up to 23 cm, \pm 2 mm thick, thickened at base, tapering upwards, green or red or reddish brown, hairy like stem; leaflets opposite or subopposite, shortly petiolulate; petiolule flattened above, convex beneath, green, hairy like stem; blades ovate or ovate-oblong or ovate-lanceolate, in terminal leaflet sometimes lanceolate, with index 2–4, usually largest in highest but one pair of leaflets, up to 14½ by 4 cm, having an acuminate acute top and a rounded or shortly acuminate or only an acute asymmetrical base narrowed into petiolule (TROUP: base acute), pinninerved, prominently nerved beneath, coarsely serrate, rarely entire, dull green above, dull light green beneath, ciliate, both surfaces hairy like stem especially on midrib (TROUP: glabrous above). *Top of plant* hairy, green.

Seeds from 3 motherplants from different localities.

XYLOCARPUS KOEN.

B. II: 117, 118; K. et V. III: 189, *Carapa*; TROUP I: 186, *Carapa*

***Xylocarpus granatum* KOEN.**

B. II: 118; K. et V. III: 189, *Carapa obovata* BL.; TROUP I: 187, *Carapa obovata* BL.

Mal.: pohon kira kira, niri, njireh. *Sund.*: miri, niri. *Jav.*: djombo, niri, njiri, njiri abang

Fig. 102

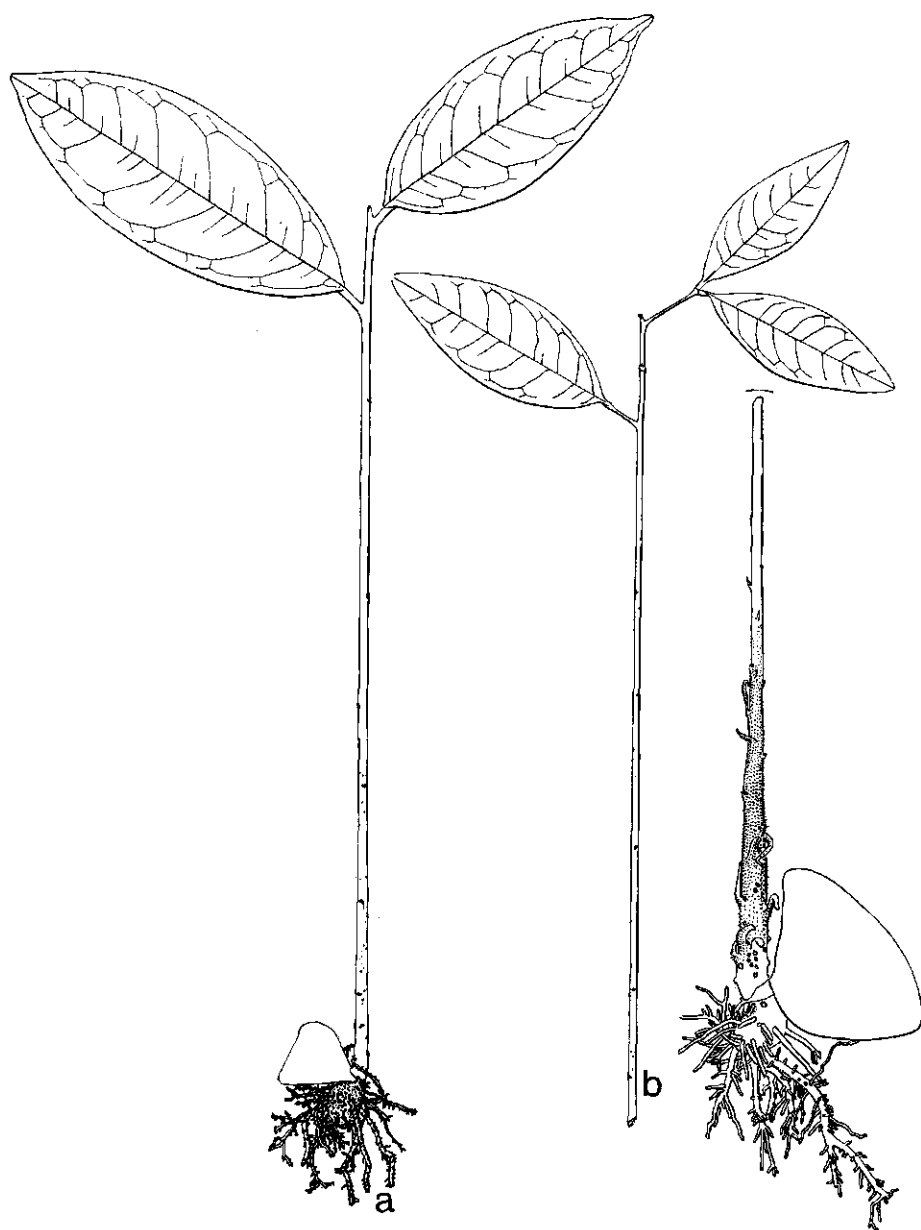


Fig. 102. *Xylocarpus granatum* a. young seedling, $1/2\times$; b. older seedling, $1/4\times$.

Size at 1st stage (1 developed leaf only) 32–46 cm, 27–41 cm above collet. *Roots* brown turning brownish red, younger parts yellow; tips white; primary root at 1st stage very thick, very short; lateral roots at 1st stage very numerous, slightly flexuous, sometimes growing upwards, patently much branched. *Hypocotyl* hypogeous, $\pm \frac{1}{2}$ cm; at 1st stage 1–1 $\frac{1}{4}$ cm thick, terete, brownish red, possessing large round brownish yellow lenticels. *Cotyledons* hypogeous, 2, together at side of stem, their upper surfaces in close contact, usually covered with testa, shortly petiolate; 2 blades together irregularly globe-segment- or globe-sector-shaped, largest dimension 5 $\frac{1}{2}$ –8 cm, brownish red, transverse section red. *Epicotyl* usually hypogeous, erect, straight, 0–1 cm; at 1st stage $\frac{3}{4}$ cm thick, terete, brown, coarsely and scaly hairy; lenticels like those on the hypocotyl. *Stem* erect; 1st 10–20 internodes like epicotyl, very short; at 2nd stage straight, but higher internodes obtusangularly connected, terete, smooth, brown, glabrous. *Phyllotaxy* spiral. *Leaves* exstipulate; 1st 10–20 ones scale-shaped, next 9–10 ones very small, simple; succeeding ones developed 1-foliolate, followed by some paripinnate ones having 1 pair of leaflets and then by leaves with 2 pairs. *1st Developed leaf* rachis 4–10 mm, flattened above, convex beneath, 1 $\frac{1}{2}$ mm thick, thickened at top and usually thickened at base, glossy brown, glabrous; blade oblong, with index 2–2 $\frac{1}{2}$, 7 $\frac{1}{2}$ –12 by 3–4 $\frac{1}{2}$ cm, having an acute or obtuse whether or not mucronate top and a rounded or acute base, pinninerved and midrib prominent beneath, entire, slightly glossy green above but red on midrib, dull light green beneath, possessing scattered dark green orbicular glands, glabrous. *Higher leaves* leaflets opposite, petiolulate; blades obtuse, other characters usually like those of 1st developed leaf. *Top of plant* brownish red or brownish green, glabrous.

Seeds from 1 motherplant.

N.B. Seedlings grown in sand sprinkled with fresh water.

MORACEAE

B. II: 12; K. et V. XI: 1; TROUP III: 862

Cotyledons 2, equal or unequal, hypogeous or semi-hypogeous, petiole. *Stem* hairy. *Phyllotaxy* spiral or distichous-alternate; lowest leaves sometimes opposite. *Leaves* sometimes lowest ones scale-shaped; stipulate, petiolate, simple, usually hispid; stipules hairy. *Plant* with latex.

Cotyledons and (or) higher leaves (\pm 5th developed leaf and next ones) present

1. a. smallest cotyledon fugacious, largest one folded upwards; stem grading into a feather-shape with a sideward bend; stipules of higher leaves not amplexicaul, not leaving an annulate scar *Streblus asper*
- b. cotyledons and stem otherwise; stipules of higher leaves (\pm 5th developed

leaf and next ones) together amplexicaul and leaving an annulate scar

Artocarpus

ARTOCARPUS J.R. et G. FORST.

B. II: 14, 18; K. et V. XI: 11; TROUP III: 876

Cotyledons 2, hypogeous or semihypogeous, diverging and covered with testa beneath, or together at side of stem and their upper surfaces facing and remaining in testa, equal or unequal, petiolate, thick-fleshy. *Stem* erect, hispid. *Phyllotaxy* spiral but sometimes 1st 2 leaves opposite. *Leaves* stipulate, lowest ones usually scale-shaped; stipules intrapetiolar, in higher leaves together amplexicaul, leaving an annulate scar, if the leaves are opposite the four stipules together amplexicaul. *Plant* with latex.

Cotyledons and 1st developed leaf and (or) higher leaves present

1. a. lowest developed 2 leaves opposite; leaves with bristle on top and on marginal teeth *A. rotunda*
 b. 1st leaves scale-shaped, spirally arranged; leaves without bristles on top or margin 2
2. a. cotyledons $\pm \frac{1}{2}$ cm long, asymmetrical; epicotyl when young green and possessing colourless hairs; leaves dull beneath; blade in \pm 5th developed leaf and higher ones with a rounded base *A. elastica*
 b. cotyledons 1–3 $\frac{3}{4}$ cm long, symmetrical; epicotyl when young dark green and reddish brown hairy; leaves glossy beneath; blade in \pm 5th developed leaf and higher ones with an acute base. *A. integra*

Artocarpus elastica REINW. ex BL.

B. II: 18; K. et V. XI: 13

Mal.: bakil (*Bill.*), kerbang, tambran (name of young form), tarok, terep. *Sund.*: benda, teureup. *Jav.*: benda, b. ketan, b. kebo. *Mad.*: kokap

Size at 1st stage (1st developed leaf only) \pm 30 cm, 8 cm above collet, at 2nd stage (\pm 8 developed leaves) \pm 15–23 cm above collet. *Plant* with white latex. *Roots* lemon-yellow turning orange but having lemon-yellow younger parts; tips white; primary root at 1st stage slightly to moderately flexuous, much thicker than lateral ones; collet not or gradually and slightly thickened. *Hypocotyl* hypogeous, very short. *Cotyledons* hypogeous, 2, asymmetrical, one another's mirror image, together at side of stem, their upper surfaces in close contact, usually remaining in testa; petiole $\pm \frac{1}{2}$ cm, fleshy, breadth > thickness, 2 $\frac{1}{2}$ mm broad, yellow, with simple colourless hairs; blade up to \pm 7–15 mm long, asymmetrical, breadth > length, thick-fleshy, yellow. *Epicotyl* at 1st stage erect, straight, up to \pm 1 $\frac{1}{2}$ cm long, having a gradually and slightly thickened base, terete, smooth, dark green, with simple stiff patent reddish brown hairs. *Stem* at 2nd stage erect, straight, or spiral owing to obtusangular

connection of internodes, terete, hispid, with simple patent uncinat reddish brown or colourless hairs. *Phyllotaxy* spiral. *Leaves* stipulate; 1st-2nd or 4th leaves scale-shaped, next ones developed; stipules 3-angular, hairy like epicotyl, those in higher leaves together amplexicaul, intrapetiolar, leaving an annulate scar. *Developed leaves* simple, petiolate; petiole terete, green, hairy like stem; blade thin, pinninerved, prominently nerved beneath, entire or irregularly incised, dull green above, dull light green beneath, ciliate, on both surfaces simple patent colourless hairs. *1st Developed leaf* stipules up to $\pm \frac{1}{2}$ cm long; petiole $\pm \frac{1}{2}$ cm, 1 mm thick; blade ovate often irregular, ± 2 by $1\frac{1}{2}$ -3 cm often smaller, top acute or obtuse, base acute or rounded or cordate. *Highest developed leaves* stipules $\pm 1\frac{1}{2}$ cm long; petiole up to ± 12 mm long, 3 mm thick; blade obovate-oblong, with index $\pm 2\frac{1}{2}$, up to ± 23 by $9\frac{1}{2}$ cm, having a shortly acuminate acute top and a rounded base, entire or repand or shallowly and remotely dentate; ± 10 th leaf and higher ones sometimes pinnately lobed. *Top of plant* enclosed in hairy stipules of highest leaf.

Seeds from 5 motherplants from different localities.

***Artocarpus integra* (THUNB.) MERR.** (*A. polyphema* Auct. non PERS., *A. integrifolia* L.f., nom. illeg.)

B. II: 19; K. et V. XI: 19; TROUP III: 878, fig. 324

In many languages: nangka

Size at 1st stage (1st leaf only) 50-110 cm, 18-44 cm above collet; at 2nd stage (± 5 developed leaves) 39-67 cm above collet. *Plant* with white latex. *Roots* yellow turning a beautiful orange-red; tips yellow or white; primary root at 1st stage slightly flexuous, much thicker than lateral ones; collet not or gradually and slightly thickened; lateral roots very numerous, very flexuous, much branched. *Hypocotyl* hypogeous, very short. *Cotyledons* 2, usually hypogeous, sometimes semihypogeous, very unequal, the smaller one parting like a valve from the larger one, usually diverging; petiole up to ± 1 cm, sometimes very short, breadth > thickness, thick-fleshy, usually whitish yellow rarely green; blade of smallest cotyledon elliptic or oblong, usually curved, with index 1-2 $\frac{1}{2}$, 1-3 $\frac{1}{2}$ by 1-1 $\frac{1}{2}$ cm, having a rounded obtuse top and a base narrowed into petiole, flattened above, globose beneath, often covered with testa beneath, usually light green, where in daylight dark green, glabrous; blade of largest cotyledon irregularly terete ovoid-oblong, obliquely truncate above, with index 2-2 $\frac{1}{2}$, 2 $\frac{1}{2}$ -3 $\frac{3}{4}$ by 1 $\frac{1}{2}$ -1 $\frac{3}{4}$ cm, usually thickness slightly > breadth, thick-fleshy, a hole in the base beneath; other characters like those of the smaller cotyledon. *Epicotyl* erect, straight, up to ± 6 cm; at 1st stage terete, smooth, green or white or yellow, hispid, with simple stiff patent often uncinat yellowish white hairs. *Stem* erect; at 2nd stage straight, or spiral owing to obtusangular connection of internodes, terete, smooth, near base brown, green in higher part, hairy like epicotyl, sticky to touch owing to the hairs. *Phyllotaxy* spiral. *Leaves* stipulate, 1st-5th or 9th ones scale-shaped, next ones developed, petiolate; stipules caducous, 3-angular, in higher

leaves ovate-lanceolate, having an acute top, intrapetiolar, in higher leaves together amplexicaul and leaving annulate scar, up to 2 cm long, membranous, hairy. *Developed leaves* petiole slightly flattened above, green, hairy like epicotyl; blade ovate or elliptic or oblong, in lowest leaves sometimes asymmetrical, with index $1\frac{1}{2}$ – $2\frac{1}{2}$, thin (TROUP: coriaceous), coarse and thick to touch, having a shortly acuminate acute or obtuse top in lower developed leaves and a rounded base narrowed into the petiole but in higher leaves an acute base, pinninerved, prominently nerved beneath, entire or very slightly and remotely dentate (TROUP: obscurely crenate or entire), in highest leaves sometimes lobed at one side, dull dark green but lighter green on nerves above, slightly glossy light green beneath, ciliate, both surfaces hairy like epicotyl (TROUP: minutely pubescent and scabrous). *1st Developed leaf* petiole 4–10 mm; blade 5–15 by 3– $7\frac{1}{2}$ cm. *Highest leaves* petiole up to 13 mm; blade up to 18 by 8 cm. *Top of plant* covered with hairy stipules of the topmost leaf.

Seeds from 5 motherplants from different localities.

Artocarpus rotunda (HOUTT.) PANZER (*A. rigida* BL.)

B. II: 18; K. et V. XI: 17

Mal.: keledang (*Bill.*), mandalika (*Djak.*), purin (*Bangka*), tampunei, tawan (*S. Sum.*).

Sund.: kosar, peusar

Size at 1st stage (1 leaf only but if the 1st 2 leaves are opposite or the 1st 3 leaves in a whorl: 2 leaves only or 3 leaves only) 18–27 cm, 5–9 cm above collet; at 2nd stage (7–9 leaves) 13–19 cm above collet. *Plant* with white latex. *Roots* off white turning a beautiful orangish red; primary root at 1st stage moderately flexuous, much thicker than lateral ones; collet gradually and moderately thickened; lateral roots at 1st stage very numerous, very flexuous, much branched. *Hypocotyl* hypogeous, very short. *Cotyledons* hypogeous, 2, usually unequal, their upper surfaces in close contact, together at side of stem within testa, petiolate; rarely semihypogeous and diverging, one at either side of stem and covered with testa only beneath; petiole $\pm \frac{1}{2}$ cm, slightly channelled above, yellow, glabrous; blade ovate or oblong or obovate or obovate-oblong, thick-fleshy, flat or concave above, convex beneath, with index $\frac{1}{2}$ – $2\frac{1}{2}$, 11–14 by 5–8 mm, having an obtuse top and a base gradually narrowing into petiole, yellow, if exposed to daylight greenish. *Epicotyl* erect, straight, $4\frac{1}{2}$ –9 cm; at 1st stage 2 mm thick, terete, smooth, green, whitish green at base, sticky owing to simple patent colourless uncinat hairs. *Stem* erect, spiral owing to obtusangular connection of internodes, terete, smooth, brown near base, green near top, hispid owing to simple colourless stiff hairs. *Phyllotaxy* 1st 2 leaves opposite rarely spirally arranged; rarely 1st 3 leaves in a whorl; succeeding ones spirally arranged. *Leaves* stipulate, simple, petiolate; stipules intrapetiolar, together amplexicaul, in lowest 2 opposite leaves 4 stipules together amplexicaul, narrow-3-angular, in next ones ovate-lanceolate, having an acute top, up to 2 cm long, membranous, hairy like stem, caducous, leaving an annulate scar; petiole terete, smooth, green, hairy like stem; blade thin, hispid and thick to touch,

having an acute top, pinninerved, with nerves sunk above and prominent beneath, remotely dentate, slightly glossy on both surfaces, dark green above, light green beneath, ciliate, a long bristle on top and teeth, nerves on both surfaces hairy like stem; highest leaves uncinat-hairy beneath and owing to this sticky to touch, with straight hairs above. *1st Leaf* stipules ± 4 mm long; petiole 3–6 mm; blade cordiform or ovate or elliptic or oblong, with index $1\frac{1}{3}$ – $2\frac{1}{2}$, $2\frac{1}{2}$ – $6\frac{1}{2}$ by 1 – $3\frac{1}{2}$ cm, having an acute sometimes obtuse top and an asymmetrically cordate or -rounded base. *Topmost leaves* (2nd stage) petiole up to $\frac{3}{4}$ cm, $2\frac{1}{2}$ mm thick; blade obovate-oblong, with index 2 – $2\frac{1}{2}$, up to 17 by $7\frac{1}{2}$ cm, having a shortly acuminate acute top and a rounded base. *Top of plant* within hairy stipules of topmost leaf.

Seeds from 1 motherplant.

STREBLUS LOUR. emend. CORNER

B. II: 16; K. et V. XI: 6

Streblus asper LOUR. var. *asper*

B. II: 16; K. et V. XI: 7

Jav.: serut. *Mad.*: peleh

Size at 1st stage (1st developed leaf only) 12–30 cm, 2–7 cm above collet; at 2nd stage (± 20 –30 developed leaves) 23–32 cm above collet. *Plant* with white latex. *Roots* light reddish brown turning yellowish white; tips red; primary root at 1st stage very flexuous, moderately thicker than lateral ones; collet gradually thickened; lateral roots at 1st stage very numerous, very flexuous, much branched. *Hypocotyl* hypogeous, 3–5 mm long. *Cotyledons* hypogeous, 2, unequal, shortly petiolate, larger one covered with testa, smaller one free from testa; blade of smaller one very small, fugacious; blade of larger one folded upwards and filling up the globose remains of the seed, $\varnothing 4$ –6 mm, pale green. *Epicotyl* erect, straight, 1–15 mm long; at 1st stage terete, smooth, green, with simple patent colourless hairs. *Stem* erect, straight turning feather-shaped with a sideward bend, zigzag owing to obtusangular connection of internodes, terete, smooth, green, with hispid hairs like those on epicotyl. *Phyllotaxy* lower leaves spirally arranged, next ones distichous-alternate. *Leaves* 1st 1–3 leaves scale-shaped, higher ones developed, stipulate, simple, petiolate; stipules 3-angular, green, hairy; blade of developed leaves thin, pinninerved and nerves prominent beneath, margin serrate. *1st Developed leaf* stipules ± 2 mm long; petiole ± 2 mm; blade orbicular or ovate or obovate or irregular, with index ± 1 , sometimes length $>$ sometimes $<$ breadth, 6–15 by 4–14 mm, having an obtuse or acute top and a rounded or cordate base, on both surfaces dull green and hispid like epicotyl. *Highest leaves* (2nd stage) petiole 2–3 mm, curved; blade obovate-oblong, with index 3, up to $11\frac{1}{2}$ by 4 cm, having a shortly acuminate acute top and an asymmetrically-cordate at posterior side lower base, slightly glossy dark green above, dull green beneath, not

ciliate, on both surfaces coarse appressed colourless hairs especially on the nerves.
Top of plant hairy, green.

Seeds from 5 motherplants from different localities.

MYRSINACEAE

B. II: 194; K. et V. V: 215; LUBB. II: 187; TROUP II: 636

ARDISIA SWARTZ

B. II: 194, 196; K. et V. V: 243; LUBB. II: 191

Ardisia humilis VAHL

B. II: 200; K. et V. V: 255, 271

Mal.: rampanai (*Minangk.*), djambulan pante (*Menad.*), daun kikiran (*Ambon*).

Sund.: lampani. *Jav.*: lempeni. *Alf. Amb.*: nanhe it. *Aru*: tanasa

Fig. 103

Size at 1st stage (1st leaf only) 12–45 cm, $3\frac{1}{2}$ –6 cm above collet; at 2nd stage (25–41 leaves) 16–24 cm above collet. *Roots* white near collet, blue in lower part, turning dirty pale pink; tips white; primary root at 1st stage very flexuous, much thicker than lateral ones; collet gradually and slightly thickened; lateral roots at 1st stage moderate in number, very flexuous, moderately or unbranched. *Hypocotyl* epigeous, erect, straight; at 1st stage 3–6 cm, 1–2 mm thick, terete, smooth, pale green, pink at base; with simple very short brown hairs. *Cotyledons* epigeous, 2, rarely 3, equal, rarely asymmetrical, shortly petiolate; blade elliptic or ovate, with index 1–2, $1-2\frac{1}{2}$ by $1-1\frac{1}{4}$ cm, thin-coriaceous, having a notched top and an acute narrowed base, pinninerved and midrib prominent beneath, entire or slightly crenate, dull dark green on both surfaces, transparently red punctate near margin, glabrous. *Epicotyl* 1–9 mm. *Stem* erect; at 2nd stage straight, terete, smooth, brownish green, red near top, glabrous. *Phyllotaxy* spiral; lower leaves rarely opposite. *Leaves* exstipulate, simple, petiolate; blade thin-coriaceous, pinninerved and midrib prominent beneath. *1st Leaf* ovate or oblong or lanceolate, with index 2–3, having an obtuse or acute top and an acute narrowed base, entire or slightly crenate, rarely deeper incised, punctate like cotyledons, hairy on midrib beneath. *Highest leaves* (2nd stage) petiole up to 1 cm, up to 2 mm thick, flattened above, convex beneath, reddish violet or green, glabrous; blade long-lanceolate, with index 7, up to 15 by $2\frac{1}{2}$ cm, having a taper-pointed acute top and a long-taperpointed or acuminate base narrowed into petiole, entire, rarely slightly undulate near top, slightly glossy green on both surfaces, transparently punctate, glabrous. *Top of plant* hairy turning glabrous, green or yellowish green with red.

Seeds from 3 motherplants from different localities.

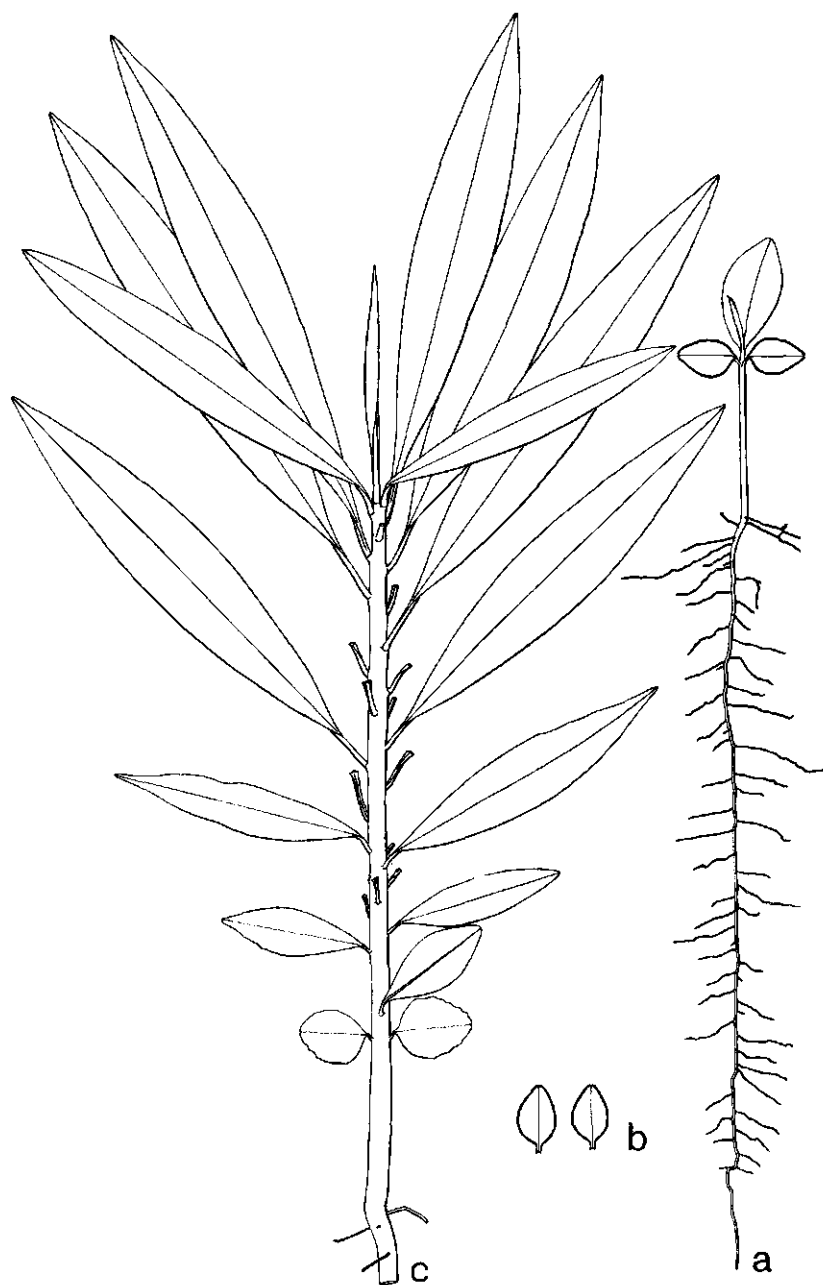


Fig. 103. *Ardisia humilis* a. young seedling, $1/2\times$; b. cotyledons, $1/2\times$; c. older seedling, $1/2\times$.

MYRTACEAE

B. I: 333; III: 646; K. et V. VI: 27; LUBB. I: 523; TROUP II: 548

Cotyledons 2, hypogeous, semihypogeous or epigeous; if hypogeous or semihypogeous: sessile or petiolate and whether or – rarely – not peltate, thick-fleshy; if epigeous: foliaceous, thin, petiolate; if hypogeous or semihypogeous: with upper sides facing or diverging, usually enclosed by or partly covered with remains of seed, rarely together at side of stem. *Stem* erect, 4-angular near top, glabrous or hairy. *Phyllotaxy* decussate, sometimes sub-decussate. *Leaves* exstipulate; developed ones simple, petiolate, transparently punctate, sometimes intramarginally nerved; if cotyledon hypogeous or semihypogeous: lowest leaves scale-shaped, developed and scale-shaped leaves often alternating. *Plant* whether or not fragrant.

Cotyledons and (or) 1st developed and (or) higher leaves present.

1. a. cot. hypogeous or semihypogeous, thick-fleshy; lowest leaves scale-shaped, higher developed leaves intramarginally nerved *Syzygium*
 b. cot. epigeous, thin; lowest leaves developed; higher leaves not intermarginally nerved 2
2. a. cot. blade: top emarginate; plant glabrous all over. *Eucalyptus*
 b. cot. blade: top obtuse or acute; stem and leaves slightly or more distinctly hairy, especially top of plant hairy 3
3. a. cot. blade: with obtuse top, 2–4 mm long; leaves pinninerved
Tristania conferta
 b. cot. blade: with acute top, 7½–9 mm long; leaves 3-plinerved
Rhodamnia cinerea

EUCALYPTUS L'HÉRIT.

B. I: 334, 348; K. et V. VI: 174; LUBB. I: 530; TROUP II: 556

Roots collet abruptly thickened into disk-shape. *Hypocotyl* epigeous, erect, 4-angular near top. *Cotyledons* epigeous, 2, equal, petiolate; blade obreniform, thin or coriaceous, having an emarginate top, palmately 3-nerved, entire. *Epicotyl* erect, straight; at 1st stage 4-angular. *Phyllotaxy* lower leaves decussate. *Leaves* exstipulate, simple, finely and transparently punctate. *Plant* fragrant, glabrous all over.

Cotyledons and (or) 1st leaf present

- a. cot blade: index 1¾–1, 9–10 mm broad, coriaceous; 1st leaf whether or not developed; if developed: sessile, acute *E. globulus*
- b. cot. blade: index ½, 2–5½ mm broad, thin; 1st leaf developed, petiolate, obtuse .
E. tereticornis

***Eucalyptus globulus* LABILL.**

B. I: 349; LUBB. I: 530, fig. 339; TROUP II: 573

Fig. 104

Size at 1st stage (1 leaf or 2 opposite leaves only) 10–19 cm, 4–5½ cm above collet. *Plant* very fragrant. *Roots* at 1st stage off white; primary root at 1st stage very flexuous, slightly or not thicker than lateral ones; collet abruptly thickened into disk-shape; lateral roots at 1st stage very numerous, very flexuous, much branched. *Hypocotyl* epigeous, erect, straight, 3–3½ cm; at 1st stage ½–1 mm thick, tapering upwards, having a base abruptly thickened to disk-shape, 4-angular but terete near base, red, base white. *Cotyledons* epigeous, 2, equal, petiolate; petiole 3–4 mm, ½ mm thick, breadth > thickness, red; blade obreniform, with index $\frac{2}{3}$ – $\frac{1}{3}$, 3–4 by 9–10 mm, having a deeply emarginate top and an acute base narrowed into petiole, coriaceous, palmately 3-nerved, entire, dull green above, red beneath. *Epicotyl* erect, straight, 2½–7 mm; at 1st stage 4-angular, red or green. *Phyllotaxy* 1st 4 leaves spirally arranged or decussate. *1st Leaf* whether or not developed; if developed: exstipulate, simple, sessile; blade lanceolate (LUBB.: linear lanceolate), 3–5 by 1 mm, having an acute top and base, thin, 1-nerved, entire, transparently punctate, green. *Plant* glabrous all over.

Seeds from 1 motherplant.

N.B.: no seedlings at an older stage were obtained because they died.

***Eucalyptus tereticornis* J. E. SMITH**

B. I: 349; TROUP II: 588

Fig. 104

Size at 1st stage (1st leaf only) 1½–5 cm, 1–2 cm above collet; at 2nd stage (8–12 pairs of leaves) 12–37 cm above collet. *Plant* fragrant. *Roots* permanently off white; primary root at 1st stage very flexuous, slightly thicker than lateral ones; collet abruptly and moderately thickened into disk-shape; lateral roots at 1st stage moderate in number, very flexuous, moderately branched. *Hypocotyl* epigeous, erect, straight; at 1st stage very thin, 4-angular, red, base white. *Cotyledons* epigeous, 2, equal, petiolate; petiole 1–2 mm long, green or red; blade obreniform, with index $\pm \frac{1}{2}$, 1–2½ by 2–5½ mm, thin, having an emarginate top and a shortly acuminate or slightly exculptate base narrowed into petiole, palmately 3-nerved, entire, dull green above, dull green or red beneath. *Epicotyl* erect, straight, 6–8 mm; at 1st stage very thin, 4-angular, pale green or red. *Stem* erect, straight; at 2nd stage 4-angular, slightly 4-winged near top, terete near base, green near top, brownish grey below. *Phyllotaxy* lower leaves decussate, higher ones subdecussate. *Leaves* exstipulate, simple, petiolate; blade thin, having an obtuse sometimes very shortly acuminate obtusangular top and a decurrent base, pinninerved, entire, dull green above, dull greyish green beneath, finely and transparently punctate.

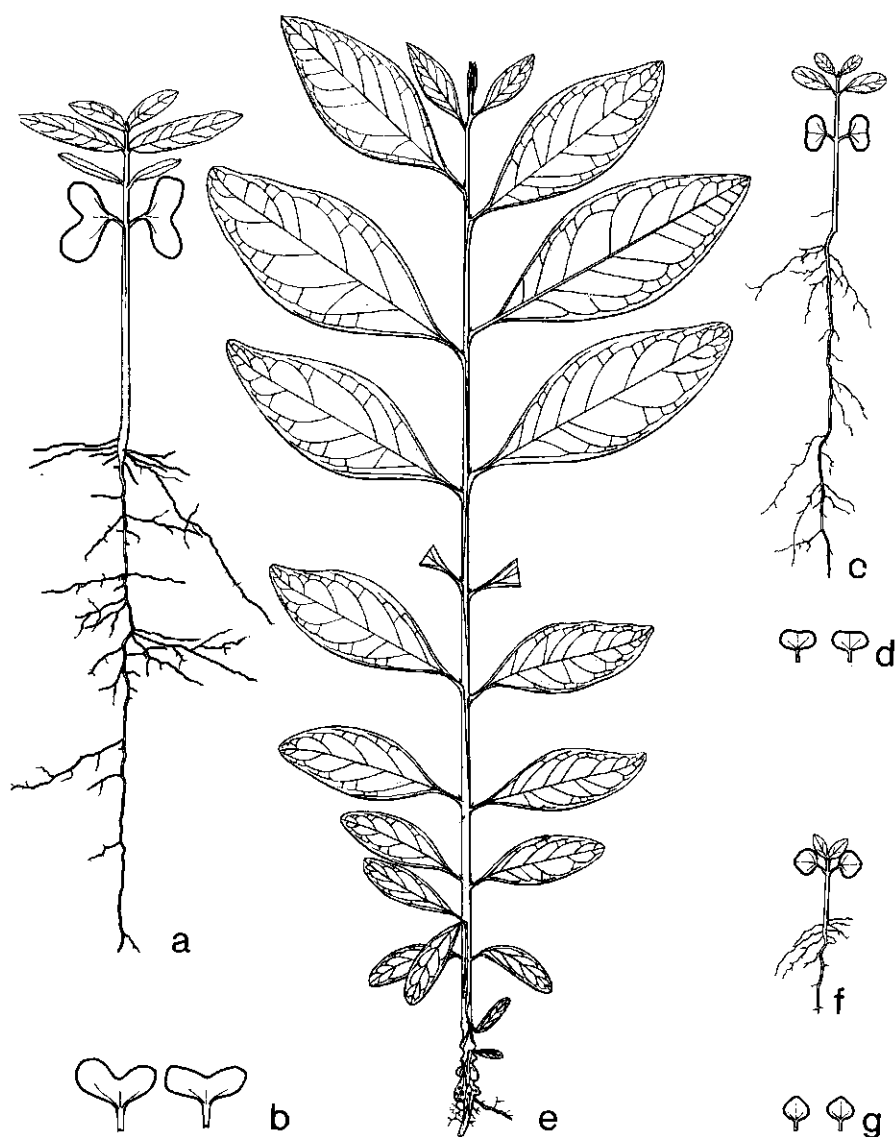


Fig. 104. *Eucalyptus globulus* a. young seedling, $1/1\times$; b. cotyledons, $1/1\times$. *Eucalyptus tereticornis* c. young seedling, $1/1\times$; d. cotyledons, $1/1\times$; e. older seedling, $1/2\times$. *Tristania conferta* f. young seedling, $1/1\times$; g. cotyledons, $1/1\times$.

1st Pair of leaves petiole 1–2 mm, pale green; blade oblong to lanceolate; with index $2\frac{1}{2}$ – $3\frac{1}{2}$, 5 – $6\frac{1}{2}$ by $1\frac{1}{2}$ – $2\frac{1}{2}$ mm, base taperpointed acute decurrent. *Highest leaves* (2nd stage) petiole up to 1 cm, slightly 2-winged; blade ovate or ovate-oblong, with index up to 3, up to 7 by 3 cm, top rounded obtuse, base rounded or acute decurrent, midrib prominent beneath. *Top of plant* green; at 2nd stage greyish green pruinose; young leaves often red. *Plant* glabrous all over.

Seeds from 1 motherplant.

RHODAMNIA JACK

B. I: 333, 334; K. et V. VI: 30

Rhodamnia cinerea JACK (*R. trinervia* Auct. non BL.)

B. I: 334; K. et V. VI: 30

Mal.: djending (*Bill.*), marapujen, merapin (*Bangka*), sekala (*Lamp.*). *Sund.*: ki beusi. *Jav.*: andong

Fig. 105

Size at 1st stage (1st pair or leaves only) ± 5 cm, $3\frac{1}{2}$ – $4\frac{3}{4}$ cm above collet; at 2nd stage (6–10 pairs of leaves) 10– $13\frac{1}{2}$ cm above collet. *Roots* off white turning brown; primary root at 1st stage slightly developed, moderately thicker than lateral ones; collet gradually and moderately thickened; lateral roots at 1st stage moderate in number, especially present near collet, moderately branched. *Hypocotyl* epigeous, erect, straight, $2\frac{1}{2}$ – $3\frac{3}{4}$ cm; at 1st stage: $\frac{1}{2}$ – $1\frac{1}{2}$ mm thick, tapering upwards, 4-angular near top, terete near base, green, white at base, glabrous. *Cotyledons* epigeous, 2, equal, petiolate; petiole ± 2 mm long, green, glabrous; blade ovate, with index $1\frac{1}{4}$ –2, $7\frac{1}{2}$ –9 by 4 – $6\frac{1}{2}$ mm, thin, having an acute top and a rounded base, palmately 3-nerved and nerves slightly prominent on both surfaces, entire, dull dark green above, dull green beneath, finely and transparently punctate, glabrous. *Epicotyl* 2–4 mm. *Stem* erect, straight, 4-angular; at 2nd stage slightly 4-winged, green, near top sparse simple colourless hairs. *Phyllotaxy* decussate. *Leaves* exstipulate, simple, petiolate; petiole channelled, green; blade thin, triplinerved, entire, finely and transparently punctate. *1st Pair of leaves* petiole ± 2 mm; blade ovate, with index $1\frac{1}{3}$ – $1\frac{2}{3}$, 6–12 by 5–6 mm, having an acute top and a rounded narrowed base, prominently nerved on both surfaces but especially beneath, both surfaces dull green. *Highest leaves* (2nd stage) petiole $\pm \frac{1}{2}$ cm, decurrent into wings of stem; blade ovate-oblong or ovate-lanceolate, with index $2\frac{1}{2}$ – $3\frac{1}{2}$, $4\frac{3}{4}$ – $6\frac{1}{2}$ by $1\frac{1}{2}$ – $2\frac{1}{4}$ cm, having an acuminate acute top and a shortly acuminate narrowed base, prominently nerved beneath, glossy above, dull green beneath, on main nerves beneath sparsely hairy like stem. *Top of plant* with sparse, later dense appressed silvery hairs.

Seeds from 1 motherplant.

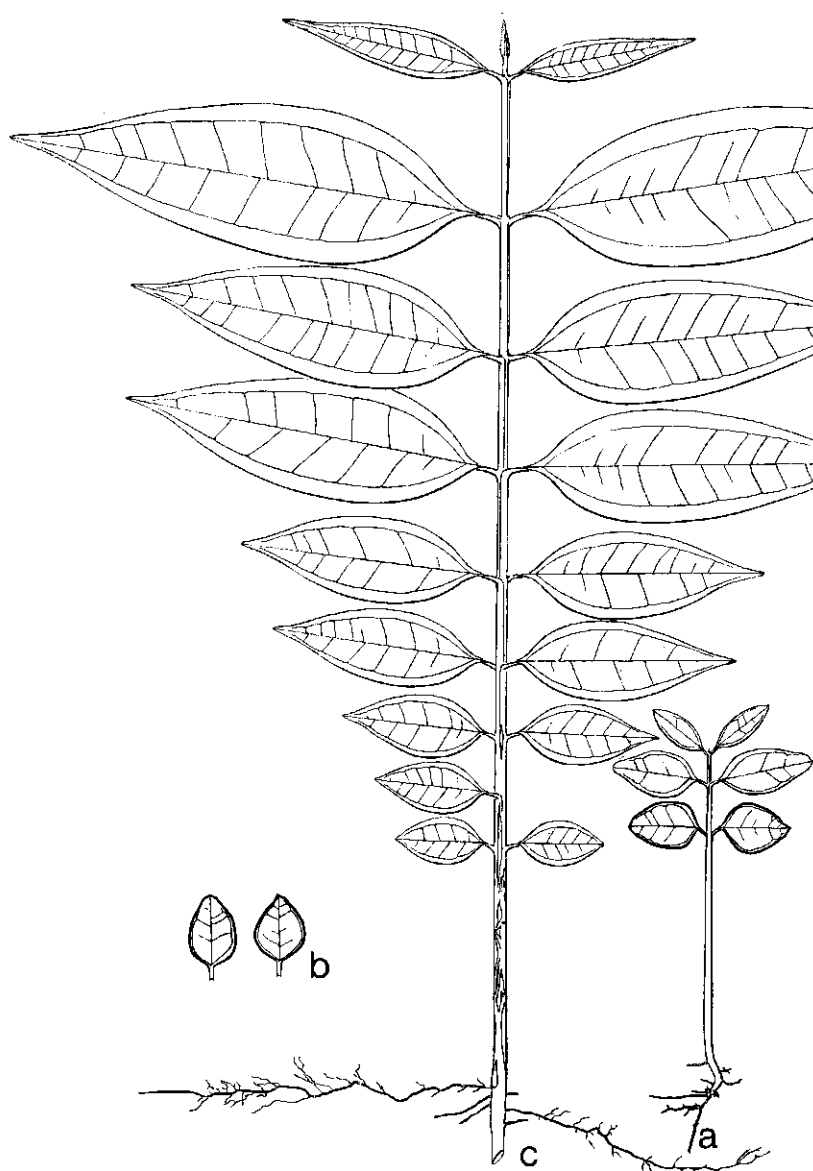


Fig. 105. *Rhodamnia cinerea* a. young seedling, $1/1 \times$; b. cotyledons, $1/1 \times$; c. older seedling, $1/1 \times$.

SYZYGIUM GAERTN.

B. I: 333, 337, III: 646; K. et V. VI: 43; LUBB. I: 537; TROUP II: 548

Cotyledons hypogeous or semihypogeous, 2, usually equal, one at either side of stem, their under surfaces facing, sometimes diverging, often partly covered with remains of seed, peltate rarely not peltate, very rarely together at one side of stem and remaining in testa with under surfaces in close contact, thick-fleshy, whether or not petiolate. *Stem* erect, straight, 4-angular near top, sometimes slightly 4-winged, glabrous. *Phyllotaxy* decussate, sometimes especially lower leaves sub-decussate, along branches sometimes seemingly distichous-opposite by twisting of the branch, sometimes 3 in whorl. *Leaves* exstipulate; lowest leaves scale-shaped, higher ones developed often alternating with scale-shaped ones; developed leaves simple, petiolate, pinninerved, sometimes most of the lateral nerves close-set straight numerous and parallel, intramarginally nerved sometimes doubly, transparently punctate. *Top of plant* usually red.

1. A. Cotyledons and 1st developed leaf present 2
 - B. Higher leaves (2nd stage), 7-17 pairs, present 6
2. a. cot. petiolate, not or very rarely their under surfaces facing 3
 - b. cot. sessile, flat, under surfaces facing 4
3. a. cot. blade semiglobose; 1st developed leaf top acuminate. . . *S. polyanthum*
 - b. cot. blade irregular sometimes globe-segment-shaped; 1st developed leaf top not acuminate *S. litorale*
4. a. 1st developed leaf doubly intramarginally nerved *S. pycnanthum*
 - b. 1st developed leaf simply intramarginally nerved 5
5. a. 1st developed leaf top acuminate *S. racemosum*
 - b. 1st developed leaf top otherwise. *S. cumini*
6. a. leaves doubly intramarginally nerved *S. pycnanthum*
 - b. otherwise 7
7. a. developed highest leaves (2nd stage) lateral nerves very numerous, close set, parallel, straight 8
 - b. otherwise 9
8. a. developed highest leaves (2nd stage) top shortly acuminate. . . *S. cumini*
 - b. developed highest leaves (2nd stage) top long-acuminate . . *S. racemosum*
9. a. developed highest leaves (2nd stage) blade index up to 5; top taperpointed . . *S. litorale*
 - b. developed highest leaves (2nd stage) blade index up to 3; top shortly acuminate *S. polyanthum*

***Syzygium cumini* (L.) SKEELS (*Eugenia jambolana* LMK., *E. cumini* (L.) DRUCE)**

B. I: 340; K. et V. VI: 132; TROUP II: 549, fig. 210

Mal.: djambulan (*Menado*), djiwat. Sund.: djamblang. Jav.: djuweit, duwet

Fig. 106

Size at 1st stage (1st developed pair of leaves) 15½–31 cm, 4–7 cm above collet; at 2nd stage (7–13 developed leaves) 13–45 cm above collet. *Roots* white turning brown, brown near collet; primary root at 1st stage moderately flexuous, much thicker than lateral ones; collet abruptly much thickened often only at one side; lateral roots at 1st stage moderate in number, very flexuous, unbranched. *Hypocotyl* hypogeous, very short. *Cotyledons* hypogeous sometimes semihypogeous, 2, usually unequal, one at either side of stem, their under surfaces facing, upper surfaces often covered with remains of seed, peltate, sessile; blade orbicular (TROUP: irregular in shape and size, angular), semiglobose, thick-fleshy, convex above, flat beneath, Ø 6–8 mm, 6–11 mm thick, yellowish green. *Epicotyl* very short. *Stem* erect, straight; at 1st stage 4-angular, slightly 4-winged, green or reddish; at 2nd stage 4-angular and laterally compressed near top, terete below, sometimes slightly 4-winged, green or brownish red, brown below. *Phyllotaxy* decussate, sometimes 3 in whorl; lower leaves sometimes subdecussate (TROUP: sometimes alternate or sub-opposite). *Leaves* exstipulate; 1st 3–4 pairs of leaves scale-shaped; higher ones developed, simple; blade thin-coriaceous, pinninerved possessing very numerous close-set parallel straight lateral nerves, intramarginally nerved and midrib prominent beneath, entire, transparently punctate. *1st Pair of developed leaves* sessile or petiolate; blade elliptic or ovate or obcordiform or irregular, much varying in shape and size, slightly glossy green. *Highest leaves* (2nd stage) petiolate; petiole up to 8 mm and 2½ mm thick, flattened above, convex beneath, red or green (TROUP: channelled above); blade obovate-lanceolate, with index 3–5, up to 14 by 5½ cm, having a shortly acuminate obtuse rarely rounded or emarginate top and a taperpointed often cuneate acute base (TROUP: ovate, obovate or elliptic, apex acute or sometimes obtuse), dull dark green above, dull light green beneath. *Top of plant* red or green. *Plant* glabrous all over.

Seeds from 1 motherplant.

***Syzygium litorale* (BL.) AMSH. (*Eugenia subglauca* K. et V., *Jambosa litoralis* BL.)**

B. I: 344; K. et V. VI: 66

Sund.: kopo, k. laut. Jav.: djembluk, dj. krikil, klampok, k. watu

Fig. 107

Size at 1st stage (1st developed leaf only) 21–45 cm, 5–11 cm above collet; at 2nd stage (9–14 developed pairs of leaves) 19–26 cm above collet. *Roots* permanently brown; tips white; primary root at 1st stage very flexuous, much thicker than lateral ones; collet gradually thickened; lateral roots at 1st stage very numerous, very flexuous. *Hypocotyl* hypogeous, whether or not erect, whether or not straight, ½–

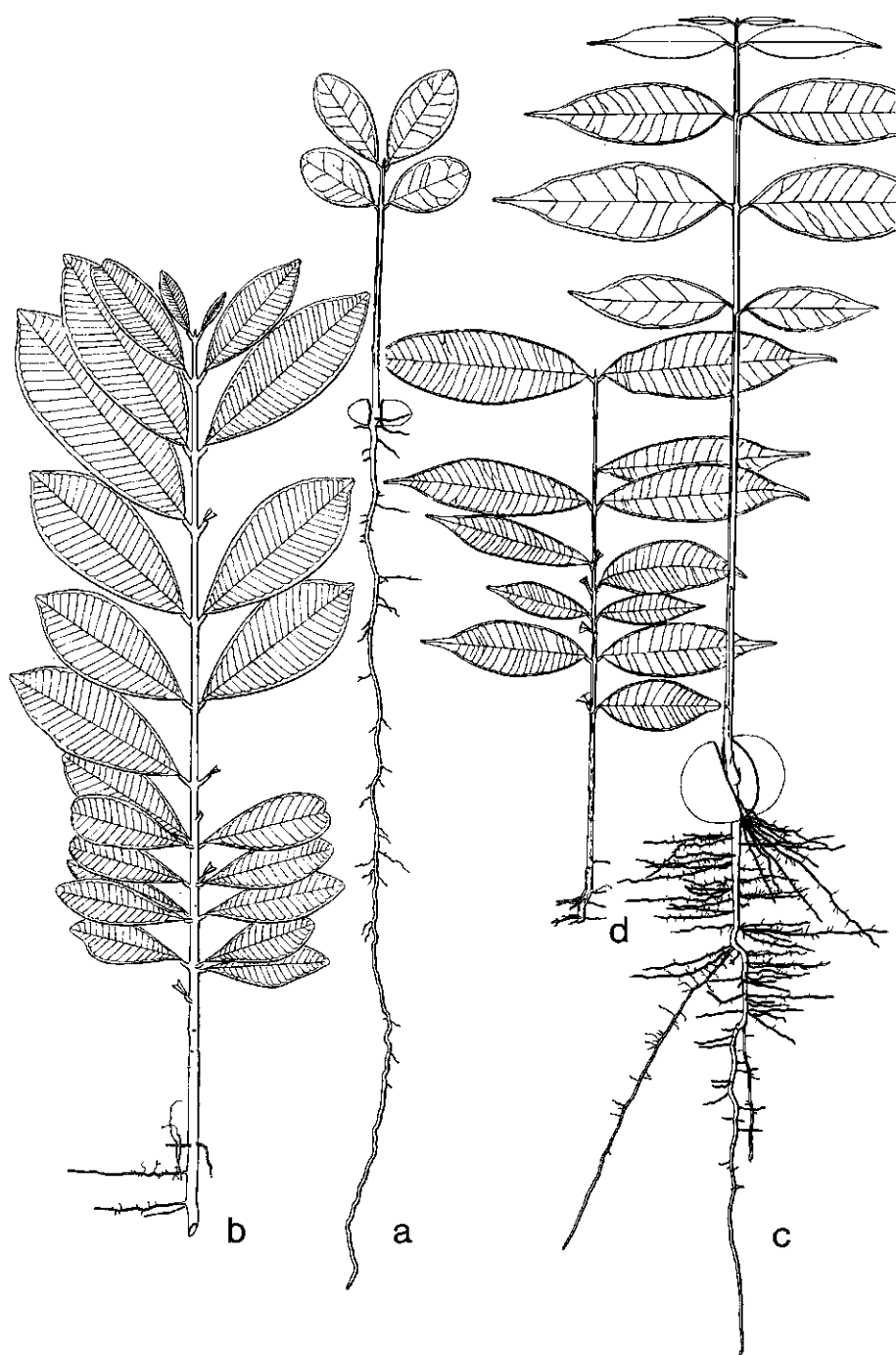


Fig. 106. *Syzygium cumini* a. young seedling, $1/2\times$; b. older seedling, $1/4\times$. *Syzygium racemosum* c. young seedling, $1/2\times$; d. older seedling, $1/4\times$.

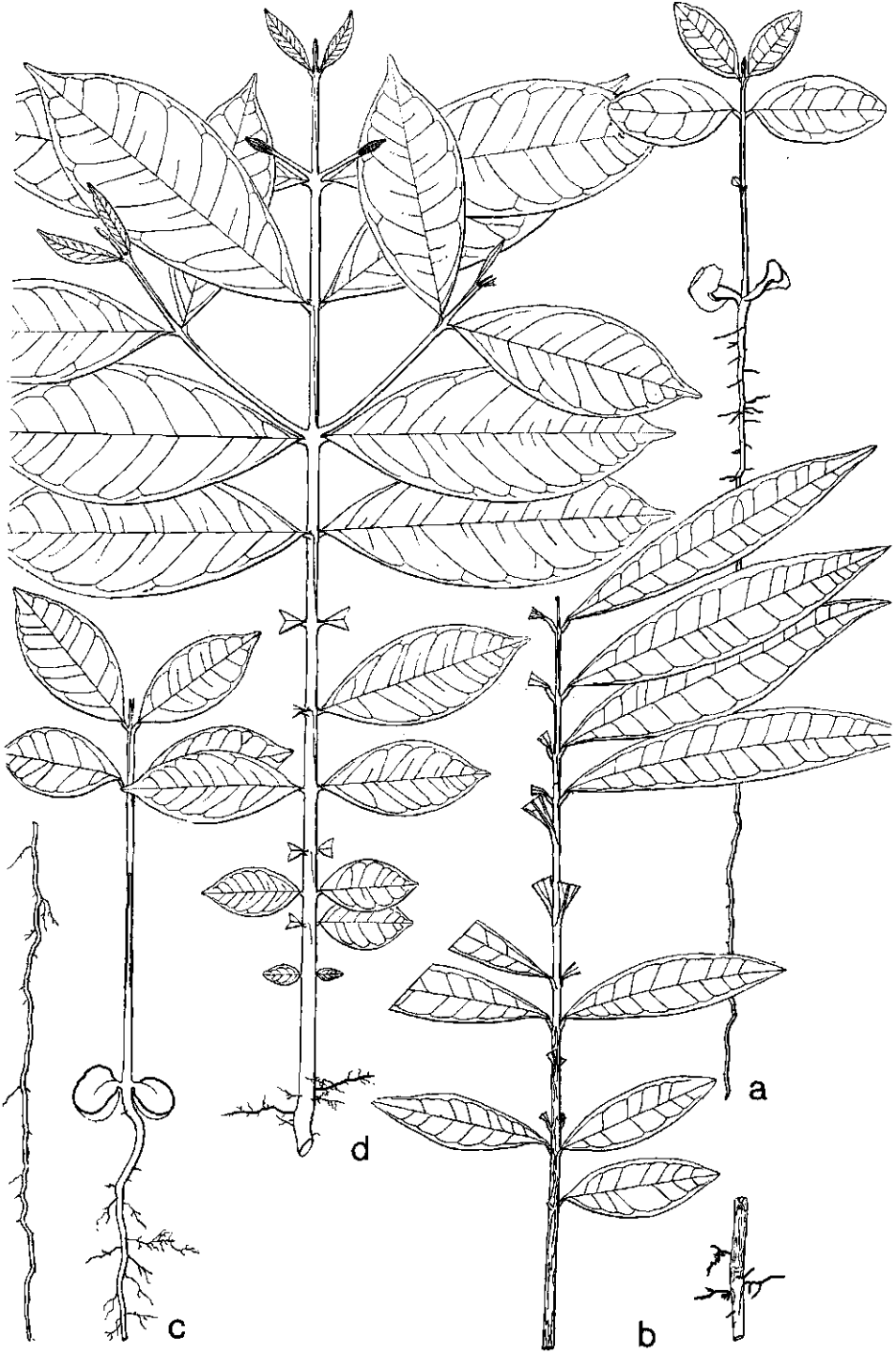


Fig. 107. *Syzygium littorale* a. young seedling, $1/2\times$; b. older seedling, $1/2\times$. *Syzygium polyanthum* c. young seedling, $1/1\times$; d. older seedling, $1/2\times$.

1 cm; at 1st stage 2–3 mm thick, yellow or green. *Cotyledons* hypogeous, 2, equal or unequal, one at either side of stem, diverging, peltate, petiolate, upper surface often covered with remains of seed; petiole 4–10 mm, breadth > thickness, near top broader, green or yellow; blade usually irregular sometimes globe-segment-shaped, thick-fleshy. *Epicotyl* erect, straight or curved, 3–27 mm long; at 1st stage $1\frac{1}{2}$ –2 mm thick, terete near base, 4-angular near top, green or whitish yellow at top, brown below. *Phyllotaxy* decussate but lowest leaves often subdecussate. *Leaves* exstipulate; 1st 2–6 leaves scale-shaped; higher ones developed sometimes alternating with scale-shaped ones. *Developed leaves* simple, petiolate; petiole flattened above, convex beneath, green or red; blade thin-coriaceous, having a whether or not mucronate top and an acute base narrowed into petiole, intramarginally nerved, prominently nerved beneath, entire, slightly glossy dark green above, dull green beneath, transparently punctate but sometimes very sparsely in older leaves. *1st Developed leaf* petiole 2–3 mm long, 1 mm thick; blade elliptic or oblong or ovate or ovate-oblong or obovate or obovate-oblong, with index $1\frac{1}{4}$ – $2\frac{1}{2}$, $\frac{1}{2}$ –6 by $\frac{1}{4}$ – $2\frac{1}{2}$ cm, top acute or obtuse or notched. *Highest developed leaves* (2nd stage) petiole up to 5 mm; blade lanceolate, with index up to 5, up to $11\frac{1}{2}$ by $2\frac{1}{2}$ cm, top taperpointed acute. *Top of plant* usually red. *Plant* glabrous all over.

Seeds from 1 motherplant.

***Syzygium polyanthum* (WIGHT) WALP. (*Eugenia polyantha* WIGHT)**

B. I: 339; K. et V. VI: 88

Mal.: meselangan, ubar serai. *Jav.*: salam, manting

Fig. 107

Size at 1st stage (1st developed leaf only) 9–35 cm, 3–8½ cm above collet; at 2nd stage (\pm 11–17 developed pairs of leaves) 31–46 cm above collet. *Roots* brownish yellow; tips white turning dirty yellow; primary root at 1st stage moderately to very flexuous, much thicker than lateral ones; collet gradually and slightly thickened; lateral roots at 1st stage very numerous, very flexuous, sparsely to much branched. *Hypocotyl* hypogeous, 5–8 mm, 1 mm thick, terete, white or brown. *Cotyledons* hypogeous or semi-hypogeous, 2, usually equal, one at either side of stem, diverging or flattened surfaces facing, convex surface covered with remains of seed; very rarely together at one side of stem remaining in testa and their flat surfaces in close contact; whether or not peltate, shortly petiolate; blade semiglobose, \varnothing 5–7 mm, 3–5 mm thick, thick-fleshy, flat surface almost orbicular, yellowish green, *Epicotyl* very short. *Stem* erect, straight; at 2nd stage 4-angular near top, terete below, green at top, brown below. *Phyllotaxy* decussate, lower leaves sometimes subdecussate; sometimes seemingly distichous-alternate along branches by twisting of the branch. *Leaves* exstipulate, first 2–6 ones scale-shaped, next ones developed. *Developed leaves* simple, petiolate; blade pinninerved, intramarginally nerved, entire, dull light green beneath, transparently punctate. *1st Developed leaf* blade elliptic or oblong or ovate or obovate

or obovate-oblong or ovate-lanceolate or obovate-lanceolate, with index $1\frac{1}{4}$ – $2\frac{1}{2}$, 1 – $3\frac{1}{2}$ by $\frac{1}{2}$ – $1\frac{1}{2}$ cm, having an acuminate obtuse sometimes acute top and a rounded base narrowed into petiole, prominently midribbed beneath, dull green above. *Highest leaves* (2nd stage) petiole to 6 mm, flattened above, convex beneath, green; blade oblong or obovate-oblong or lanceolate or obovate-lanceolate; with index 3, up to $11\frac{3}{4}$ by 4 cm, thin-coriaceous, having an acuminate obtuse top and an acute base decurrent into petiole, prominently nerved beneath, slightly glossy green above. *Top of plant* green. *Plant* glabrous all over.

Seeds from 3 motherplants from different localities.

Syzygium pycnanthum MERR. et PERRY (*Eugenia densiflora* (BL.) DUTHIE, *E. axillaris* Auct. non WILLD.)

B. I: 344; K. et V. VI: 57

Mal.: ubar-ubar (*Palemb.*). *Sund.*: kopo, k. badak, k. lalaj, petag. *Jav.*: djambu alas, dj. klampok, dj. wana, djambon, klampok, kl. arum. *Mad.*: klampok bato

Fig. 108

Size at 1st stage (1st developed leaf only) 27–69 cm, 9–19 cm above collet; at 2nd stage (± 10 developed leaves) ± 40 cm above collet. *Roots* brown; tips white turning yellowish; primary root at 1st stage moderately flexuous, much thicker than lateral ones; collet gradually or abruptly and slightly thickened whether or not at one side; lateral roots at 1st stage moderate in number to very numerous, very flexuous, moderately to much branched. *Hypocotyl* hypogeous, very short. *Cotyledons* hypogeous, 2, equal, one at either side of stem, their under surfaces facing, sometimes remains of seed on upper surfaces, peltate, sessile, blade semiglobose, with radius $\frac{1}{2}$ –1 cm, petioled in centre, globose above, flat beneath, yellowish white. *Epicotyl* 0–3 mm. *Stem* erect, base often curved; at 2nd stage 4-angular, slightly 4-winged, green or red. *Phyllotaxy* lower leaves subdecussate, higher ones decussate. *Leaves* exstipulate, 1st 3–8 pairs of leaves scale-shaped; higher ones developed, sometimes alternating with scale-shaped ones. *Developed leaves* simple, petiolate; petiole slightly channelled, green; blade thin-coriaceous or coriaceous, having an acuminate acute top and an acute base narrowed into petiole, pinninerved, doubly intramarginally nerved and midrib sunk above prominent beneath, entire, dull green on both surfaces or glossy above, finely and transparently punctate. *1st Developed leaf* petiole ± 2 –5 mm; blade elliptic or oblong or lanceolate, with index $1\frac{1}{2}$ – $3\frac{1}{2}$, $1\frac{1}{2}$ –6 by 1 – $2\frac{1}{4}$ cm. *Highest developed leaves* (2nd stage) petiole ± 1 cm, 3 mm thick; blade lanceolate sometimes ovate-lanceolate, with index ± 4 , ± 20 by 5 cm. *Top of plant* formed by scale-shaped leaves; young leaves red or green. *Plant* glabrous all over.

Seeds from 3 motherplants from different localities.

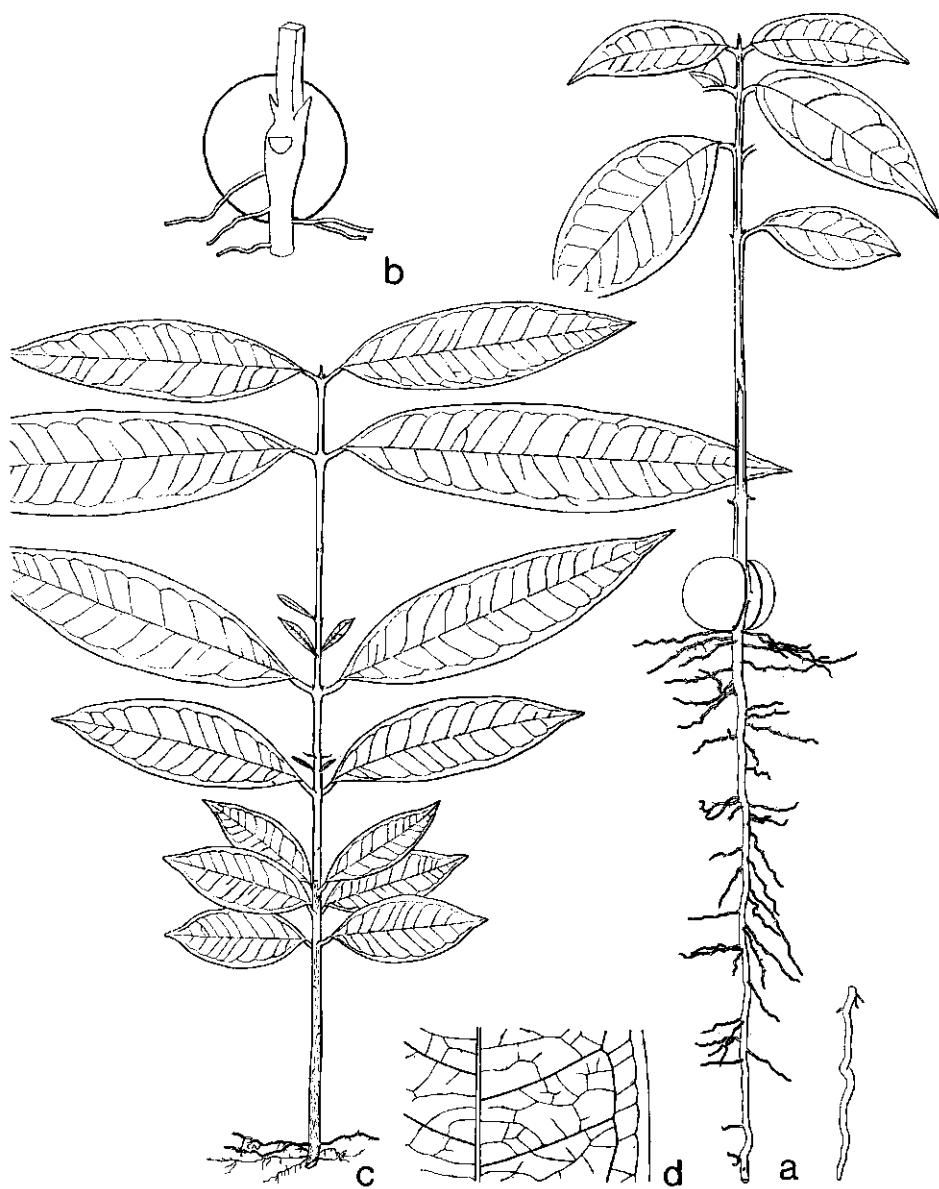


Fig. 108. *Syzygium pycnanthum* a. young seedling, $1/2\times$; b. cotyledon, $1/1\times$; c. older seedling, $1/4\times$; d. double intramarginal nerve, $1/1\times$.

***Syzygium racemosum* (BL.) DC. (*Eugenia jamboloides* K. et V.)**

B. I: 341; K. et V. VI: 136

Jav.: resep, risep. Mad.: klampok bato, rèsek

Fig. 106

Size at 1st stage (1st developed leaf only) 16–53 cm, 8–22 cm above collet; at 2nd stage (± 8 developed pairs of leaves) ± 39 cm above collet. *Roots* brown near collet, white below, turning blackish brown; tips white; primary root at 1st stage moderately flexuous, much thicker than lateral ones; collet gradually and slightly thickened; lateral roots at 1st stage moderate in number to very numerous, very flexuous, sparsely branched. *Hypocotyl* hypogeous, very short. *Cotyledons* hypogeous, 2, equal, one at either side of stem, their under surfaces facing and upper surfaces covered with remains of seed, peltate, sessile; blade semi-globose, \varnothing 12–22 mm, orbicular beneath, petioled in centre, convex above, flat beneath, light yellow. *Epicotyl* hypogeous, erect, $\pm \frac{1}{2}$ cm, white. *Stem* erect, straight; at 2nd stage 4-angular near top, terete below, green or red or brown. *Phyllotaxy* decussate, sometimes subdecussate. *Leaves* exstipulate; 1st 4–5 pairs of leaves scale-shaped, in 5th–6th ones blade often very small, succeeding ones developed alternating with scale-shaped ones. *Developed leaves* simple, shortly petiolate; blade thin-coriaceous, having a long-acuminate acute or obtuse top and an acute base narrowed into petiole, pinninerved, prominently midribbed beneath, intramarginally nerved, entire, glossy green above, dull greyish green beneath, transparently punctate. *1st Developed leaf* blade oblong or ovate-oblong or obovate-oblong, with index 2–3, 2–6 by 1–2½ cm. *Highest developed leaves* (2nd stage) petiole $\pm \frac{1}{2}$ cm, 1½ mm thick, slightly channelled, green; blade ovate-lanceolate or lanceolate, up to 12½ by 3 cm. *Top of plant* red or green. *Plant* glabrous all over.

Seeds from 3 motherplants from different localities.

TRISTANIA R. BR.

B. I: 334, 347; K. et V. VI: 172; LUBB. I: 535.

***Tristania conferta* R. BR.**

B. I: 348; K. et V. VI: 173; LUBB. I: 535, fig. 345

Fig. 104

Size at 1st stage (1st pair of leaves only) 1–3½ cm, 6–13 mm above collet. *Roots* at 1st stage off white; primary root at 1st stage very flexuous, not thicker than lateral ones; collet gradually and slightly thickened; lateral roots at 1st stage few, very flexuous, moderately branched. *Hypocotyl* epigeous, erect, straight, 5–12 mm; at 1st stage ½ mm thick, 4-angular near top, red, white at base, glabrous. *Cotyledons* epigeous, 2, equal, petiolate; petiole 1–2 mm, breadth > thickness, green or red; blade ovate or rhomboid, with index ¾–1, 2–4 by 2–4 mm, thin (LUBB.: somewhat

fleshy), having an obtuse top and a rounded or acute base slightly narrowed, palmately 3-nerved and nerves with an upward bend, entire, dull green, finely and transparently punctate, glabrous. *Epicotyl* erect, straight, 7–13 mm; at 1st stage with simple colourless hairs. *Stem* already possessing some pairs of leaves: erect, (LUBB.: 4-angular), straight, green, hairy like epicotyl. *Phyllotaxy* first pairs of leaves decussate. *Leaves* (first pair of leaves) exstipulate, simple, shortly petiolate; petiole green, hairy like epicotyl; blade lanceolate (LUBB.: lanceolate, oval, obtuse), thin, having an acute top and an acuminate narrowed base, pinninerved, prominently nerved beneath, entire, dull green on both surfaces, finely and transparently punctate, ciliate, both surfaces hairy like epicotyl. *1st Pair of leaves* petiole 2–3 mm; blade 4–7 by $1\frac{1}{2}$ –3 mm. *Top of plant* hairy, green.

Seeds from 1 motherplant.

N.B. Seedlings at an older stage not obtained.

PINACEAE

B. I: 90

PINUS L.

B. I: 90; LUBB. II: 553; TROUP III: 1013

Pinus merkusii JUNGH. et DE VRIESE

B. I: 90; TROUP III: 1093, fig. 438

Atjeh: sala. *Gajo language*: uje um. *Djak.*: tusam. *Minangk. language*: susugi
Fig. 109

Size at 1st stage (only ± 20 leaves on stem) 8–20 cm, 4–7 cm above collet; at 2nd stage (1st normal leaves on stem and 1st brachyblasts inserted in groups) up to 17 cm above collet. *Plant* fragrant of resin when crushed. *Roots* brown, turning blackish brown; tips white; primary root at 1st stage moderately flexuous, slightly thicker than lateral ones; collet gradually and slightly thickened; lateral roots at 1st stage few, moderately flexuous, not or sparsely branched. *Hypocotyl* epigeous, straight, $3\frac{1}{2}$ –5 cm; at 1st stage $1\frac{1}{2}$ –2 mm thick, turning thinner, tapering upwards, terete, smooth, reddish brown or green, white at base, glabrous. *Cotyledons* epigeous, 7–10 (TROUP: 8–12), equal, sessile; blade needle-shaped, $2\frac{1}{2}$ – $4\frac{1}{2}$ cm long, $\frac{1}{2}$ mm thick, in transverse section 3-angular sharp above and flat beneath, having an acute top, light green, at upper edge sometimes serrulate, glabrous. *Epicotyl* very short. *Stem* erect, straight; at 2nd stage terete, brown near base. *Phyllotaxy* first whorled, higher leaves spirally arranged (but see beneath: leaves on brachyblasts). *Leaves* on lower part of main stem fully developed and of these leaves the higher ones with axillary brachyblasts, next ones

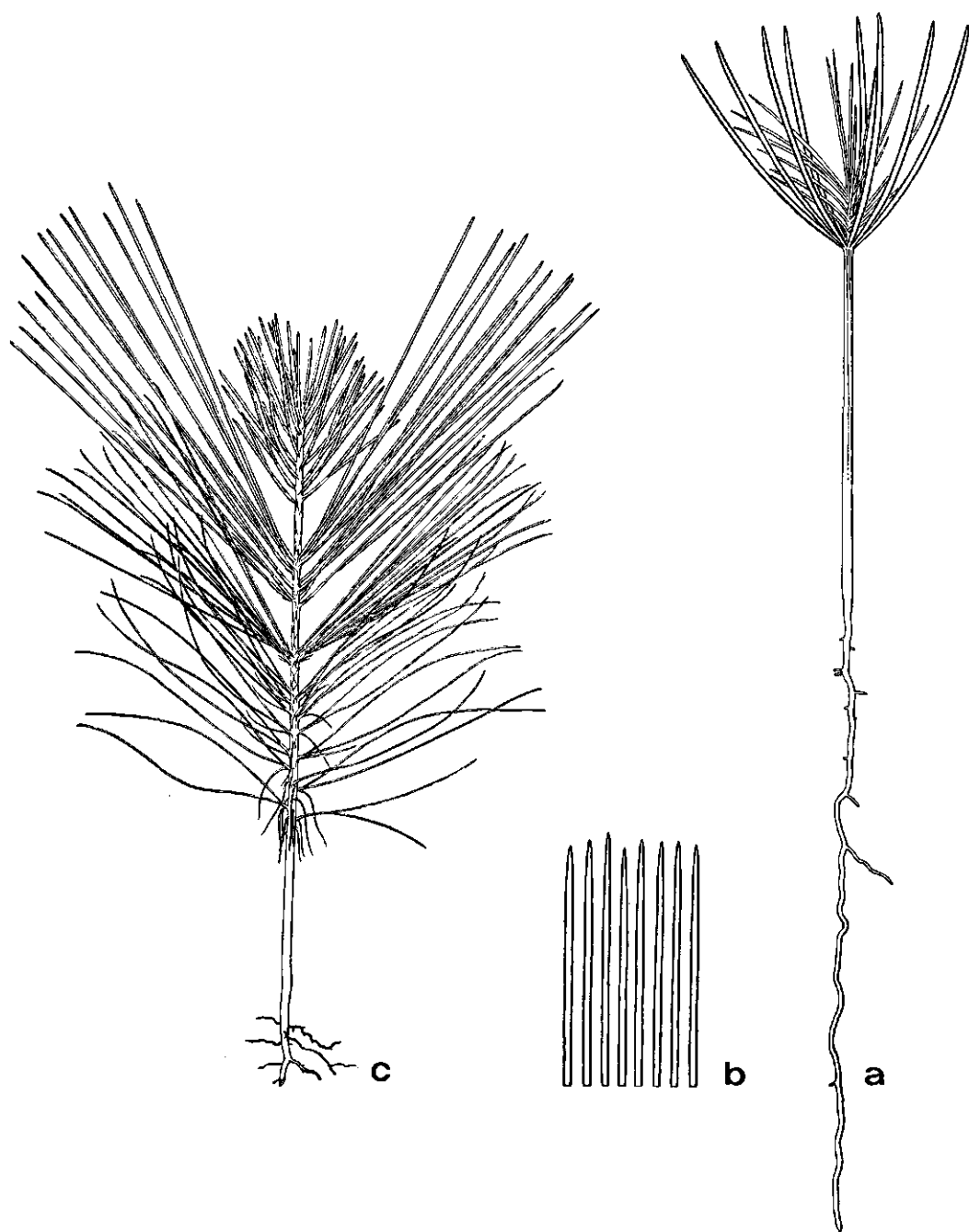


Fig. 109. *Pinus merkusii* a. young seedling, $1/1 \times$; b. cotyledons, $1/1 \times$; c. older seedling, $1/2 \times$.

scale-shaped without brachyblasts, higher on stem groups of devolved leaves without brachyblasts alternating above one another with groups of scale-shaped ones with brachyblasts; leaves of lowest whorl needle-shaped, $\frac{3}{4}$ –2 mm by $\frac{1}{3}$ mm, on both surfaces flattened (TROUP: flattened above, rounded beneath), having an acute top, coriaceous, sometimes serrulate, light dull green, on both surfaces possessing lengthwise arranged light coloured dots, glabrous; higher developed needles like lower ones, but up to 2 cm long, having a narrowed base, serrulate; scale-shaped leaves 3-angular, brownish, membranous; leaves at base of brachyblasts connate and sheathing into a brownish membranous up to 1 cm long sheath from which appears a bundle of 2 needles; needles up to 12 cm long, flattened or slightly concave above, convex beneath, having an acute top, very finely serrulate, slightly glossy dark green, on both surfaces longitudinal rows of lighter coloured dots. *Top of plant* at 1st stage glabrous, light green; at 2nd stage enveloped in brownish membranous scale-shaped leaves.

Seeds from 1 motherplant.

PITTOSPORACEAE

B. I: 279; K. et V. IV: 50; LUBB. I: 200

PITTOSPORUM BANKS et SOLAND. ex GAERTN.

B. I: 279; K. et V. IV: 50

Pittosporum ferrugineum W. AIT.

B. I: 280; K. et V. IV: 53

Mal.: giramong, kaju kutana (*Mol.*), leting (*Bangka*), medang pasir (?). *Sund.*: huru hondjé, ki hondjé. *Jav.*: handje-handjean. katjombrangan, tjombrangan. *Alf. Amb.*: anaser

Size at 1st stage (1 leaf only) 6–10 cm, 3–3½ cm above collet; at 2nd stage (15–22 leaves) 16–27 cm above collet. *Roots* off white, smelling very irritatingly; primary root at 1st stage moderately to very flexuous, moderately thicker than lateral ones; lateral roots at 1st stage moderate in number, very flexuous, sparsely branched. *Hypocotyl* epigeous, erect, straight, sometimes with a curved base, 2½–4 cm; at 1st stage 1 mm thick, tapering upwards, terete, smooth, green, white at base, with dense simple patent colourless hairs. *Cotyledons* epigeous, 2, foliaceous, sessile or very shortly petiolate; blade lanceolate, with index 4–5, 11–25 by 3–5 mm, thin, having a taperpointed shortly acuminate acute top and a narrowed semi-amplexicaul base, pinninerved, intramarginally nerved and midrib prominent beneath, entire, dull green above, dull greyish green beneath, glabrous or hairy on midrib beneath or near base like hypocotyl. *Epicotyl* erect, straight, 1–3 mm, hairy. *Stem* erect, straight,

terete, with simple reddish brown slightly or more distinctly appressed hairs. *Phyllotaxy* spiral. *Leaves* exstipulate, simple, petiolate, sometimes part of higher leaves scale-shaped; petiole green, hairy like stem; blade elliptic or oblong, having an acute top and an acute base narrowed into petiole, pinninerved and midrib prominent beneath, dark slightly glossy green above, light dull green beneath. *1st Leaf* petiole very short, broadened; blade elliptic or oblong, with index $1\frac{1}{2}$ –2, 15–25 by 9–13 mm, thin, entire or slightly palmately 3-lobed, glabrous above, beneath hairy on midrib like stem or glabrous. *Topmost leaves* (2nd stage) petiole $\pm\frac{1}{2}$ cm, very gradually grading into blade, channelled above; blade oblong or asymmetrically-oblong, with index 2–3, up to $10\frac{1}{2}$ by 4 cm, having an acuminate top, mucronate, prominently nerved beneath, entire but margin usually waving up and down, on both surfaces especially on midrib golden hairs. *Top of plant* hairy, green, becoming densely and felty golden.

Seeds from 2 motherplants from different localities.

PODOCARPACEAE

B. I: 89; K. et V. X: 257, *Coniferae*; LUBB. II: 547, *Coniferae*; TROUP III: 1013, *Coniferae*

PODOCARPUS L'HÉRIT. ex PERS. emend. L.C. RICH.

B. I: 89; K. et V. X: 259; TROUP III: 1169

Podocarpus imbricatus BL. (*Dacrycarpus imbricatus* (BL.) LAUBENF.)

B.I: 89; K. et V. X: 262

Mal.: ambun, medang tjemara (S.W.C.). *Sund.*: ki djamudju, ki hades (name of young form), ki putri, ki tjemara. *Jav.*: aru, tadj, tekik, tjemara tikung, tjemara tukung. *S. Celeb.*: kaju angin, tjambo-tjamba

Fig. 110

Size at 1st stage (2–4 branches only) 8–13 cm, $3\frac{1}{2}$ –6 cm above collet; at 2nd stage (± 15 branches) 14 cm above collet. *Roots* off white, turning brownish red; primary root at 1st stage very flexuous, not much thicker than lateral ones; collet gradually and slightly thickened; lateral roots few, very flexuous, unbranched. *Hypocotyl* epigeous, erect, straight, 3–4½ cm; at 1st stage 1–1½ mm thick, tapering upwards, angular, green or brown, glabrous. *Cotyledons* epigeous, 2, equal, sessile, semi-amplexicaul; blade linear, 13–14 by 1 mm, coriaceous, having an obtuse top, flat above, lengthwise furrowed and 2-ridged beneath, dark dull green, glabrous. *Epicotyl* very short. *Stem* erect, green, glabrous. *Phyllotaxy* spiral but 1st 2 leaves opposite, along branches alternate but at their base sometimes spirally arranged. *Leaves on stem and sometimes at the base of the 15 1st branches* simple, sessile; blade subulate, in lowest leaves ± 3 mm long, in highest ones up to $\frac{1}{2}$ cm long, very thin, having an acute top

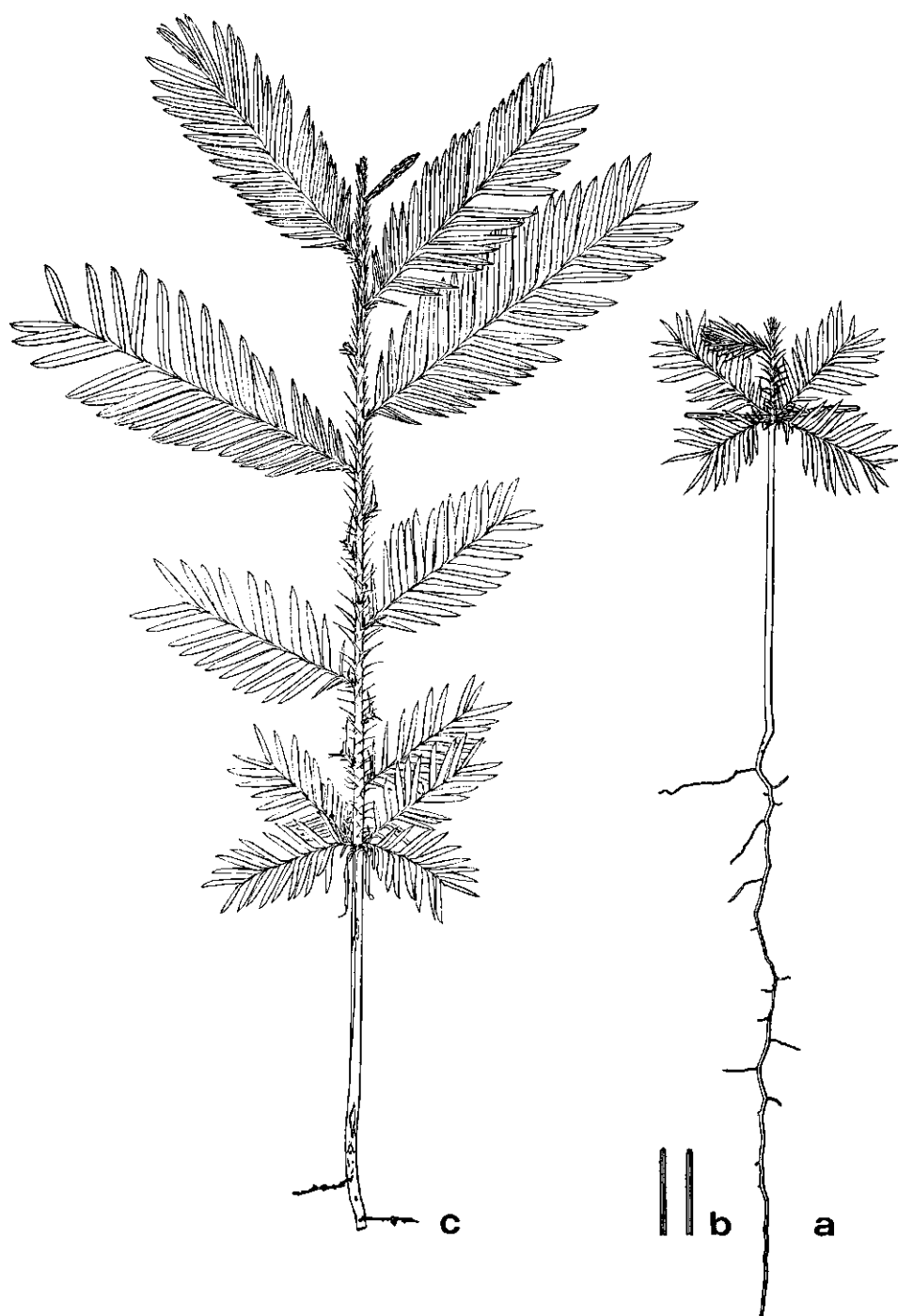


Fig. 110. *Podocarpus imbricatus* a. young seedling, $1/1\times$; b. cotyledons, $1/1\times$; c. older seedling, $1/1\times$.

and a slightly broadened decurrent base, slightly glossy green, glabrous; blade in leaves on branches linear slightly S-shaped, on lowest branches up to 8 by 1 mm, on higher ones up to 13 by 2 mm, thin-coriaceous, having an acute top and a narrowed decurrent base, 1-nerved, on both surfaces some lines of very fine white dots, both surfaces glossy green, glabrous. *Lateral branches* already present in axils of some of the 1st leaves. *Top of plant* green, glabrous.

Seeds from 3 motherplants from different localities.

RHIZOPHORACEAE

B. I: 378; K. et V. IV: 271; TROUP II: 496

The genera *Rhizophora*, *Ceriops* and *Bruguiera* occur in mangrove swamps, they are viviparous. These genera show the following characters. The hypocotyl develops in the tree, its base pierces the top of the fruit, directed downwards. The mature length of the hypocotyl is already reached in the tree. The *cotyledons* are fleshy, connate, forming a cotyledon-body, in *Bruguiera* lobed at the top, but not in *Ceriops* and *Rhizophora*. The cotyledon-body encloses the top of the seedlings (embryo). Under the upper part of the cotyledon-body there is a contraction. The opening in the fruit closes around this contraction, preventing the seedling from falling from fruit and tree. At last the hypocotyl separates from the cotyledon-body and the seedling falls (*Rhizophora*, *Ceriops*), or fruit and seedling fall together (often in *Bruguiera*). So, in the fallen seedling the cotyledon-body is no longer present in *Rhizophora* and *Ceriops* but in *Bruguiera* it can often still be seen. Most seedlings have a thicker and heavier base. Therefore they often fall in the mud, base first, and stay erect. If the seedling does not stick erect but lies flat, the top often curves upwards later. The *root* possesses an aërenchyma which is easily compressible, in *Rhizophora* and *Ceriops* with pores, in *Bruguiera* with lamels. Aërating roots, present in adult plants, are not yet to be observed in young seedlings. *Carallia* is different, it does not occur in mangrove swamps and it is not viviparous; its *cotyledons* epigeous, 2, foliaceous.—The four described genera show the following characters. *Stem* erect or arched. *Phyllotaxy* decussate, in *Carallia* along branches approximately distichous-alternate. *Leaves* stipulate; if developed, simple, usually petiolate; stipules interpetiolar, opposite pairs connate at base, together amplexicaul, leaving an annulate scar on the stem just above the scar of the leaves. *Plant* glabrous all over.

Seedling (embryo) still in the tree, or just fallen and still without leaves, or with 1 or more pairs of leaves.

1. a. hypocotyl not thickened; cotyledons not connate, not fleshy, foliaceous;
leaves dentate *Carallia brachiata*

- b. hypocotyl thickened; cotyledons wholly or partly connate, fleshy; leaves entire 2
- 2. a. hypocotyl and stem on fracture with bristle of idioblasts; cotyledon-body not lobed at top; developed leaves punctate beneath *Rhizophora*
- b. hypocotyl and stem on fracture no bristle of idioblasts; cotyledon-body whether or not lobed at top; developed leaves not punctate beneath 3
- 3. a. hypocotyl lengthwise sharply angular; cotyledon-body not lobed at top; developed leaves notched or emarginate at top; young plant laterally and flatly compressed at top *Ceriops*
- b. hypocotyl terete or lengthwise obtusely angular; cotyledon-body lobed at top; developed leaves not notched, not emarginate at top *Bruguiera*

BRUGUIERA Lmk.

B. I: 378, 380; K. et V. IV: 290; TROUP II: 503

Viviparous. *Roots* in seedling (embryo) in tree only indicated by a commencement of the primary root at the base of the hypocotyl; at older stages having lamelled aërenchyma, easily compressible. *Hypocotyl* in seedling (embryo) in tree pendent down, fleshy, usually thickest in centre or just lower; top and base obtuse acuminate or taperpointed. *Cotyledons* connate. *Cotyledon-body* thick-fleshy, petiolate, remaining in fruit; top open, lobed; lobes bent together; upper part subglobose; petiole with a contracted top, tube-shaped, terete, narrowly enclosing the growing point. *Phyllotaxy* decussate. *Leaves* stipulate; if developed simple; stipules interpetiolar, opposite pairs connate at base, together amplexicaul, leaving an annulate scar on the stem just above the scars of the leaves. *1st Pair of leaves* scale-shaped or developed. *Top of plant* covered with acutely twisted stipules. *Plant* glabrous all over.

Seedling still pendent in tree, or just fallen and still without developed leaves, or with 1 pair of leaves, or with some pairs of leaves.

- 1. a. hypocotyl cylindrical, not thicker than 8 mm; stem not much thinner than hypocotyl. 2
- b. hypocotyl cylindrical or fusiform, 1 cm thick or more; stem much thinner than hypocotyl. 3
- 2. a. cotyledon-body 3-lobed; hypocotyl 10–15 cm long, 6–8 mm thick; calyx revolute; 1st pair of leaves scale-shaped; remains of fruit and cot.-body in fallen growing seedling absent; epicotyl very short; leaves never obovate or obovate-cordiform *B. cylindrica*
- b. cot.-body 2-lobed; hypocotyl 12–26 cm long, 4–6 mm thick; calyx not revolute; seedling and fruit falling together; top of plant piercing the fruit; epicotyl ± 2 –3 cm; 1st pair of leaves developed, blade obovate or obovate-cordiform; plant with some pairs of leaves: fruit usually still present in the shape of a loose collar *B. parviflora*

3. a. cot.-body 3-5-lobed; hypocotyl fusiform, 5-8 cm, thickest in centre . . .
B. sexangula
 b. cot.-body 3-4-lobed; hypocotyl cylindrical or fusiform, 7-25 cm, thickest
 in centre or slightly lower *B. gymnorrhiza*

***Bruguiera cylindrica* (L.) BL. (*B. caryophylloides* (BURM. f.) BL.)**

B. I: 381; K. et V. IV: 298; TROUP II: 504

Mal.: bakau burus. Jav.: lindor (*Banjuwangi*), tandjang

Fig. 111

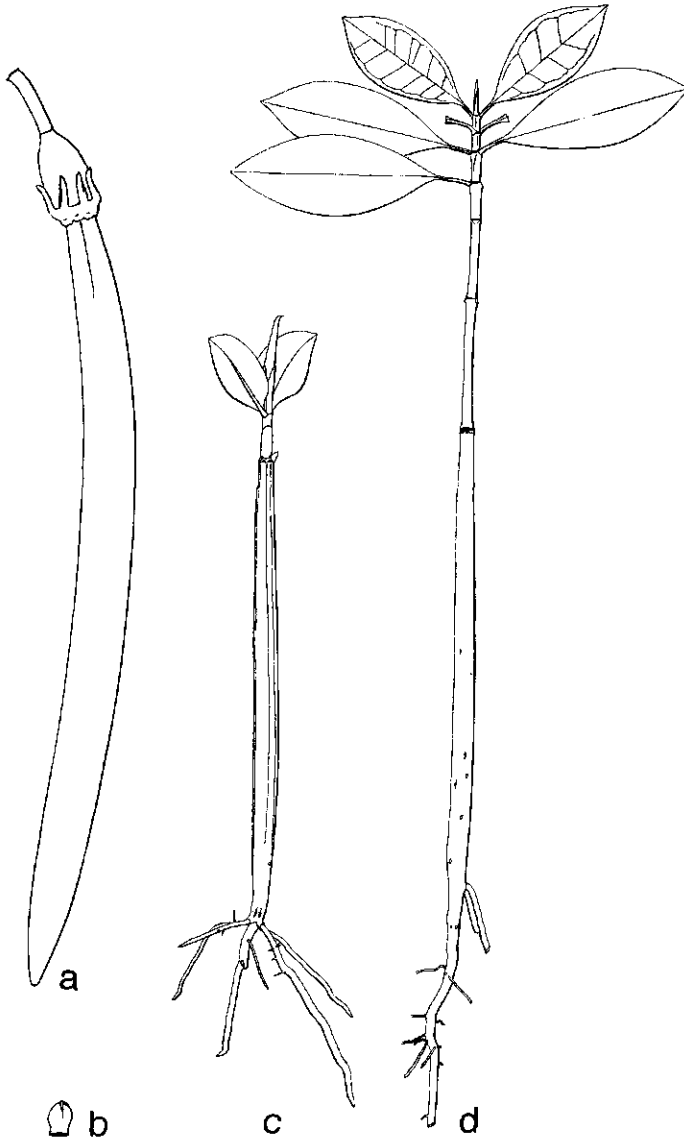


Fig. 111. *Bruguiera cylindrica* a. young seedling shortly before falling, 1/1 x; b. cotyledon-body, 1/1 x; c. seedling with developed first and second pair of leaves, 1/2 x; d. older seedling, 1/2 x.

Viviparous. Size when developed but still pendent in tree up to $10\frac{1}{2}$ – $14\frac{1}{2}$ cm; at 1st stage (in the earth, 1 pair of leaves) same size; at 2nd stage (2–8 pairs of leaves) 13–35 cm above collet. *Roots* in seedling (embryo) in the tree only indicated by a commencement of the primary root at the base of the hypocotyl; at older stages possessing lamelled aërenchyma, easily compressible; at 2nd stage yellow; primary root slightly flexuous, much thicker than lateral ones; collet gradually and considerably thickened; lateral roots slightly flexuous, patent. *Hypocotyl* in seedling in tree pendent down, fleshy, usually straight sometimes curved, 10–15 cm, approximately cylindrical, taperpointed at top and base, 6–8 mm thick, terete, surface finely granular; at 1st stage on truncate top annulate scar of cotyledon-body and in centre of it the 3-angular growing point; scar usually soon replaced by a whorl of large lenticels, dull greyish green or bronze-coloured sometimes yellow at base. *Cotyledons* connate. *Cotyledon-body* in seedling in tree: 3-lobed, thick-fleshy, petiolate, remaining in fruit; top open, lobed; lobes curved together, ± 2 mm long, together 2–3 mm thick; upper part subglobose; petiole contracted near top, narrowly enclosing growing point, 2–3 mm long, ± 2 mm thick. *Epicotyl* very short. *Stem* erect, straight, much thinner than hypocotyl, terete, smooth, green. *Phyllotaxy* decussate. *Leaves stipulate*; stipules interpetiolar, opposite pairs connate at base, together amplexicaul, leaving annulate scar on stem just above the scars of the leaves, appressed to stem, membranous but base fleshy. *1st Pair of leaves* scale-shaped, sessile; stipules 5–11 mm long; blade broadly ovate, 2 by $2\frac{1}{2}$ mm, brown. *2nd Pair of leaves* petiolate; stipules 12–13 mm long; petiole 2–4 mm, green; blade elliptic or oblong, sometimes asymmetrical, with index $1\frac{3}{4}$ – $2\frac{1}{3}$, 20–29 by 10–18 mm, coriaceous, having an acute top and an acute narrowed base, pinninerved, palmately 3-nerved at base, with indistinct lateral nerves and midrib prominent beneath, entire, glossy green above, dull green beneath. *5th–7th Pair of leaves* like 2nd pair but petiole 10–15 mm; blade with index $2\frac{1}{2}$ –3, $5\frac{1}{2}$ – $7\frac{1}{2}$ by 2– $2\frac{1}{2}$ cm, pinninerved. *Top of plant* covered with acutely twisted stipules; green; after these stipules have fallen top acute, twisted. *Plant* glabrous all over.

Seedlings from 1 original habitat in alcohol and from material grown in fresh-water-mud in Bogor.

***Bruguiera gymnorhiza* (L.) LMK.**

B. I: 381; K. et V. IV: 292; TROUP II: 503

Mal.: kendeke nasi (*Djak.*), pertut, putut, tumu, tongke (*Mol.*). *Java*: tandjang.

Mak.: sala-sala. *Tern.*: lolaro

Fig. 112

Viviparous. Size when developed but still pendent in the tree up to 9–25 cm; at 1st stage (in the earth, 1 pair of leaves) \pm the same size; at 2nd stage (12–18 pairs) 32–60 cm above collet. If fruit and seedling (embryo) fall together, the growing tip of the plant pushes away the remains of the fruit and of the cotyledon-body. *Roots* in seedling in tree: only a commencement of a primary root at the base of the hypocotyl; at 2nd

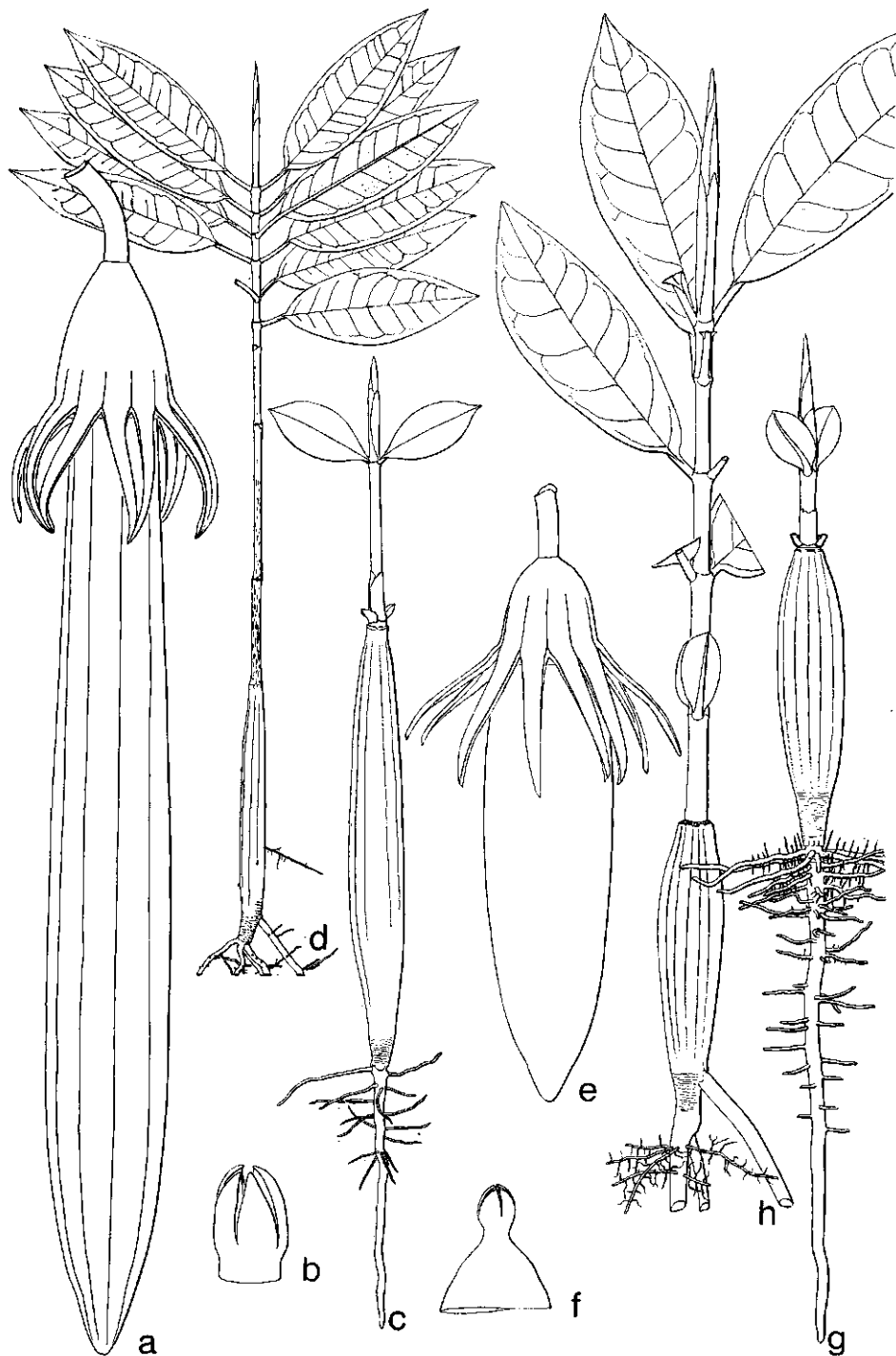


Fig. 112. *Bruguiera gymnorhiza* a. young seedling shortly before falling, $1/1\times$; b. cotyledon-body, $2/1\times$; c. seedling with developed 1st and 2nd pair of leaves, $1/2\times$; d. older seedling, $1/4\times$. *Bruguiera sexangula* e. young seedling shortly before falling, $1/1\times$; f. cotyledon-body, $1/1\times$; g. seedling with developed 1st and 2nd pair of leaves, $1/2\times$; h. older seedling, $1/2\times$.

stage possessing lamelled easily compressible aërenchyma, dirty yellow or reddish brown; tips yellowish white; primary root slightly flexuous, much thicker than lateral ones, sometimes poorly developed and replaced; lateral roots slightly flexuous, patent, much branched. *Hypocotyl* in seedling (embryo) in tree: pendent straight down, fleshy, 7–25 cm, thickest in centre or slightly lower and there $1\frac{1}{4}$ –2 cm thick, taperpointed at top and base, obtuse at base, obtusely multangular, sometimes slightly or more distinctly terete, lengthwise obtusely ridged, surface granular dull brownish reddish violet or greyish green usually red at top; top within calyx, calyx not revolute; at 1st stage often curved at base, on the truncate top the annulate scar of the cotyledon-body and in the centre of it the growing point, but usually the scar is soon replaced by a whorl of large lenticels; later the surface of the hypocotyl with longitudinal and transverse long-linear brown lenticels. *Cotyledons* connate. *Cotyledon-body* in seedling in tree petiolate; upper part subglobose, 3–4-lobed, open at top; lobes bent together, together terete, 5–7 mm long and together 4 mm thick, thick-fleshy; petiole tube-shaped, terete, fleshy, narrowly enclosing the 3–4-angular growing point, 1 mm long, 3 mm thick. *Epicotyl* 0–1 mm. *Stem* erect, straight, much thinner than hypocotyl, terete, smooth, green; at 2nd stage upper part often red, with numerous lengthwise-elliptic light brown lenticels below. *Phyllotaxy* decussate. *Leaves* stipulate, simple; stipules interpetiolar, opposite pairs connate at base, together amplexicaul, leaving annulate scar on stem just above the scars of leaves, appressed to stem, membranous but fleshy at base. *1st Pair of leaves* scale-shaped, occasionally slightly developed, sessile; stipules 7–12 mm; blade broadly ovate, 4–9 by 3–8 mm, thick-coriaceous, green or brown. *2nd Pair of leaves* forming transitions, varying much. *3rd Pair of leaves* sessile or shortly petiolate; stipules 17–23 mm long; petiole up to $\frac{1}{2}$ cm long and 2 mm thick, thickness < breadth, green, sometimes red marginate at base; blade oblong, with index 2–3, 2–8 by $\frac{3}{4}$ – $3\frac{1}{2}$ cm, coriaceous, having an acuminate acute top and an acute or rounded narrowed base, pinninerved and midrib sunk above but prominent beneath, entire, glossy green above, dull reddish brown or green beneath. ± 9 th *Pair of leaves* petiole 2–3 cm, 2 mm thick, slightly channelled; blade lanceolate, with index 3–4, $9\frac{1}{2}$ – $12\frac{1}{2}$ by $2\frac{3}{4}$ –4 cm. *Top of plant* covered with acutely twisted stipules, later coming out of them acutely coiled; stipules $\pm 2\frac{1}{2}$ – $5\frac{1}{2}$ cm long, embracing one another, nearly semi-amplexicaul, membranous, light green or light red. *Plant* glabrous all over.

Seedlings from 3 natural habitats, fresh and in alcohol, and from material grown in fresh-water-mud and in fresh-water-sand.

***Bruguiera parviflora* (ROXB.) W. et A. ex GRIFF.**

B. I: 381; K. et V. IV: 297; TROUP II: 504

Mal.: langgadei. *Jav.*: tandjang

Fig. 113

Viviparous. Size when developed but still pendent in the tree 13–27 cm; at 1st stage

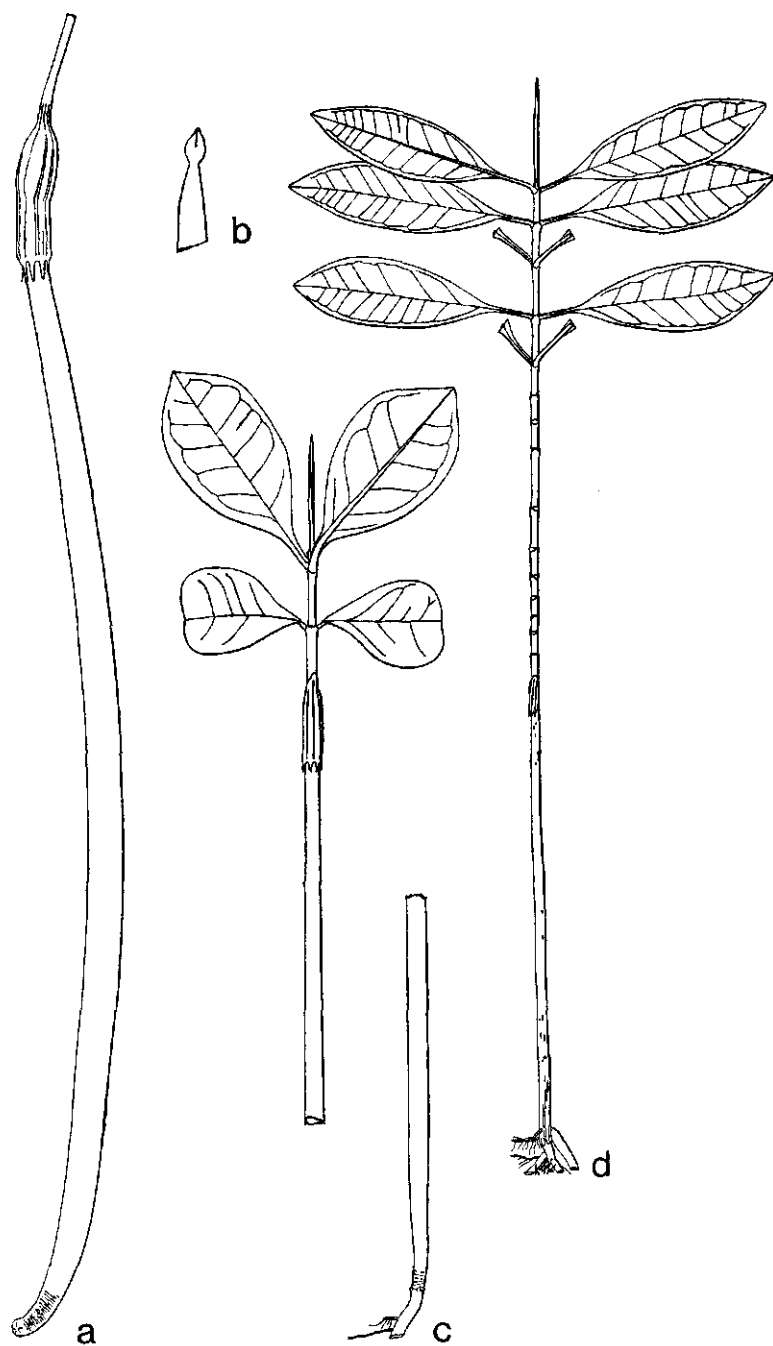


Fig. 113. *Bruguiera parviflora* a. young seedling shortly before falling, $1/1\times$; b. cotyledon-body, $1/1\times$; c. seedling with developed 1st and 2nd pair of leaves, $1/2\times$; d. older seedling, $1/4\times$.

(in the earth, 1 pair of leaves, fallen together with fruit) top covered with the cotyledons and the remains of the fruit; growing tip piercing the remains of the fruit; these remains last a long time in the plant in the shape of a loose collar; at 2nd stage (2–17 pairs of leaves) 19–82 cm above collet. *Roots* in seedling (embryo) in tree absent; at 2nd stage possessing easily compressible lamelled aërenchyma; primary root moderately flexuous, much thicker than lateral ones; lateral roots very numerous, patent, much branched. *Hypocotyl* in seedling in tree pendent down, straight or slightly curved, sometimes bent down near top if the fruit is not directed downwards, 12–26 cm, nearly cylindrical, slightly taperpointed obtuse at top and base, 4–6 mm thick, terete, lengthwise finely furrowed, surface finely granular, top covered with calyx which is not revolute; at 1st stage top still covered with remains of fruit later only with an annulate scar of cotyledons, base with a whorl of scales owing to the coming out of the primary root. *Cotyledons* connate. *Cotyledon-body* separating with much difficulty from the hypocotyl, petiolate; upper part subglobose, 3-angular, slightly and unequally 2-lobed and open at top, ± 3 mm long, near base ± 3 mm thick, thick-fleshy; lobes bent together; petiole tube-shaped, much contracted near top, terete, fleshy, narrowly enclosing the very small growing point, ± 3 mm long, not clearly distinct from the top of the hypocotyl, contracted part $\pm 1\frac{1}{2}$ mm thick. *Epicotyl* ± 1 –3 cm. *Stem* erect, straight, not much thinner than top of hypocotyl. *Phyllotaxy* decussate. *Leaves* stipulate, simple, petiolate; stipules interpetiolar, opposite pairs connate at base, together amplexicaul, leaving annulate scar on stem just above scars of leaves, appressed to stem, membranous, fugacious. *1st Pair of leaves*¹ developed petiole short, passing into the blade; blade obovate or obovate-cortiform, with index 1–2, $1\frac{1}{2}$ – $3\frac{1}{2}$ by $1\frac{1}{4}$ – $2\frac{1}{2}$ cm, thin-coriaceous, having a rounded obtuse or notched top and an acute base, pinninerved, intramarginally nerved and midrib prominent beneath, entire. *2nd Pair of leaves* like 1st one, but petiole $\pm \frac{3}{4}$ –1 cm, blade elliptic or obovate, with index 1–2, $\pm 3\frac{1}{2}$ –6 by 2– $3\frac{1}{4}$, having an acute top. Succeeding leaves like 2nd pair, but larger, blade lanceolate. *Top of plant* at 2nd stage covered with acutely twisted 3–8 cm long membranous stipules embracing one another. *Plant* glabrous all over.

Material in alcohol from 1 natural habitat.

***Bruguiera sexangula* (LOUR.) POIR. (*B. eriopetala* W. et A. ex ARN.)**

B. I: 381; K. et V. IV: 295; TROUP II: 503

Java: djankar, tandjang. *Mal.*: ting (*Menado*), tongke parampuan (*Mol.*). *Alf.*

Minah.: makurung

Fig. 112

Viviparous. *Size* when developed but still pendent in the tree up to 5–8½ cm; at 1st stage

1 Perhaps to be considered as the 2nd pair of leaves; in which case the organ here called epicotyl is the 1st internode of the stem, etc.

(in the earth, 1 pair of leaves) the same; at 2nd stage (± 6 pairs of leaves) ± 25 cm above collet. *Roots* in seedling (embryo) in tree only a commencement of a primary root at the base of the hypocotyl; at 2nd stage possessing lamelled easily compressible aërenchyma, yellow turning yellowish brown; tips white; primary root and lateral ones almost like those in *B. gymnorrhiza*. *Hypocotyl* in seedling (embryo) in tree: pendent straight down, 5–8 cm, fleshy, fusiform, taperpointed at top and base, thickest in centre and there $\pm 1\frac{3}{4}$ cm thick, terete, lengthwise very slightly and granularly ridged, surface slightly granular; top within calyx, calyx not revolute; at 1st stage the truncate top having an annulate scar of the cotyledon-body and in the centre of it the growing point but usually the scar is soon replaced by a whorl of large lenticels, dark dull green. *Cotyledons* connate. *Cotyledon-body* in seedling (embryo) in tree: petiolate; upper part subglobose, $\varnothing \pm 5$ mm, 3–5-lobed, open at top, thick-fleshy; lobes bent together; petiole tube-shaped, terete, fleshy, narrowly enclosing the very small growing point, top-contraction 1 mm long, 3 mm thick. *Epicotyl* 0–1 mm. *Stem* erect, straight, much thinner than hypocotyl. *Phyllotaxy* decussate. *Leaves* stipulate, simple; stipules interpetiolar, opposite pairs connate at base, together amplexicaul, leaving annulate scar on stem just above scars of leaves, appressed to stem, membranous near top. *1st Pair of leaves* scale-shaped, sessile; stipules up to 1 cm long, top irregularly notched; blade ovate, 4 by 4 mm, thick-coriaceous. *2nd Pair of leaves* forming transitions, varying rather much. $\pm 6th$ Pair petiolate; stipules $3\frac{1}{2}$ by 7 mm, petiole 1 cm, slightly channelled, green; blade obovate-oblong or oblong, ± 9 by $3\frac{1}{4}$ cm, coriaceous, having an acuminate top and a rounded base, pinninerved and midrib sunk above but prominent beneath, entire, glossy green above, dull beneath. *Top of plant* covered with acutely twisted stipules.

Material from 1 motherplant in the Botanical Garden in Bogor, grown in fresh-water-mud.

CARALLIA ROXB.

B. I: 378, 380; K. et V. IV: 300; TROUP II: 504

Carallia brachiata (LOUR.) MERR. (*C. integerrima* DC., *C. lucida* ROXB.)

B. I: 380; K. et V. IV: 301; TROUP II: 504

Mal.: ringit daroh, semeragi. *Sund.*: (uncertain) ki kukuran, ki tamijang. *Jav.*: (uncertain): kedalen, kukuran, krintjing, sepat, tandjang girang, tandjang gunung Fig. 114

Not *viviparous*. *Size* at 1st stage (1st pair of leaves only) $5\frac{1}{2}$ –19 cm, 3– $5\frac{1}{2}$ cm above collet; at 2nd stage (9–12 pairs of leaves) 21–42 cm above collet. *Roots* white turning yellowish white; primary root at 1st stage very flexuous, slightly thicker than lateral ones; collet whether or not abruptly and slightly thickened; lateral roots at 1st stage very numerous, very flexuous, sparsely branched. *Hypocotyl* epigeous, erect, straight,

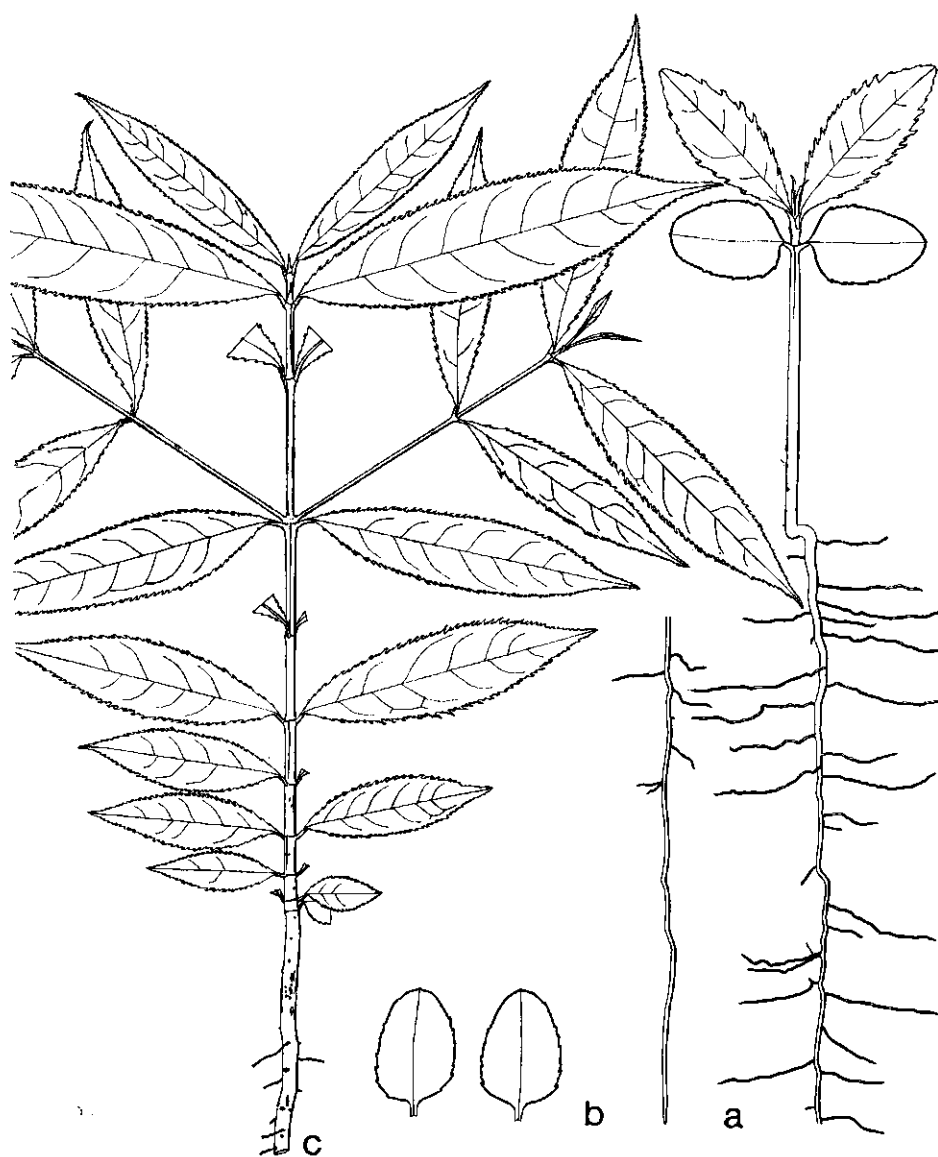


Fig. 114. *Carallia brachiata* a. young seedling, $1/1\times$; b. cotyledons, $1/1\times$; c. older seedling, $1/2\times$.

3–3½ cm; at 1st stage 1 mm thick, tapering upwards, terete near base, 2-winged near top, green, base white. *Cotyledons* epigeous, 2, equal, sometimes asymmetrical and one another's mirror image, stipulate, petiolate; stipules very small, hair-shaped, red; petiole 1–2 mm, green; blade ovate, with index 1–2, 8–18 by 5–11 mm, thin, having an obtuse or acute or emarginate top and an acute decurrent base, pinninerved and midrib prominent on both surfaces, entire or serrate, sometimes irregularly notched, glossy dark green above, slightly glossy green beneath. *Epicotyl* ± ½ cm. *Stem* erect, straight, terete; at 2nd stage slightly and laterally compressed at top of internodes, smooth, green in upper part, lower grey, with numerous lengthwise elliptic yellow lenticels below. *Phyllotaxy* decussate but along branches nearly distichous-alternate. *Leaves* stipulate, simple, petiolate; stipules interpetiolar, opposite pairs connate at base, together amplexicaul, leaving an annulate scar on the stem just above the scar of the leaves; stipules up to ± 1 cm long; petiole flattened above, convex beneath, green; blade in higher leaves lanceolate but in lower ones oblong or obovate-oblong, thin, having an acuminate acute top and an acute base, pinninerved and midrib prominent beneath, dentate, glossy green above, dull green beneath. *1st Pair of leaves* blade with index 2–3, 2–2½ cm by 7–11 mm. *Highest leaves* (2nd stage) petiole up to ½ cm, up to 1½ mm thick; blade index 4–5, up to 14 by 4 cm. *Top of plant* covered with stipules. *Plant* glabrous all over.

Seeds from 1 motherplant.

CERIOPS ARN.

B. I: 378, 379; K. et V. IV: 283; TROUP II: 501

Ceriops tagal (PERR.) C. B. ROBINS (*C. candolleana* ARN.)

B. I: 379; K. et V. IV: 284; TROUP II: 501, fig. 192

Mal.: tengah, tengar. *Jav.*: tingi. *Alf. Amb.*: palum, parun

Fig. 115

Viviparous. *Size* when developed but still pendent in tree up to ± 22–36 cm; at 1st stage (in the earth, 1st pair of leaves only) not much larger than hypocotyl; at 2nd stage (3–16 pairs of leaves) ± 31–46 cm above collet. *Roots* in seedling (embryo) in tree only indicated by some wart-shaped thickened spots near base of hypocotyl; at older stages easily compressible aërenchyma having pores; primary root developed like lateral ones or less than these from collet or as adventitious roots from hypocotyl; lateral roots 2nd order patent. *Hypocotyl* in seedling in tree pendent down, straight or slightly curved, but when the fruit is not directed downwards the hypocotyl is often a little curved near its top, 20–33½ cm, at ± ½ length thickest and there ± ¾–1 cm thick, tapering up- and downwards, near top ± 3–5 mm thick, having a slightly thickened top and an acute base, lengthwise sharply angular and furrowed, with scattered orbicular wart-shaped brown lenticels, dark dull green, sometimes reddish brown at

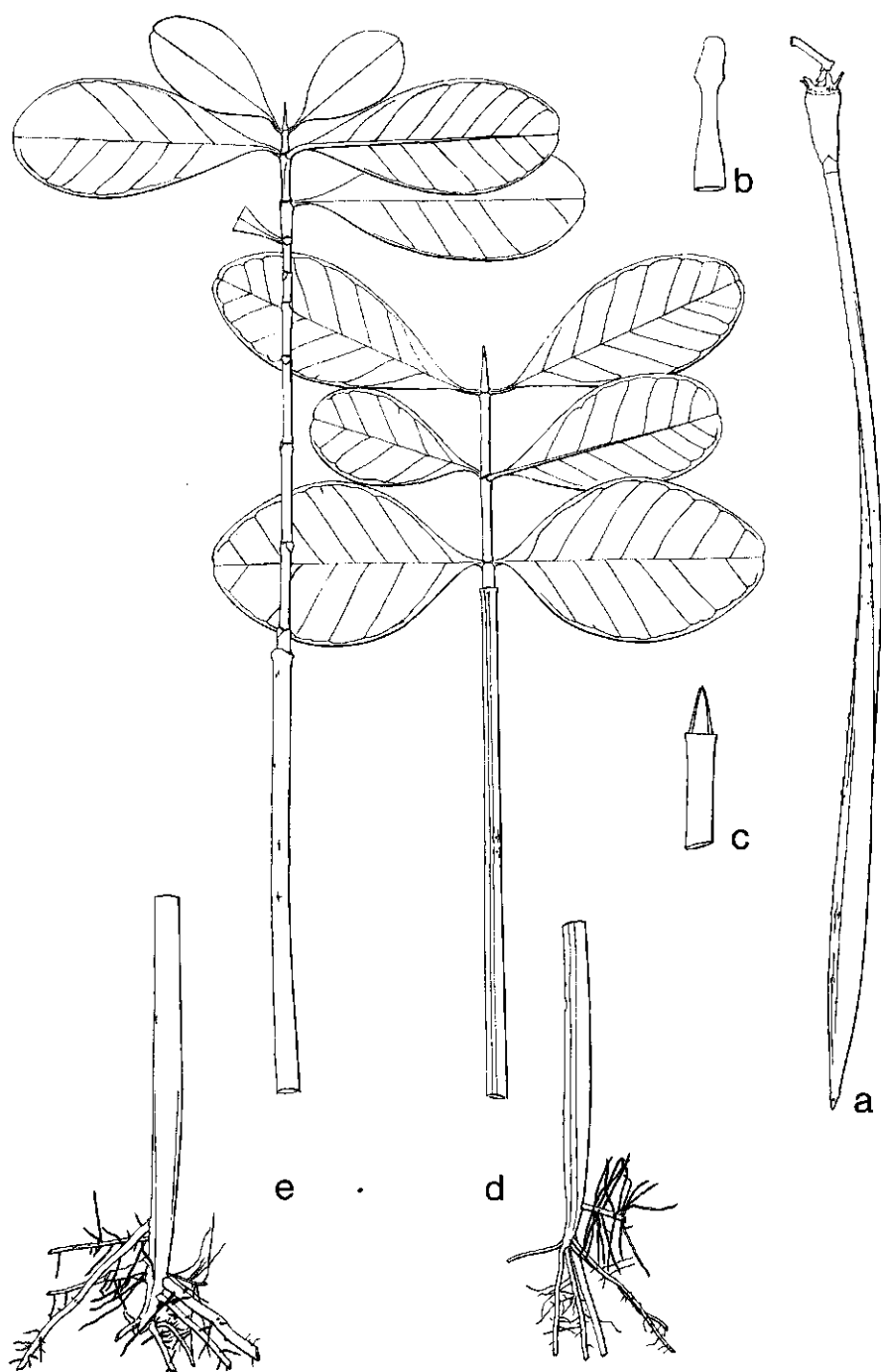


Fig. 115. *Ceriops tagal* a. young seedling shortly before falling, $1/2\times$; b. cotyledon-body, $1/1\times$; c. top of the plant after falling, $1/1\times$; d. seedling with developed second pair of leaves, $1/2\times$; e. older seedling, $1/2\times$.

base; at 1st stage top truncate, bearing annulate scar of cotyledon-body and in the centre of it the growing point. *Cotyledons* in seedling in tree fleshy, connate. *Cotyledon-body* remaining in fruit in tree, petiolate; upper part subglobose, 5–7 mm long, 4–6 mm thick, top narrowed; petiole tube-shaped, terete, fleshy, enclosing the growing point, 12–20 mm long, up to 4 mm thick, tapering upwards, protruding from fruit 0–12 mm, scar horizontal. *Epicotyl* 0 mm. *Stem* erect, straight, much thinner than hypocotyl; at 2nd stage nodes thickened, with large orbicular leaf-scars and narrow annulate stipule-scars just above these. *Phyllotaxy* decussate. *Leaves* stipulate, simple; stipules interpetiolar, opposite pairs connate at base, membranous, together amplexicaul, leaving an annulate scar. *1st Pair of leaves* scale-shaped, fleshy, 3-angular, ± 5 –8 mm long, green or brownish green, leaving half-moon-shaped scar just above the scar of the cotyledon-body. *2nd Pair of leaves* developed, petiolate; petiole $\pm \frac{1}{2}$ cm, 2-winged; blade obovate, with index $1\frac{1}{2}$ –2, ± 7 by $4\frac{1}{2}$ cm, coriaceous, having a notched top and a taperpointed decurrent base, pinninerved, prominently nerved beneath, intramarginally nerved, entire. *Succeeding leaves* some larger, some smaller; petiole longer, unwinged; blade top rounded, only slightly emarginate (B.: rounded-emarginate, K. et V.: obtuse). *Top of plant* covered with stipules, acute, green or brown; at 2nd stage stipules $\pm \frac{3}{4}$ – $1\frac{1}{4}$ cm long, flatly conduplicate upwards along the midrib, embracing one another. *Plant* glabrous all over.

Seedlings from 3 natural habitats, fresh and in alcohol, and from material grown in fresh-water-mud in Bogor.

RHIZOPHORA L.

B. I: 378, 379; K. et V. IV: 276; TROUP II: 500

This genus is *viviparous*. *Roots* in seedling (embryo) in tree only indicated by some wart-shaped spots near the base of the hypocotyl; at older stages easily compressible aërenchyma having pores. *Hypocotyl* in tree pendent down, lowest part thickest, having an acute base, on fracture bristle of idioblasts; top shortly after falling truncate with an annulate scar of the cotyledon-body and in the centre of it the growing point. *Cotyledons* connate. *Cotyledon-body* fleshy, petiolate, remaining in fruit in tree; upper part globular, top narrowed; petiole having a contracted top, tube-shaped, terete, fleshy, protruding from fruit, enclosing the growing point. *Epicotyl* maximum length 3 mm. *Stem* on fracture like the hypocotyl. *Phyllotaxy* decussate. *Leaves* 1st pair undeveloped, leaving no distinct scar, stipulate; stipules together amplexicaul, opposite pairs connate at base, leaving annulate scar; *developed leaves* stipulate, simple, petiolate; stipules interpetiolar, leaving a scar like the stipules of the 1st pair of leaves just above the scars of the leaves; blade of the leaves punctate beneath. *Plant* glabrous all over.

Seedling still pendent in tree, or just fallen, or having some pairs of leaves¹

a. hypocotyl 27–42 cm, usually lighter green than upper surface of developed leaves, warts few; epicotyl $1\frac{1}{2}$ –3 mm long; scars of the stipules of 1st developed pair of leaves oblique or nearly horizontal *R. apiculata*

b. hypocotyl 31–66 cm, usually darker green than upper surface of developed leaves, warts numerous; epicotyl $1-1\frac{1}{2}$ mm long; scars of stipules of 1st developed pair of leaves nearly vertical *R. mucronata*

***Rhizophora apiculata* BL. (*R. conjugata* Auct. non L.)**

B. I: 379; K. et V. IV: 282; TROUP II: 501

Jav.: tandjang. *Mad.*: tandjang

Fig. 116

Viviparous. Size when developed but still pendent in tree up to ± 45 cm; at 1st stage (in the earth, slightly or not developed 1st pair of leaves only) not much larger than hypocotyl; at 2nd stage (3–8 pairs of leaves) ± 45 –85 cm above collet. *Roots* in seedling (embryo) in tree only indicated by some wart-shaped spots near the base of the hypocotyl, easily compressible aërenchyma having pores; at 2nd stage dirty yellow; primary root usually undeveloped and replaced; lateral ones slightly flexuous, much branched; lateral roots 2nd order patent. *Hypocotyl* in seedling in tree pendent straight down, but if the fruit is not directed downwards the hypocotyl often curves slightly down, 27–42 cm, lower part thickest and there $\pm 1-1\frac{1}{2}$ cm thick, tapering up- and downwards, $\pm \frac{1}{4}$ –1 cm thick at top, having an acute base, terete, with some warts and lenticels, green usually lighter than upper surface of developed leaves, bristle of idioblasts on fracture; at 1st stage top shortly after the seedling has fallen truncate, with an annulate scar of cotyledon-body and in centre of it the growing point; light green usually lighter than upper surface of developed leaves; sometimes yellowish green usually reddish yellow at base; with numerous orbicular or longitudinal elliptic or linear blackish grey lenticels, some of them heighthened to warts up to 1 mm high orbicular or lengthwise elliptic with yellow centre. *Cotyledons* connate. *Cotyledon-body* nearly like that in *R. mucronata* (see description) but smaller, leaving horizontal scar at top of hypocotyl as in that species. *Epicotyl* $1\frac{1}{2}$ –3 mm, much thinner than hypocotyl. *Stem* erect, straight, terete, green, 1st internode much thinner than epicotyl and usually longer than next ones; bristle of idioblasts on fracture like hypocotyl. *Phyllotaxy* decussate. *Leaves* stipulate, simple; stipules opposite pair connate at base, together amplexicaul, leaving annulate scar, membranous but fleshy at base. *1st Pair of leaves* very slightly or not developed, leaving no distinct scar; stipule-scar at top of epicotyl oblique or nearly horizontal. *2nd Pair of leaves* developed, petiolate, petiole $\frac{3}{4}$ – $1\frac{1}{2}$ cm long, 3–5 mm broad, $1\frac{1}{2}$ mm thick, glossy dark green above, dull

¹ It is rather difficult to distinguish between the leaves of these two species, but at the 2nd stage the difference between the hypocotyls is still present.

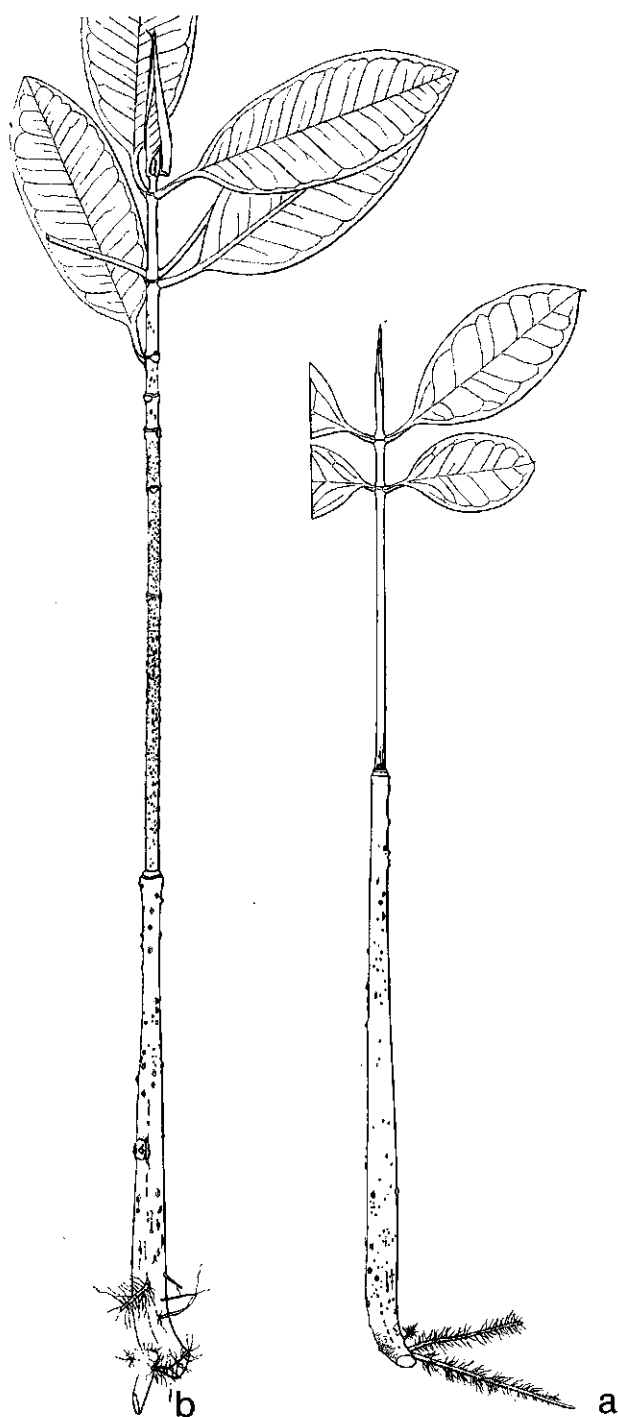


Fig. 116. *Rhizophora apiculata* a. young seedling, $1/4\times$; b. older seedling, $1/4\times$.

light green beneath; blade oblong, with index $\pm 2-3$, $\pm 7-9\frac{1}{2}$ by $2\frac{3}{4}-4\frac{1}{4}$ cm, having a mucronate acute top and an acute base, thick-coriaceous, pinninerved, intramarginally nerved and midrib prominent beneath, entire, coloured like petiole, but light green on midrib above, slightly or more distinctly finely brown or dark green punctate beneath. *Highest leaves* at 2nd stage like 2nd pair but larger; petiole longer and often red; mucronate top abruptly acuminate owing to involute margin near top. *Top of plant* conical, acute, covered with stipules; these stipules embracing one another, membranous but at base fleshy, slightly or more distinctly red; at 1st stage stipules up to 6 cm, at 2nd stage longer. *Plant* glabrous all over.

Seedlings from 2 natural habitats, fresh and in alcohol.

***Rhizophora mucronata* LMK.**

B. I: 380; K. et V. IV: 278; TROUP II: 500, fig. 192

Mal.: bakau hitam, b. korab, b. merah. *Jav.*: tandjang

Fig. 117

Viviparous. Size when developed but still pendent in tree up to 35–72 cm (K. et V.: up to 100 cm); at 1st stage (in the earth, undeveloped 1st pair of leaves only) not much larger than hypocotyl; at 2nd stage (2–6 pairs of leaves) $\pm 50-105$ cm above collet. *Roots* in seedling (embryo) in tree only indicated by some wart-shaped spots near the base of the hypocotyl; at 2nd stage easily compressible aërenchyma having pores; primary root often undeveloped and replaced; lateral ones slightly flexuous, much branched; lateral roots 2nd order patent. *Hypocotyl* in seedling in tree pendent straight down, but when the fruit is not directed downwards often hypocotyl a little curved down, 31–66 cm, at $\pm \frac{1}{4}-\frac{1}{3}$ length from base thickest and there $\varnothing 1\frac{1}{4}-1$ cm thick, tapering up- and downwards, $\frac{3}{4}-1$ cm thick at top, having an acute base, terete, with numerous warts and numerous lengthwise elliptic or linear black lenticels, green, bristle of idioblasts on fracture; at 1st stage having a truncate top bearing annulate scar of cotyledon-body and in the centre of it the growing point, dark green, usually darker than the upper surface of the leaves (older stage), yellow sometimes yellowish red at base, with numerous lengthwise and transversally elliptic linear black lenticels many of them heightened to warts 2 mm high with yellow centre. *Cotyledons* in seedling in tree fleshy, connate. *Cotyledon-body* remaining in fruit in tree, petiolate; upper part globose, narrowed at top, $1\frac{1}{2}-2\frac{1}{2}$ cm long, 1–2 cm thick; petiole tube-shaped, terete, fleshy, enclosing the growing point, $3-4\frac{1}{2}$ cm long, 7–8 mm thick, protruding from fruit $\frac{1}{2}-2\frac{1}{4}$ cm, horizontal scar. *Epicotyl* $1-1\frac{1}{2}$ mm; much thinner than hypocotyl. *Stem* erect, straight, terete, slightly and laterally compressed just below the nodes, green, on fracture like hypocotyl, 1st internode not or slightly thinner than epicotyl usually larger than next ones. *Phyllotaxy* decussate. *Leaves* stipulate, simple; stipules interpetiolar, opposite pairs connate at base, membranous but fleshy at base, together amplexicaul, leaving annulate scar. *1st Pair of leaves* very slightly or not developed, leaving no distinct scar; stipules developed, leaving

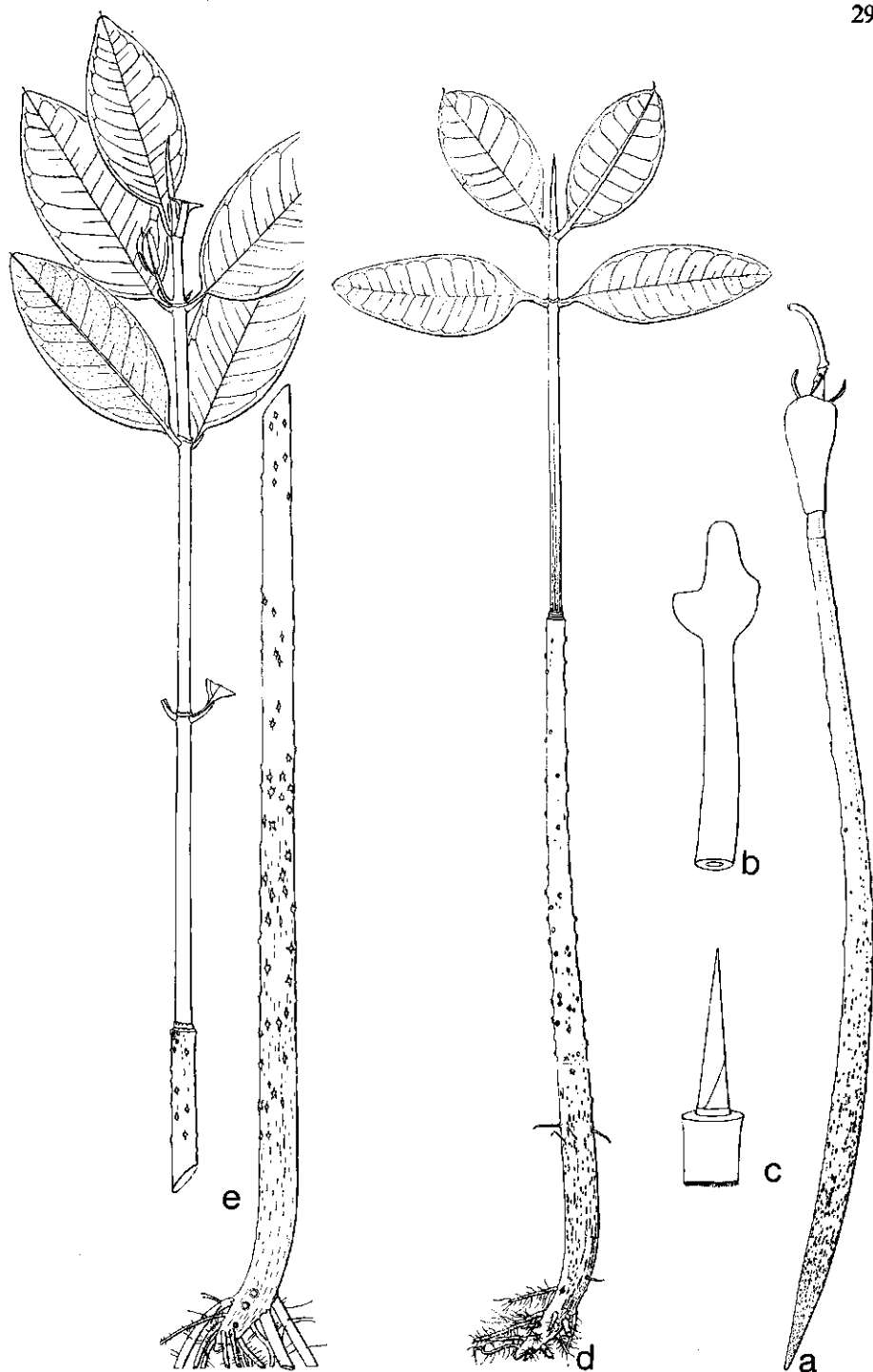


Fig. 117. *Rhizophora mucronata* a. young seedling shortly before falling, $1/4\times$; b. cotyledon-body, $1/1\times$; c. top of the plant shortly after falling, $1/1\times$; d. seedling with developed 2nd pair of leaves, $1/4\times$; e. older seedling, $1/4\times$.

nearly vertical scar. *2nd Pair of leaves* developed, petiolate; petiole 2 cm, 4 mm broad, 2½ mm thick, glossy dark green above, dull light green beneath, blade oblong, with index 2½, ±10 by 4 cm, thick-coriaceous, having a mucronate top abruptly acuminate owing to involute margin near top, acute at base, pinninerved, intramarginally nerved and midrib prominent beneath, entire, coloured like petiole but light green on midrib above, under surface slightly or more distinctly finely brown or dark green punctate. *Highest leaves* at 2nd stage like 1st developed pair but larger. *Top of plant* at 1st stage conical, acute; covered with stipules, embracing one another, enclosing the growing point, membranous but fleshy at base, slightly or more distinctly red; at 1st stage up to ±6 cm long, at 2nd stage larger. *Plant* glabrous all over.

Seedlings from 3 natural habitats, fresh and in alcohol.

ROSACEAE

B. I: 509, III: 649; K. et V. V: 330; LUBB. I: 476; TROUP II: 487

PARINARI AUBL. (*Parinarium* JUSS.)

B. I: 509, 521; K. et V. V: 332

***Parinari corymbosum* (BL.) MIQ. (*Parinarium griffithianum* BTH., more recent: *Maranthes corymbosa* KOSTERMANS)**

B. I: 522; K. et V. V: 334

Mal.: kaju batu, merbatu lojeng, sungko bimau. *Sund.*: tariti, taritiq. *Jav.*: suluh, triwulan, wuloh

Fig. 118

Size at 1st stage (1st 2 leaves only) 21–39 cm, 5–11 cm above collet; at 2nd stage (9–13 leaves) 15–37 cm above collet. *Roots* off white or yellowish white turning brown; primary root at 1st stage moderately flexuous, much thicker than lateral ones; collet abruptly and very much broadened at one side; lateral roots at 1st stage very numerous very flexuous, highest ones much branched. *Hypocotyl* epigeous, erect, straight, 3–8½ cm; at 1st stage having a base very much broadened at one side, 2–4 mm thick turning thinner, terete, smooth, pale green turning brown, white at base, with simple colourless hairs. *Cotyledons* epigeous, 2, asymmetrical, one another's mirror image, sessile; blade oblong, with index 2–2½, 17–22 by 7–9 mm, semiglobose beneath, fleshy, flattened above, turning moderately flattened or convex above or beneath or irregularly so on both surfaces, having a rounded obtuse top and a narrowed base nearly semi-amplexicaul sometimes slightly eared, indistinctly nerved, entire, on both surfaces green turning pale, glabrous. *Epicotyl* 2½–3 cm. *Stem* erect; at 2nd stage zigzag, feather-shaped with a sideward bend, terete, green but brown in lower part,

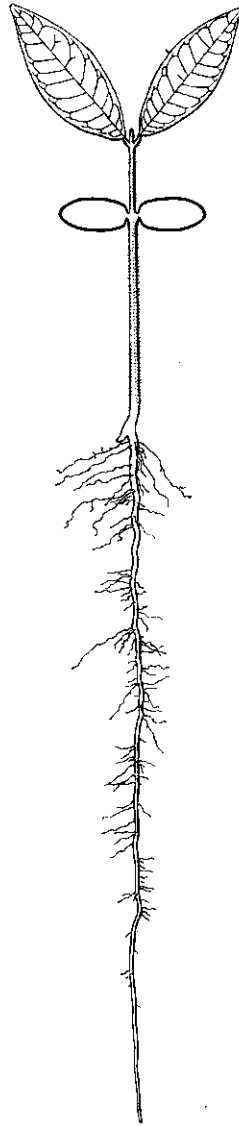


Fig. 118. *Parinari corymbosum* young seedling, $1/2\times$.

with dense and felty simple colourless hairs. *Phyllotaxy* spiral but 1st 2 leaves opposite, highest (2nd stage) ones distichous-alternate. *Leaves* stipulate, simple, petiolate; stipules connate but with free acute tops, ovate, semi-amplexicaul, appressed to stem, green, hairy like stem. *1st 2 Leaves* stipules ± 6 mm long, green, hairy like stem; blade oblong or obovate-oblong, with index 2-3, 6-8 by 3-4 cm, thin, having an acute or obtuse sometimes acuminate top and a shortly acuminate acute base, some-

times slightly or more distinctly glandular, pinninerved, on both surfaces but especially beneath prominently nerved, entire, slightly glossy green above, dull light green beneath, on midrib above and on lateral nerves beneath hairy like stem. *Highest leaves* (2nd stage) stipules up to 13 mm long; petiole up to $\frac{1}{2}$ cm, up to 2 mm thick, terete, green, hairy like stem; blade obovate-lanceolate, with index up to 4, up to 17 by 6 cm, thin-coriaceous, having a shortly acuminate top and a rounded base on upper surface of which at left and right a small orbicular red gland, in older leaves these glands sometimes turning indistinct, pinninerved, on both surfaces but especially beneath prominently nerved, entire, slightly glossy dark green above, dull greyish green beneath, on both surfaces white felty hairy but especially beneath turning slightly or more distinctly glabrous. *Top of plant* at 1st stage hairy, green; at 2nd stage with white felty hairs.

Seeds from 1 motherplant.

RUBIACEAE

B. II: 274, III: 655; K. et V. VIII: 1; LUBB. II: 59; TROUP II: 613

Cotyledons epigeous, 2, equal, foliaceous, petiolate, whether or not stipulate. *Stem* terete or 4-angular, hairy or glabrous. *Phyllotaxy* decussate, along branches sometimes distichous-alternate. *Leaves* stipulate, simple, petiolate; stipules connate, interpetiolar or intrapetiolar, often together amplexicaul.

Cotyledons and (or) 1st pair of leaves and (or) highest leaves (2nd stage, 7–11 pairs of leaves) present

1. a. cot. acutely stipulate, blade 5–8 mm long; leaves stipulate, stipules acute; 1st pair of leaves blade 9–12 mm long *Hypobathrum microcarpum*
 b. cot. stipulate or exstipulate, if stipulate stipules obtuse, blade $1\frac{1}{2}$ –5 mm long; leaves stipulate, stipules obtuse; 1st pair of leaves blade 3–11 mm long 2
2. a. cot. exstipulate, blade $1\frac{1}{2}$ mm long; 1st pair of leaves blade 3 mm long; highest leaves (2nd stage) stipules up to 2 cm long, petiole channelled
 Neonauclea obtusa
 b. cot. stipulate, blade $2\frac{1}{2}$ –5 mm long; 1st pair of leaves blade 5–11 mm long; highest leaves (2nd stage) stipules up to $1\frac{1}{2}$ cm long, petiole not channelled . . .
 Nauclea coadunata

HYPOBATHRUM BL. (*Petunga* DC. included)

B. II: 277, 315; K. et V. VIII: 113

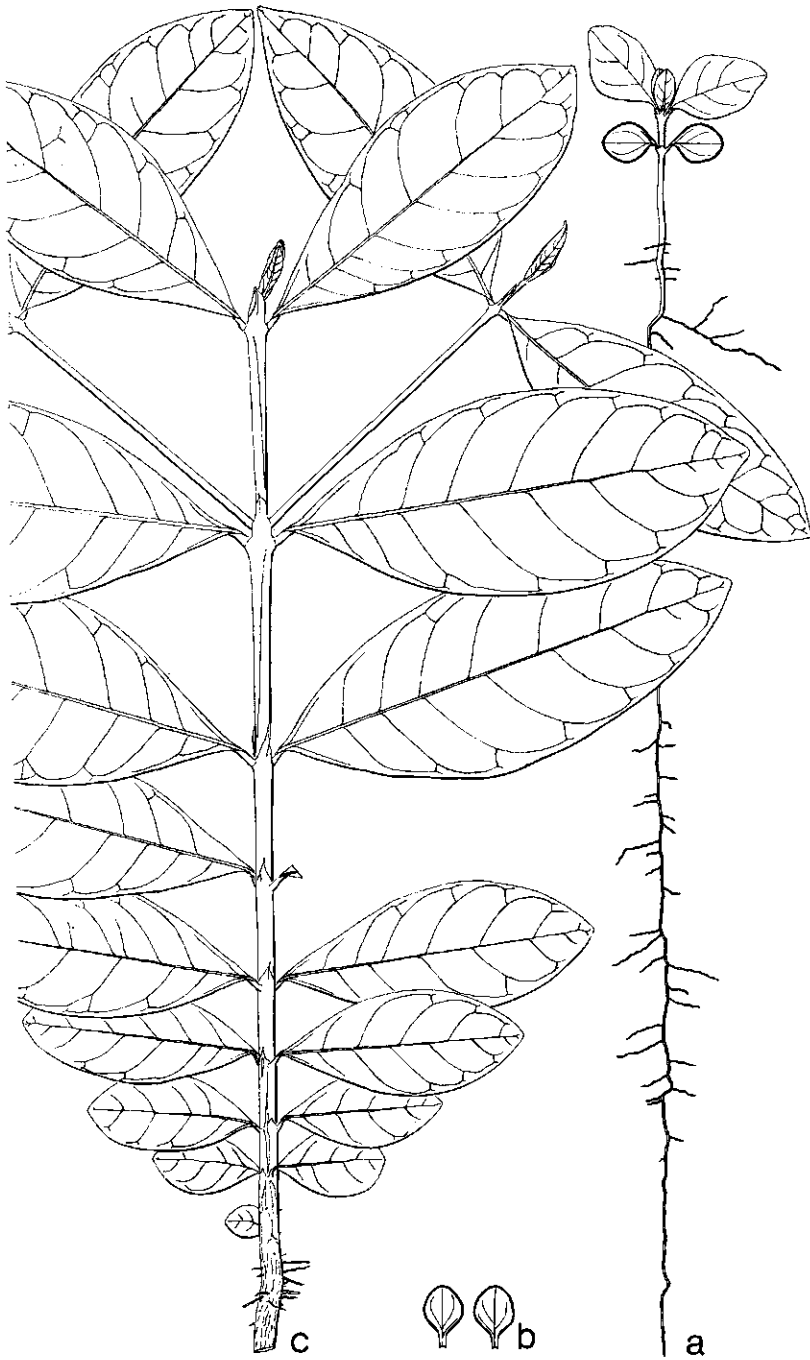


Fig. 119. *Hypobathrum microcarpum* a. young seedling, $1/1\times$; b. cotyledons, $1/1\times$; c. older seedling, $1/2\times$.

***Hypobathrum microcarpum* (BL.) BAKH. f. (*Petunga microcarpa* (BL.) DC.)**

B. II: 316; K. et V. VIII: 119

Sund.: hapit, ki hapit. *Jav.*: apit, bakalan

Fig. 119

Size at 1st stage (1st pair of leaves only) 6½–23 cm, 1½–3 cm above collet; at 2nd stage (\pm 10–12 pairs of leaves) 30–48 cm above collet. *Roots* white turning brownish yellow; primary root at 1st stage very flexuous, slightly or not thicker than lateral ones; collet gradually and slightly thickened; lateral roots at 1st stage moderate in number, very flexuous, moderately branched. *Hypocotyl* epigeous, erect, straight, sometimes curved at base, 10–24 mm; at 1st stage ½–1 mm thick, terete, smooth, white or pale green, glabrous. *Cotyledons* epigeous, 2, equal, stipulate, petiolate; stipules connate, small, acute; petiole 1 mm, pale green, glabrous; blade ovate or elliptic, with index $\frac{5}{7}$ –1½, 5–8 by 4–7 mm, thin, having an obtuse or emarginate top and a narrowed base, 3-plinerved, entire, dull green, glabrous. *Epicotyl* 1–5 mm. *Stem* erect, straight; at 2nd stage 4-angular near top, terete below, smooth, green near top reddish brown below. *Phyllotaxy* decussate, along branches distichous-opposite. *Leaves* stipulate, simple, petiolate; stipules connate, interpetiolar, acute; petiole flattened above, convex beneath, green; blade pinninerved, entire, glabrous. *1st Pair of leaves* stipules small, green; petiole 1–2 mm, hairy beneath like stem; blade elliptic, with index 1½–2, 9–12 by 5–9 mm, thin, having an obtuse top and a narrowed base, prominently nerved beneath, dull green above, dull greyish green beneath, glabrous. *Highest leaves* (2nd stage) stipules 3-angular, green turning reddish brown, with simple very short colourless hairs; petiole up to 1 cm, glabrous; blade oblong or lanceolate or obovate-oblong or obovate-lanceolate, with index up to 3½, up to 12½ by 5 cm, thin-coriaceous, having a taperpointed obtuse top and an acute narrowed base, on both surfaces nerves prominent, both surfaces dull green. *Top of plant* covered with flatly and laterally compressed stipules of highest pair of leaves.

Seeds from 2 motherplants from different localities.

NAUCLEA L. sensu MERR.B. II: 301; K. et V. VIII: 11, *Sarcocephalus*

***Nauclea coadunata* J. E. SMITH (*N. orientalis* Auct. non (L.) L., *Sarcocephalus cordatus* (ROXB.) MIQ., *Cephalanthus orientalis* L.,**

B. II: 302, III: 655; K. et V. VIII: 13

Mal.: gempol. kaju mas (*Minahasa*). *Sund.*: gempol. *Jav.*: gempol, klepu pasir, lampajan. *Alf. Minah.*: seha

Fig. 120

Size at 1st stage (1st pair of leaves only) \pm 4 cm, 1½ cm above collet; at 2nd stage

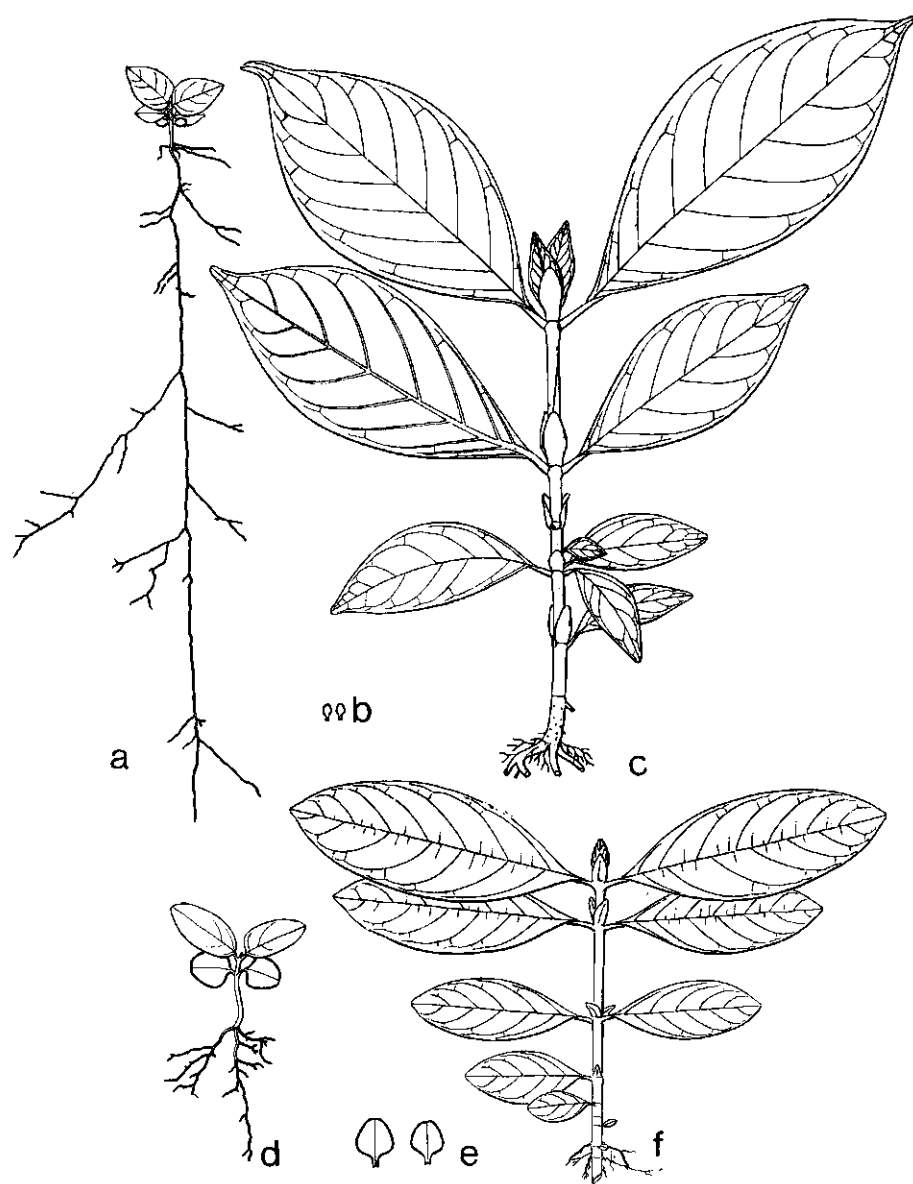


Fig. 120. *Neonauclea obtusa* a. young seedling, $1/1\times$; b. cotyledons, $1/1\times$; c. older seedling, $1/2\times$.
Nauclea coadunata d. young seedling, $1/1\times$; e. cotyledons, $1/1\times$; f. older seedling, $1/4\times$.

(7–9 pairs of leaves) 14–18 cm above collet. *Roots* white sometimes turning yellow; primary root at 1st stage often replaced by a lateral one, very flexuous; collet gradually and moderately thickened; lateral roots at 1st stage moderate in number, very flexuous, sparsely or much branched. *Hypocotyl* epigeous, erect, straight, ± 1 cm; at 1st stage $\frac{3}{4}$ mm thick, terete, smooth, white or greenish white, with simple patent very short colourless hairs. *Cotyledons* epigeous, 2, equal, obtusely stipulate, petiolate; petiole 1–2 mm, greenish white; blade ovate, with index 1–2, $2\frac{1}{2}$ –5 by 2–4 mm, thin, having a rounded obtuse or shallowly notched top and a truncate base narrowed into petiole, pinninerved, entire, dull green on both surfaces, glabrous. *Epicotyl* $2\frac{1}{2}$ –10 mm. *Stem* erect, straight. *Phyllotaxy* decussate. *Leaves* stipulate, simple, petiolate; stipules connate, interpetiolar, together amplexicaul; petiole glabrous; blade thin, having an obtuse top and an acute narrowed base, pinninerved, entire, glabrous. *1st Pair of leaves* stipules 3-angular, red or green; petiole ± 1 –2 mm, green; blade ovate, with index $1\frac{1}{2}$ –2, ± 5 –11 by 3 – $6\frac{1}{2}$, dull green. *Highest leaves* (2nd stage) stipules large, foliaceous, ovate, up to 15 by 8 mm, obtuse, green; petiole up to $1\frac{1}{2}$ cm, flattened above, convex beneath, red or green; blade oblong, with index 2– $2\frac{1}{4}$, $13\frac{1}{2}$ –17 by $5\frac{1}{2}$ – $7\frac{1}{2}$ cm, prominently nerved on both surfaces, glossy dark green above, dull green beneath. *Top of plant* covered with flatly and laterally compressed stipules of highest pair of leaves.

Seeds from 3 motherplants from different localities.

NEONAUCLEA MERR.

B. II: 302; K. et V. VIII: 19, *Nauclea*; TROUP II: 631, *Nauclea*

Neonauclea obtusa BL. MERR. (*Nauclea obtusa* BL.)

B. II: 303; K. et V. VIII: 30

Sund.: tjangjaratan. *Jav.*: klepu, klepu ketek

Fig. 120

Size at 1st stage (1st pair of leaves only) 5–16 cm, $\frac{1}{2}$ – $1\frac{1}{2}$ cm above collet; at 2nd stage (± 7 –11 pairs of leaves) 7–27 cm above collet. *Roots* off white; primary root at 1st stage very flexuous, not thicker than lateral ones; collet gradually and slightly thickened; lateral roots at 1st stage moderate in number, very flexuous, moderately branched. *Hypocotyl* epigeous, erect, straight, 2–5 mm, white; often adventitious roots. *Cotyledons* epigeous, 2, equal, exstipulate, shortly petiolate; blade ovate, $1\frac{1}{2}$ by $1\frac{1}{2}$ mm, thin, having an obtuse top and a rounded base narrowed into petiole, entire, green. *Epicotyl* erect, straight, 1–7 mm, pale green. *Stem* erect, straight; at 2nd stage terete, smooth, red or green, glabrous or near top simple very short patent colourless hairs. *Phyllotaxy* decussate. *Leaves* stipulate, simple, petiolate; stipules connate, interpetiolar, together amplexicaul, obtuse; blade thin, entire, dull green. *1st Pair of leaves* petiole 2 mm; blade ovate, 3 by 2 mm, having an obtuse or acute top and a

rounded base narrowed into petiole, with simple very short colourless hairs. *Highest leaves* (2nd stage) stipules ovate, large, up to 2 by 1 cm, having an obtuse top, green, glabrous; petiole up to 1½ cm, channelled, red sometimes green, hairy like stem; blade elliptic or oblong, with index $\pm 2-3$, 8½-15 by 3½-8¼ cm, having an acuminate obtuse top and a rounded or acute base narrowed into petiole, pinninerved; nerves prominent, red and hairy beneath like stem. *Top of plant* covered with flatly and laterally compressed stipules of highest leaves.

Seeds from 1 motherplant.

RUTACEAE

B. II: 94; K. et V. IV: 198; LUBB. I: 317; TROUP I: 166

Cotyledons 2, hypogeous and fleshy, or epigeous and foliaceous. *Stem* erect, terete, hairy. *Phyllotaxy* of 1st 2 leaves opposite, but subopposite if cotyledons are hypogeous; of next ones spiral. *Leaves* exstipulate; 1st leaves simple, next ones (2nd stage) 3-foliolate or imparipinnate; blades transparently punctate but in sicco this is only visible in young leaves.

1. A. cotyledons and (or) 1st leaf present¹ 2
 - B. higher leaves present (3-foliolate or pinnate-5-8-foliolate). 4
2. a. cot. epigeous, foliaceous; all leaves spirally arranged

Micromelum minutum
- b. cot. hypogeous, fleshy; 1st leaves opposite or subopposite 3
3. a. 1st leaf: blade 1-4 cm long, base narrowed, top acute or obtuse

Aegle marmelos
- b. 1st leaf: blade ± 19 mm long, base rounded, top notched

Murraya paniculata
4. a. higher leaves 3-foliolate *Aegle marmelos*
- b. higher leaves imparipinnate. 5
5. a. top of the blade notched or emarginate *Murraya paniculata*
- b. otherwise *Micromelum minutum*

¹ Not enough characters were available of the cotyledons of *Murraya paniculata*, so this species is not present in the first part of the key.

AEGLE CORR.

B. II: 95, 107; K. et V. IV: 253; LUBB. I: 325; TROUP I: 167

***Aegle marmelos* (L.) CORR.**

B. II: 107; K. et V. IV: 254; LUBB. I: 325; TROUP I: 167

Dutch: slijmappelboom. *India*: bael tree. *Mal.*: bila, bilak, kawista (*Djak.*), madja, m. batu, m. ingus (*Djak.*). *Sund.*: madja. *Jav.*: madja, m. galepong, m. gedan, m. lumut, m. pait, maos. *Mad.*: bila, b. gledhang, b. paëk. *Mak.*: bila, tang kulu

Fig. 121

Size at 1st stage (2 leaves only) 13–32 cm, 3–8 cm above collet. *Roots* persistently yellowish white; tips white; primary root at 1st stage moderately thicker than lateral ones; collet gradually and slightly thickened; lateral roots moderate in number, very flexuous, sparsely branched. *Hypocotyl* hypogeous, very short. *Cotyledons* hypogeous, 2, equal, together at side of stem, with their upper surfaces usually in close contact, sometimes covered with testa, petiolate; petiole ± 3 mm, yellowish white; blade obovate (TROUP: orbicular or broadly elliptical), gradually grading into petiole, with index $1-1\frac{1}{2}$, 6–8 by 4–7 mm, thick-fleshy, flattened above, convex beneath, having a rounded obtuse top, entire. *Epicotyl* erect, straight, $1\frac{1}{2}$ –5 mm; at 1st stage tapering upwards, terete, smooth, green, yellowish white at base, with simple colourless hairs. *Stem* erect; at 2nd stage spiral owing to obtusangular connection of internodes, terete, smooth, green, near top hairy like epicotyl at 1st stage. *Phyllotaxy* spiral, but 1st 2 leaves opposite or subopposite. *Leaves* exstipulate; lowest leaves simple, next ones 1-foliolate, following ones 3-foliolate but between these sometimes some 2-foliolate ones. *Highest leaves* (2nd stage) possessing green thick spines laterally inserted in the axil at the base of a bud. *1st Leaf* simple, petiolate; petiole 1–3 mm, green, hairy like stem; blade ovate, sometimes obovate, with index 1–2, $1-4\frac{1}{2}$ by 1–3 cm, having a taperpointed acute but sometimes rounded obtuse top and a narrowed base, pinninerved, prominently nerved beneath, serrate or crenate, on both surfaces dull green, on both surfaces midrib sparsely hairy like stem, finely and transparently punctate. *3-Foliolate leaves* rachis thickened at top and base, flattened above, convex beneath, green, hairs like those on stem very soon falling; leaflets shortly petiolulate; middle leaflet much larger than lateral ones; blade ovate-oblong, thin, having an acuminate notched top and a base in lateral leaflets rounded and narrowed into petiole but in terminal leaflet acuminate narrowed, pinninerved and nerves prominent on both surfaces but beneath most, doubly crenate, on both surfaces dull green, finely and transparently punctate, hairs on both surfaces like those on epicotyl very soon falling. *Top of plant* hairy, green or red.

Seeds from 2 motherplants from different localities.

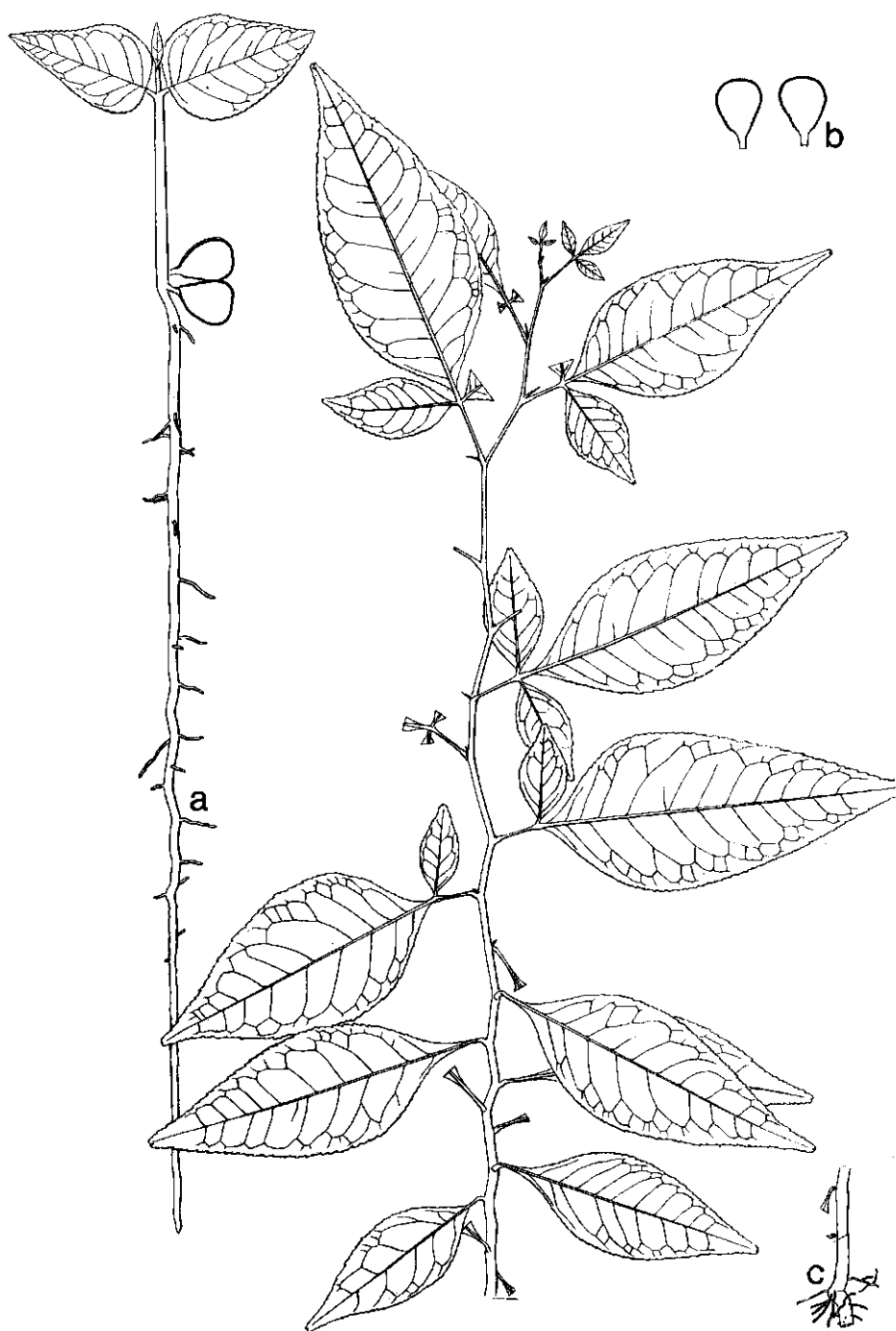


Fig. 121. *Aegle marmelos* a. young seedling, $1/1 \times$; b. cotyledons, $1/1 \times$; c. older seedling, $1/4 \times$.

MICROMELUM BL.

B. II: 95, 103; K. et V. IV: 238

***Micromelum minutum* (FORSTER f.) W. et A. (*M. pubescens* BL.)**

B. II: 103; K. et V. IV: 239

Mal.: Sesi (*Lampung-country, Sumatra*). *Sund.*: ki betjekah, ki madja, ki mangkok, mamangkukan. *Jav.*: mentanen, sentanen, telawas

Fig. 122

Size at 1st stage (1st leaf only) 9–32 cm, 4–7 cm above collet; at 2nd stage (7–11 leaves) 8–42 cm above collet. *Roots* permanently yellowish white; primary root at 1st stage slightly or moderately or very flexuous, moderately thicker than lateral ones; collet gradually and slightly thickened; lateral roots at 1st stage moderate in number, slightly flexuous. *Hypocotyl* epigeous, erect, straight, 2½–6 cm long; at 1st stage 1–1¼ mm thick, slightly tapering upwards, terete, smooth, green, yellowish white at base, with simple very short patent colourless hairs. *Cotyledons* epigeous, 2, equal, petiolate; petiole 3–5 mm; blade ovate, with index ± 1 or slightly < 1 , 14–22 by 16–23 mm, thin or thin-coriaceous, having a notched top and an exculptate base, palmately 3–5-nerved, prominently nerved beneath, entire, dull green, finely and transparently punctate, hairy beneath like hypocotyl especially on midrib. *Epicotyl* 3–15 mm. *Stem* erect; at 2nd stage straight, or spiral owing to obtusangular connection of internodes, terete, smooth, green near top, grey near base, near top simple very short patent colourless hairs curved upwards. *Phyllotaxy* spiral. *Leaves* exstipulate; 1st leaf 1-foliolate; succeeding ones imparipinnate, lower ones 3-foliolate; number of leaflets increasing with succeeding leaves; ± 8 th leaf 6–8-foliolate. *1st Leaf* rachis ½–1½ cm, thickened at base; leaflets petiolulate; petiolule 1 mm; blade ovate or ovate-oblong, with index 1½–2½, 1½–5 by 1–2½ cm, thin, having an obtuse top and a rounded or acute base, pinninerved, prominently nerved beneath, entire or undulate or dentate, dull green, finely and transparently punctate, ciliate, both surfaces hairy like stem. ± 8 th *Leaf* rachis 4–14 cm, 1–2 mm thick, terete, smooth, thickened at base, green, hairy like stem; leaflets alternate, petiolulate; petiolule 1–4 mm; blades of lowest leaflets smallest, of terminal leaflet largest, those of lower leaflets cordiform or ovate, of higher ones ovate-lanceolate or lanceolate, with index 1–3½, 1–14 by ½–4½ cm, thin, velvety to touch, having an obtuse top and a cordate or rounded but in middle leaflets asymmetrical and at posterior side acute base, remotely dentate, other characters like those of 1st leaf. *Top of plant* hairy, green or yellowish green.

Seeds from 2 motherplants from different localities.

MURRAYA L.

B. II: 95, 103; K. et V. IV: 242; LUBB. I: 323

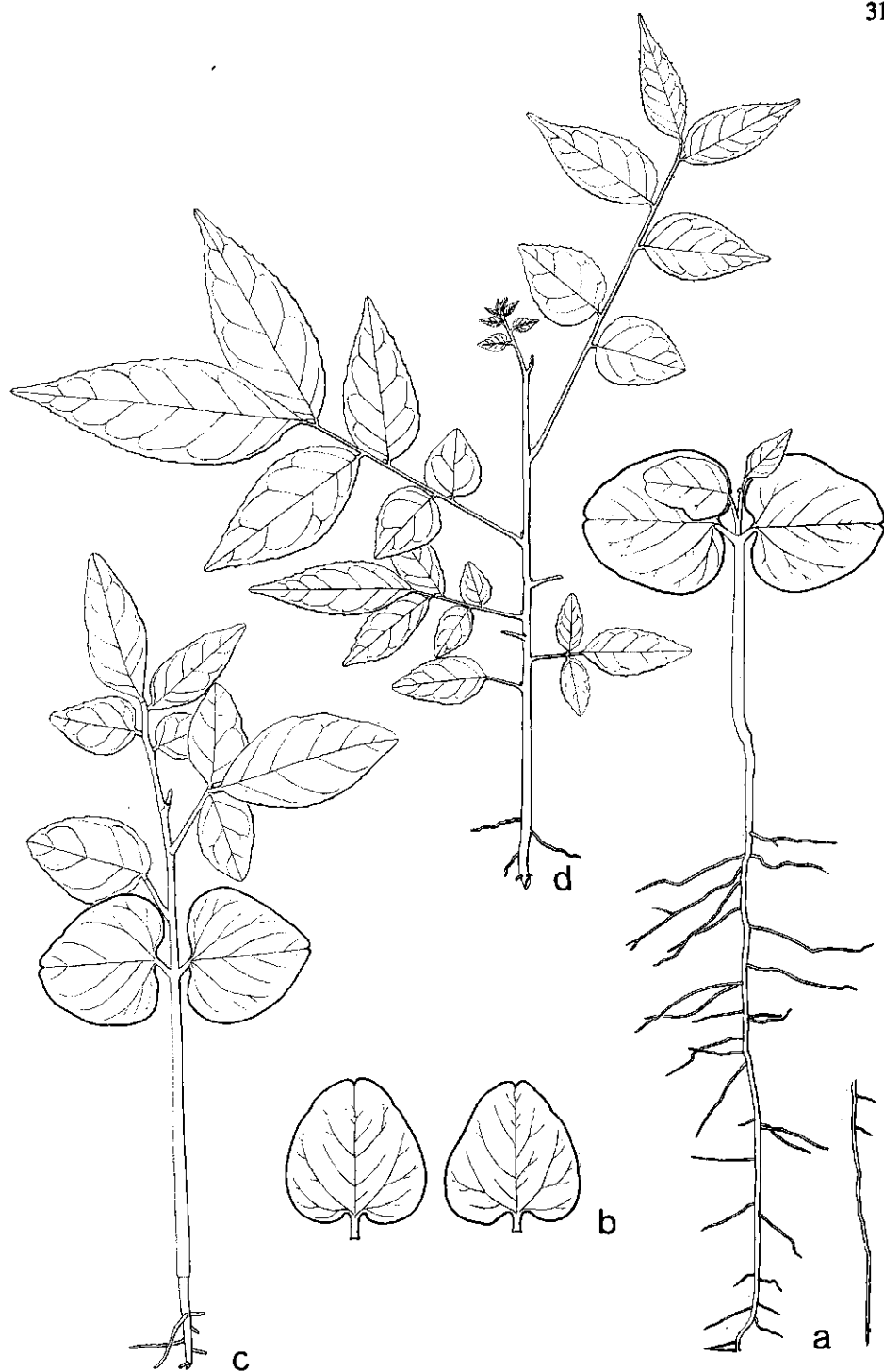


Fig. 122. *Micromelum minutum* a. young seedling, $1/1\times$; b. cotyledons, $1/1\times$; c. seedling with developed 1st leaf, $1/1\times$; d. older seedling, $1/2\times$.

***Murraya paniculata* (L.) JACK (*M. exotica* L.)**

B. I: 103; K. et V. IV: 243; LUBB. I: 323

In many languages: kemuning. Alf. Minah. (Celeb.): garing, waring
Fig. 123

Size at 1st stage (2 leaves only) ± 5 cm above collet; at 2nd stage (± 10 leaves) ± 10 cm above collet. *Roots* permanently yellowish white; primary root at 1st stage slightly flexuous, much thicker than lateral ones; collet not thickened; lateral roots at 1st stage moderately branched. *Hypocotyl* hypogeous, very short. *Cotyledons* hypogeous¹. *Epicotyl* erect, straight, up to ± 5 cm; at 1st stage terete, smooth, green, with simple colourless hairs. *Stem* erect; at 2nd stage spiral owing to obtusangular connection of internodes. *Phyllotaxy* spiral but 1st 2 leaves opposite or subopposite. *Leaves* exstipulate; 1st 2 leaves simple, petiolate; higher ones imparipinnate 1-foliolate, then 2-foliolate, number of leaflets increasing with succeeding leaves; ± 10 th leaf 5–6-foliolate. *1st 2 Leaves* petiole up to 3 mm, with simple colourless hairs; blade cordiform or ovate, up to 28 by 24 mm, thin, having a notched top and a rounded or slightly cordate base, pinninerved, prominently nerved beneath, superficially crenate, on both surfaces dull green, transparently punctate, midrib on both surfaces especially near base hairy like stem. ± 10 th *Leaf* rachis flat above, rounded beneath, green, with simple colourless hairs; leaflets alternate, petiolulate; petiolule up to ± 2 mm, hairy like rachis; blade elliptic or oblong or slightly or more distinctly rhomboid, sometimes widest below centre, with index 2, up to 6 by 3 cm, in terminal leaflet largest, thin-coriaceous, having an acuminate notched or emarginate top and an acuminate acute sometimes cuneate base, pinninerved, entire, young leaflets transparently punctate but in older ones in sicco this character is indistinct, hairy like 1st leaf. *Top of plant* hairy.

Seeds from 1 motherplant.

SANTALACEAE

B. II: 76; K. et V. V: 365; TROUP III: 799

SANTALUM L.

B. II: 76, 78; K. et V. V: 366; TROUP III: 799

¹ Other characters not available

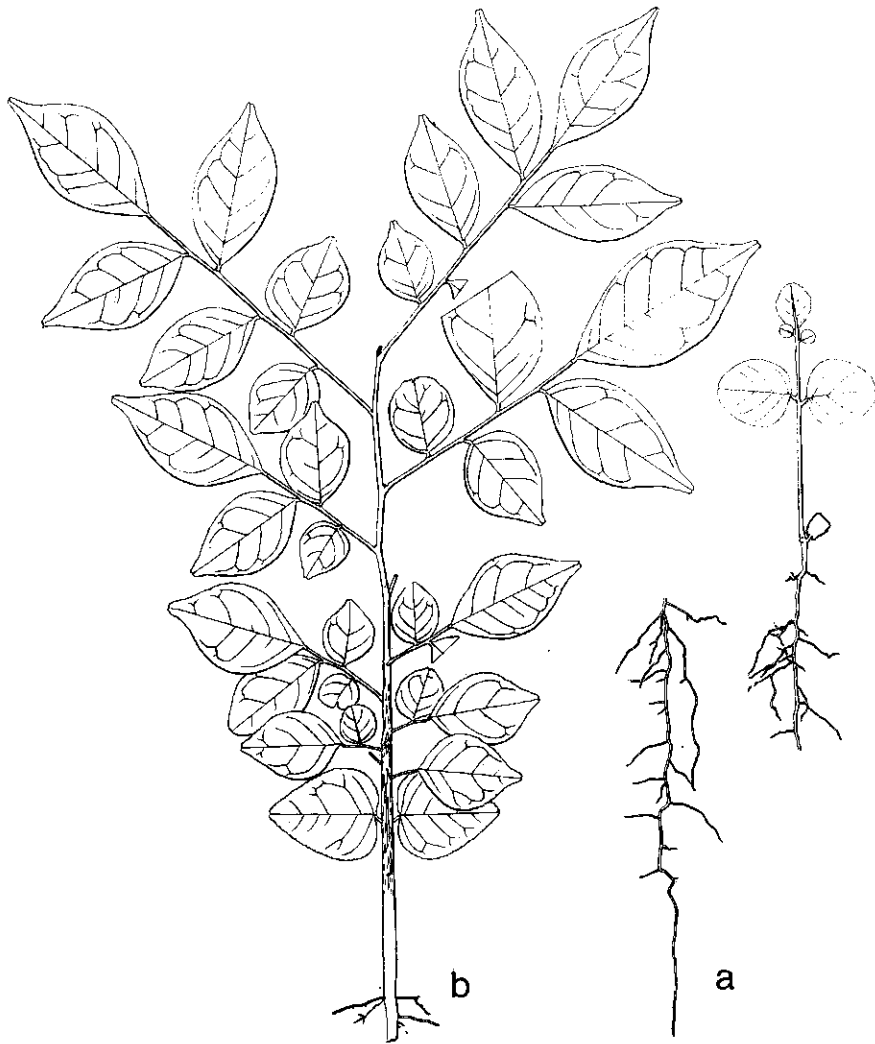


Fig. 123. *Murraya paniculata* a. young seedling, $1/1\times$; older seedling, $1/2\times$.

***Santalum album* L.**

B. II: 78; TROUP III: 799, fig. 302

Mal.: tjendana. *Mad.*: tjendana laki-laki. *Tim.*: ha-u meni. *Roti*: a-nitu

Fig. 124

Size at 1st stage (1 pair of leaves only) 15–31 cm, $5\frac{1}{2}$ –15 cm above collet; at 2nd stage (8–13 developed pairs of leaves) 17–30 cm above collet. *Roots* yellowish white turning brown, later with yellowish white semiglobose haustoria¹ on small pebbles etc. and on roots of other plants; primary root at 1st stage slightly to moderately flexuous, slightly thicker than lateral ones; collet gradually much thickened; lateral roots at 1st stage moderate in number, moderately flexuous, not or sparsely branched. *Hypocotyl* epigeous, erect, straight, sometimes curved at base, $3\frac{1}{4}$ –11 cm; at 1st stage 1 mm thick near top, just above base up to 4 mm thick, usually thickened at one side, tapering to both ends, terete, green, sometimes white dotted, white at base, glabrous. *Cotyledons* epigeous, 2 sometimes 3, sessile, upper part caducous and remaining in testa; parts which remain on the plant equal; blade of these parts linear, channelled above, up to 16 by 1–2 mm, coriaceous, having a broken off top and a semi-amplexicaul base, indistinctly nerved, entire, green, glabrous. *Epicotyl* 1–2 $\frac{1}{2}$ cm. *Stem* erect; at 2nd stage straight, terete, smooth, greyish green pruinose near top, blackish brown near base, glabrous. *Phyllotaxy* decussate, if there are 3 cotyledons the leaves usually in whorls of 3. *Leaves* exstipulate, simple, shortly petiolate, sometimes alternating with not or not quite developed ones; petiole broadened, glaucously pruinose, glabrous; blade ovate or oblong or lanceolate, thin, having a taperpointed acute narrowed base, pinninerved, prominently midribbed beneath, glabrous. *1st Pair of leaves* blade with index $1\frac{1}{4}$ –6, 1–3 $\frac{1}{2}$ cm by $3\frac{1}{4}$ –10 mm, having an acute or obtuse top, entire but sometimes repand, both surfaces dull glaucous. *Highest leaves* (2nd stage) blade with index up to 5, up to $5\frac{1}{2}$ by $1\frac{1}{2}$ cm, having an acute sometimes acuminate top and a taperpointed acute base, entire, dull green sometimes dark green above, greyish greenish pruinose beneath. *Top of plant* glabrous, greyish greenish pruinose.

Seeds from 3 motherplants from different localities.

SAPINDACEAE

B. II: 130; K. et V. IX: 139; LUBB. I: 350; TROUP I: 221

Cotyledons epigeous or hypogeous, fleshy or foliaceous, if epigeous and fleshy usually unequal in size, one curved upwards and the other downwards. *Phyllotaxy* spiral but 1st 2 sometimes 4 leaves opposite or subopposite. *Higher leaves* usually paripin-

1 These haustoria can easily be examined when the plant has been grown in loose sand.

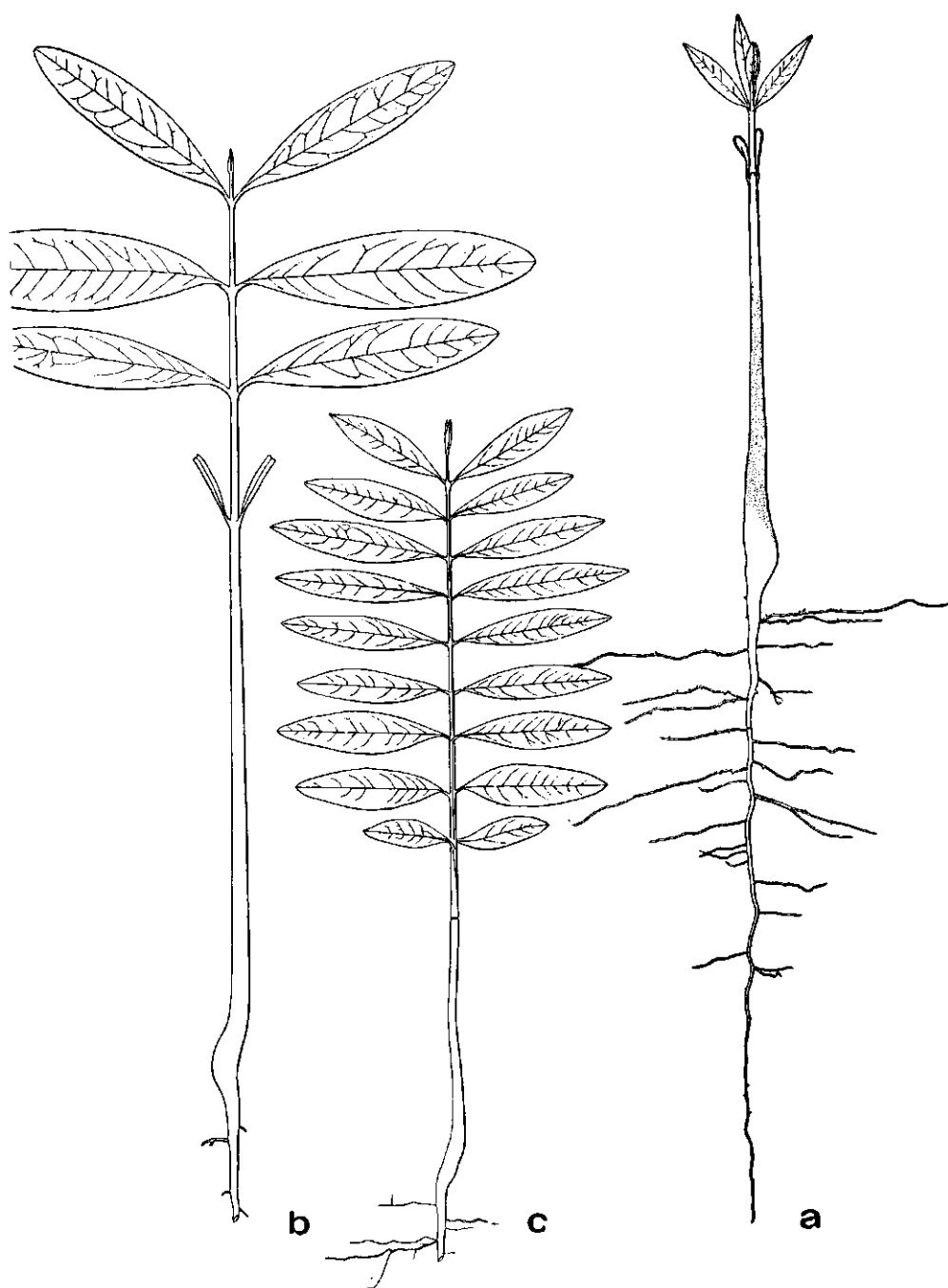


Fig. 124. *Santalum album* a. and b. young seedling, $1/1\times$; c. older seedling, $1/2\times$.

nate, sometimes simple; 1st 2 leaves usually imparipinnate (3-foliolate), or simple and slightly or more distinctly pinnately lobed, sometimes paripinnate.

1. A. cotyledons present¹ 2
 - B. 1st leaf present 7
 - C. higher leaves present 10
2. a. cot. hypogeous *Erioglossum rubiginosum*
 - b. cot. epigeous 3
3. a. cot. foliaceous, thin *Dodonaea viscosa*
 - b. cot. fleshy 4
4. a. cot. hairy, base narrowed *Allophylus cobbe*
 - b. cot. glabrous, base eared or acutely lobed or circumscissile 5
5. a. hypocotyl near top 4-angular *Ganophyllum falcatum*
 - b. hypocotyl terete all over 6
6. a. cot. sessile, top shortly acuminate acute or obtuse, base narrowed partly amplexicaul and acutely lobed *Pometia tomentosa*
 - b. cot. petiolate or sessile, top not acuminate, obtuse, base eared or acutely lobed sometimes circumscissile *Schleichera oleosa*
7. a. 1st leaf simple² *Dodonaea viscosa*
 - b. 1st leaf paripinnate *Ganophyllum falcatum*
 - c. 1st leaf imparipinnate (3- or 5-foliolate) 8
8. a. 1st leaf 2 pairs of leaflets (5-foliolate) *Pometia*
 - b. 1st leaf 1 pair of leaflets (3-foliolate) 9
9. a. blades in 1st leaf obtuse, shortly petiolulate, margin entire sometimes incised *Erioglossum rubiginosum*
 - b. blades in 1st leaf acute, margin repand; lateral leaflets petiolulate *Schleichera oleosa*
 - c. blades in 1st leaf acute, coarsely serrate or pinnately lobed; lateral leaflets sessile or shortly petiolulate *Allophylus cobbe*
10. a. higher leaves simple *Dodonaea viscosa*
 - b. higher leaves 3-foliolate *Allophylus cobbe*
 - c. higher leaves pinnate, >3-foliolate 11
11. a. higher leaflets alternate *Ganophyllum falcatum*
 - b. higher leaflets opposite or subopposite 12
12. a. higher leaves leaflets in lowest pair resembling stipules, curved around the stem (in adult plant in this way or bristle-shaped) *Pometia*
 - b. otherwise 13

1 *Pometia f. glabra* not in this key because the material was incomplete.

2 Sometimes *Schleichera oleosa* has irregular simple or 2-foliolate 1st leaves.

13. a. higher leaves blades slightly acuminate, base in lowest pair of leaflets often broadest at anterior side *Erioglossum rubiginosum*
 b. higher leaves blades obtuse, rarely acute, not acuminate, base often broadest at posterior side *Schleichera oleosa*

ALLOPHYLUS L.

B. II: 130, 133; K. et V. IX: 144

***Allophylus cobbe* (L.) RAEUSCH.**

B. II: 133; K. et V. IX: 146

Mal. S. W. C. Sumatra: sidjange, sitjangtjang (*Minangk.*). *Jav.:* tjukilan

Fig. 125

Size at 1st stage (1st 2 leaves only) 6–19 cm, 3–8 cm above collet; at 2nd stage (10–16 leaves) 11–23 cm above collet. *Roots* yellowish white turning off white; primary root at 1st stage slightly flexuous, moderately thicker than lateral ones; collet gradually and

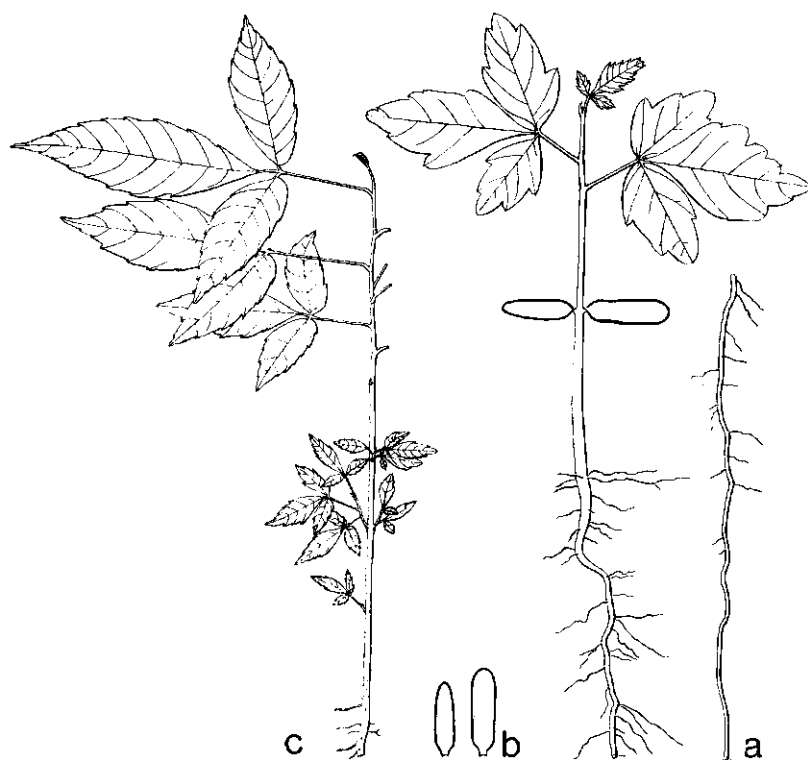


Fig. 125. *Allophylus cobbe* a. young seedling, 1/1 × ; b. cotyledons, 1/1 × ; c. older seedling, 1/2 × .

moderately thickened; lateral roots at 1st stage moderate in number, very flexuous, sparsely branched. *Hypocotyl* epigeous, erect, straight, 2–5 cm; at 1st stage 1–2 mm thick, tapering upwards, terete, smooth, green, base white, with simple patent colourless hairs. *Cotyledons* epigeous, 2, unequal, sessile; blade in smaller one curved upwards, blade in larger one straight or curved downwards; blades lanceolate, with index 3–6, 1–2 cm by 3–4 mm, fleshy, having a rounded obtuse top and a narrowed base, indistinctly nerved, often irregularly dented, entire, dull green, hairy like hypocotyl. *Stem* erect; at 2nd stage spiral owing to obtusangular connection of internodes, terete, smooth, green, in lower part brown and with small orbicular or elliptic yellow lenticels, with simple colourless hairs. *Phyllotaxy* spiral but 1st 2 leaves opposite or subopposite or spirally arranged. *Leaves* exstipulate, 3-foliolate; rachis thickened at base, flattened above, convex beneath, green, hairy like stem; blades thin, having an acute top, pinninerved, on both surfaces prominently nerved, both surfaces dull green and hairy like rachis. *1st Leaf* leaflets sessile or shortly petiolulate; blades ovate, acute at base, coarsely serrate to pinnately lobed. *Highest leaves* (2nd stage) rachis up to 4 cm, up to 1 mm thick; leaflets petiolulate; petiolule up to $\pm \frac{1}{2}$ cm, longest in terminal leaflet, green, hairy; blade ovate or elliptic or oblong, in lateral leaflets asymmetrical, with index up to 3, up to $8\frac{1}{2}$ by 3 cm, base narrowed into the petiolule in middle leaflets acute in lateral leaflets asymmetrically rounded, axillary beards beneath, margin serrate. *Top of plant* hairy, green.

Seeds from 2 motherplants from different localities.

DODONAEA MILL.

B. II: 130, 141; K. et V. IX: 226; LUBB. I: 365; TROUP I: 225

***Dodonaea viscosa* JACQ.**

B. II: 141; K. et V. IX: 227; LUBB. I: 365, fig. 253; TROUP I: 225

Mal.: sikil, tjengkeh laut (*Mol.*). *Sund.*: tjantigi. *Jav.*: kaju mesen, kese, kisig, kresek, tengsek. *Bal.*: ringan-ringan. *Alf. Amb.*: uta hatu. *Tern.*: djolo madjiko. *Alf. Minah.*: motongsi

Fig. 126

Size at 1st stage (1st 1 or 2 leaves only) 6–26 cm, 4–5½ cm above collet; at 2nd stage (29–31 leaves) 23–40 cm above collet. *Roots* white turning off white; primary root at 1st stage very flexuous, slightly thicker than lateral ones; collet gradually and slightly thickened; lateral roots at 1st stage moderate in number to very numerous, very flexuous, moderately branched. *Hypocotyl* epigeous, erect, straight, sometimes curved at base, 3–5½ cm; at 1st stage ½ mm thick, 4-angular, red but pale green at top and white at base, with simple patent short colourless hairs. *Cotyledons* epigeous, 2, equal or slightly unequal, petiolate; petiole short, gradually grading into the blade; blade lanceolate, with index 7–9, 2½–3½ cm by 3–4 mm, thin, having an acute glandular

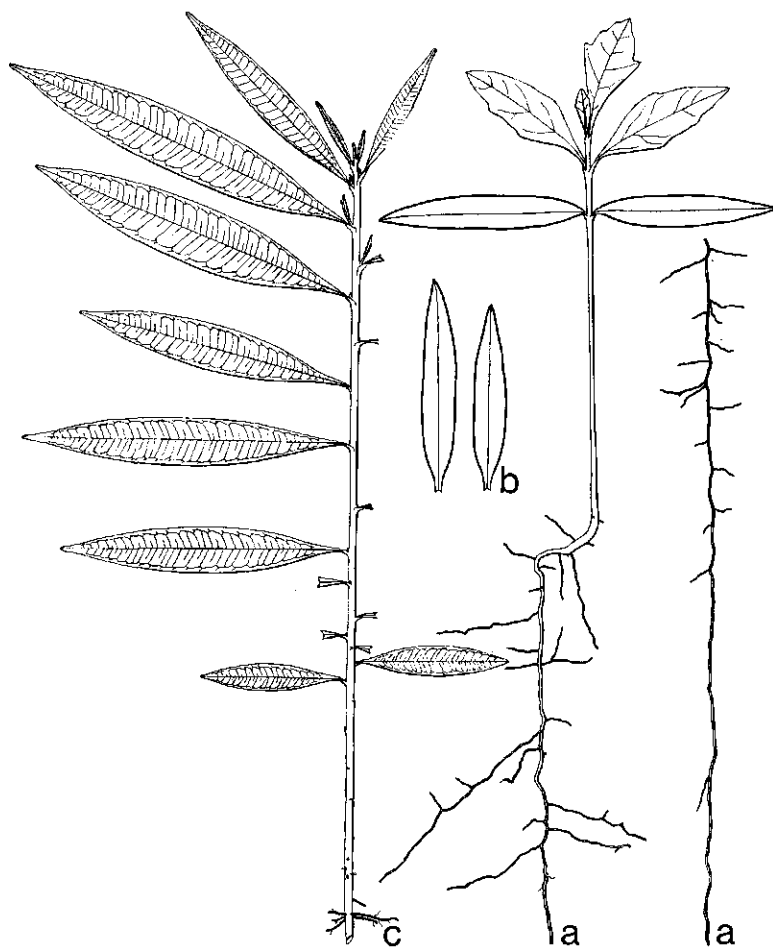


Fig. 126. *Dodonaea viscosa* a. young seedling, $1/1 \times$; b. cotyledons, $1/1 \times$; c. older seedling, $1/4 \times$.

top and a taperpointed base gradually grading into petiole, 1-nerved, entire, dull green above but light green on nerve, dull light green beneath but dark green on nerve, hairy at base like hypocotyl (LUBB.: glabrous). *Epicotyl* 0–6 mm. *Stem* erect; at 2nd stage straight, angular in upper part, terete below, green above, brown below, numerous small orbicular colourless glands in upper part, with simple patent colourless hairs. *Phyllotaxy* spiral but 1st 2 leaves subopposite. *Leaves* exstipulate, simple, petiolate; petiole short, gradually grading into blade, flattened above (LUBB.: slightly channelled above), convex beneath, green, hairy like stem; blade thin, pinninerved. *1st Leaf* blade (petiole included) obovate-lanceolate or lanceolate, with index 3–4, 18–27 by 5–11 mm, having an obtuse or acute top and a narrowed base, prominently

nerved beneath, irregularly lobed near top, slightly glossy green above, dull light green beneath, hairy and glandular near base like stem. *Highest leaves* (2nd stage) petiole up to 4 mm, 2 mm thick; blade lanceolate, with index up to 7, up to 20 by 3½ cm, having taperpointed top and base, prominently midribbed on both surfaces, entire, rough to touch, both surfaces slightly or more distinctly hairy and glandular like stem. *Top of plant* hairy, green.

Seeds from 1 motherplant.

ERIOGLOSSUM BL.

B. II: 131, 133; K. et V. IX: 153

Erioglossum rubiginosum (ROXB.) BL. (*E. edule* BL.)

B. II: 134; K. et V. IX: 154

Sund.: kilaju, tilaju. *Jav.*: kilaju

Fig. 127

Size at 1st stage (1st 2 leaves only) 14–50 cm, 4½–10 cm above collet; at 2nd stage (6–11 leaves) 18–35 cm above collet. *Roots* whitish yellow or brownish yellow, turning brownish yellow; tips white; primary root at 1st stage moderately flexuous, much thicker than lateral ones; collet slightly thickened; lateral roots at 1st stage moderate in number to very numerous, very flexuous, moderately to much branched. *Hypocotyl* hypogeous, very short. *Cotyledons* hypogeous, 2, equal, their upper surfaces in close contact, together at side of stem, covered with testa, shortly petiolate; blade oblong, with index 2, 9–12 by 4½–6 mm, thick-fleshy, flat above, globose beneath, having a rounded obtuse top and a base gradually grading into petiole, indistinctly nerved, entire, yellow. *Epicotyl* erect, straight, 4½–8 cm; at 1st stage 1½ mm thick, tapering upwards, terete, near top laterally compressed, smooth, green, yellow or brown at base, with simple patent colourless hairs. *Stem* erect; at 2nd stage spiral owing to obtusangular connection of internodes, terete, smooth, green in upper part, brown below, with dense simple colourless hairs. *Phyllotaxy* spiral but 1st 2 leaves opposite. *Leaves* exstipulate, pinnate; 1st 2 leaves imparipinnate, 1 pair of leaflets; higher ones paripinnate; 3rd leaf 2 pairs, 4–7th and higher ones 3 pairs. *1st 2 Leaves* rachis ½–1½ cm long, ½ mm thick, flattened above, convex beneath, thickened at base, hairy like stem; leaflets usually opposite, shortly petiolulate; blades in lateral leaflets asymmetrically-oblong or -oblong-ovate, with index 2–2½, 1½–3½ by ½–1½ cm, thin, having an obtuse rarely acute mucronate top and an asymmetrical at anterior side acute but at posterior side rounded broader base, pinninerved and midrib prominent on both surfaces, entire sometimes notched, dull green, ciliate, both surfaces hairy like stem; terminal leaflet larger, other characters like those of lateral leaflets but symmetrical. *Leaves with 3 pairs of leaflets* rachis 6–14 cm, mucronate, thickened at base, green, hairy like stem; leaflets opposite or subopposite, shortly petiolulate; blades of lowest pair

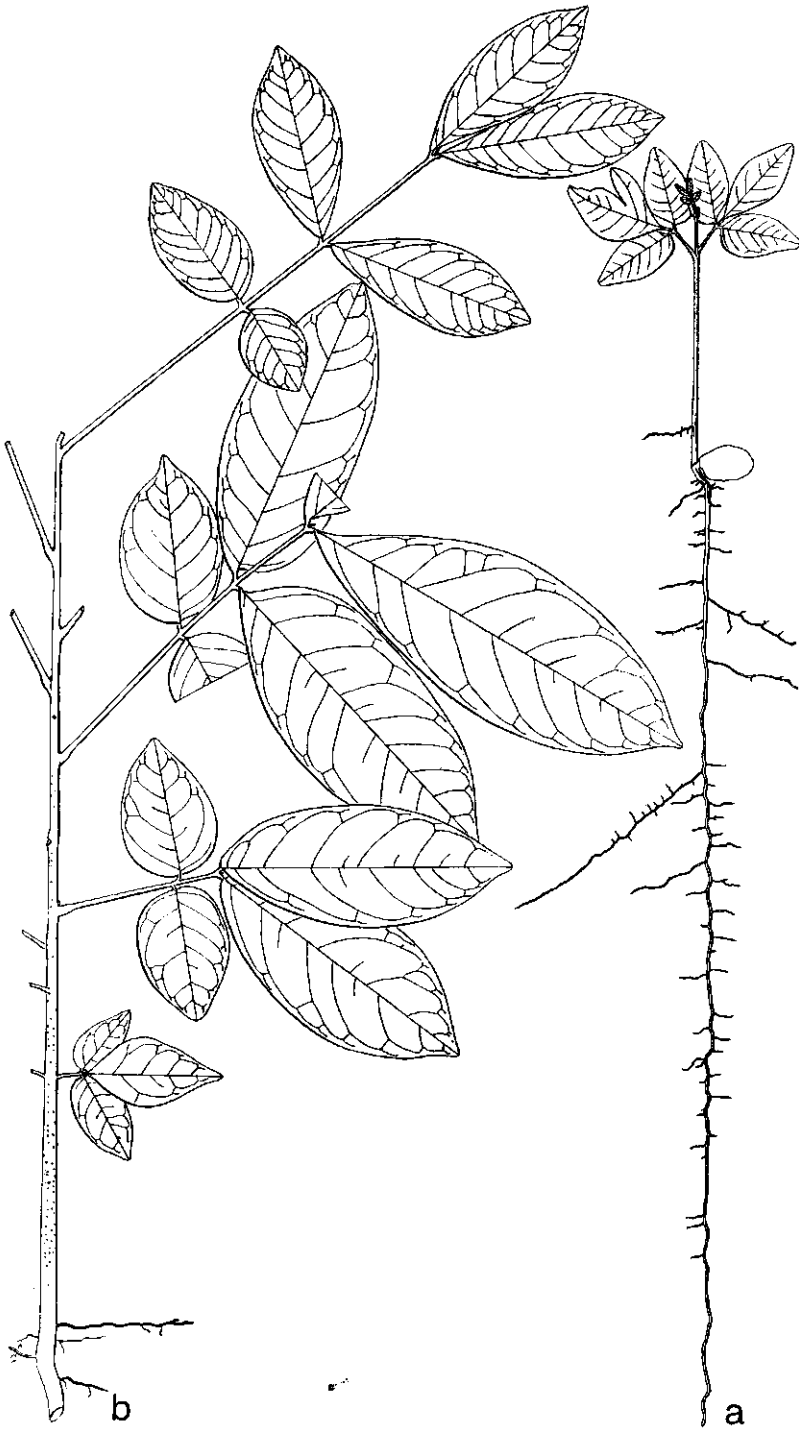


Fig. 127. *Erioglossum rubiginosum* a. young seedling, $1/2\times$; b. older seedling, $1/2\times$.

oblong or oblong-ovate, of highest pair oblong or oblong-obovate, with index $1\frac{1}{2}$ –3, 4–16 by 2–6 cm, thin, having a slightly acuminate shortly mucronate top and a rounded or acute sometimes asymmetrical in lateral leaflets often at anterior side broader base, pinninerved, prominently nerved on both surfaces, entire, both surfaces dull green and hairy like stem. *Top of plant* densely hairy.

Seeds from 2 motherplants from different localities.

GANOPHYLLUM BL.

B. II: 132, 141; K. et V. IX: 230

***Ganophyllum falcatum* BL.**

B. II: 142; K. et V. IX: 231

Sund.: ki angir. *Jav.*: mangir

Fig. 128

Size at 1st stage (1st 2 leaves only) 11–21 cm, 6–10 cm above collet; at 2nd stage (8–12 leaves) 16–25 cm above collet. *Roots* at 1st stage brown, tips white; primary root at 1st stage moderately flexuous, much thicker than lateral ones; collet gradually and slightly thickened; lateral roots at 1st stage moderate in number to very numerous, very flexuous, unbranched. *Hypocotyl* epigeous, erect, straight, 3–6 cm; at 1st stage 1–2½ mm thick, tapering upwards, turning thinner by shriveling, 4-angular at top, terete below, green, white or brown at base, glabrous. *Cotyledons* epigeous, 2, unequal, sessile; blade of smallest one curved upwards, of largest one slightly or more distinctly bent downwards, lanceolate, with index 3–4, 17–22 by 5–6 mm, thick-fleshy, irregularly dented, having a rounded sometimes abruptly acuminate obtuse top and a narrowed slightly eared base, dull green sometimes blackish green, glabrous. *Epicotyl* 2–3 cm. *Stem* erect; at 2nd stage spiral owing to obtusangular connection of internodes; angular in upper part, terete below, green in upper part, brownish grey below, in lower part numerous small orbicular yellowish red lenticels. *Phyllotaxy* spiral but 1st 2 leaves opposite or subopposite. *Leaves* exstipulate, paripinnate; 1st leaf sometimes irregularly or incompletely developed; rachis channelled, 2-winged (not always in 1st leaf), thickened at base, mucronate, green, whether or not possessing flat orbicular small glands; leaflets 3–8, alternate but in 1st leaf sometimes opposite, very shortly petiolulate; blades oblong or lanceolate or ovate-oblong or ovate-lanceolate, in 1st leaf sometimes irregular, thin, having an obtuse or acute top and an acute but in higher leaves often at anterior side broader base, pinninerved, prominently nerved on both surfaces, crenate, sometimes irregularly lobed, in higher leaves less notched or entire, on both surfaces dull green or glossy above, whether or not glandular, glabrous. *1st Leaf* rachis 2–3½ cm, 1–1½ mm thick; blades with index 2–3, 13–25 by 6–10 mm. *Top of plant* greyish glandular, green.



Fig. 128. *Ganophyllum falcatum* a. young seedling, 1/1 \times ; b. cotyledons, 1/1 \times ; c. older seedling, 1/2 \times .

Seeds from 1 motherplant.

POMETIA J.R. et G. FORST.

B. II: 130, 138; K. et V. IX: 194

Cotyledons epigeous, thick-fleshy. *Phyllotaxy* spiral but 1st 2 leaves opposite or subopposite. *Leaves* exstipulate. *Higher leaves* paripinnate; 1st 2 leaves imparipinnate; leaflets opposite or subopposite; lowest leaflets resembling stipules curved around the stem.

1. a. 1st 2 leaves: blades in lowest pair of leaflets much smaller than in the other leaflets; blades not ciliate *P.f. glabra*
- b. 1st 2 leaves: blades in lowest pair of leaflets not or only slightly smaller than in the other leaflets; blades ciliate *P.f. tomentosa*

Pometia forma glabra (BL.) JACOBS (*P. pinnata* J. R. et G. FORST. var. *javanica* K. et V.)

B. II: 139; K. et V. IX: 196

Sund.: lengsir, kaju sapi. *Jav.*: sapi

Fig. 129

Roots brown; primary root slightly flexuous, much thicker than lateral ones; collet not thickened. *Hypocotyl* epigeous, erect, straight, ± 7 cm, terete, smooth, with simple very short colourless hairs. *Cotyledons* epigeous, 2, fleshy. *Epicotyl* erect, straight, $\pm 7\frac{1}{2}$ cm, green, hairy like hypocotyl. *Phyllotaxy* spiral but 1st 2 leaves opposite. *Leaves* exstipulate. *1st 2 Leaves* imparipinnate, 2 pairs of leaflets; rachis $\pm 2\frac{1}{2}$ – $2\frac{3}{4}$ cm, $1\frac{1}{2}$ mm thick, thickened at base, flattened above, convex beneath, green, hairy like stem but hairs longer; leaflets opposite, shortly petiolate, in lowest pair much smaller than in next one, terminal leaflet largest; blades elliptic or obovate, with index $1\frac{1}{3}$ –2, ± 17 –100 by 13–45 mm, thin, having an acute in highest leaflets acuminate top and in lateral leaflets an asymmetrical at anterior side acute but at posterior side rounded broader base but in terminal leaflet an acute base, pinninerved, on both surfaces prominently midribbed but lateral nerves prominent only beneath, coarsely dentate or serrate, slightly glossy dark green above, slightly glossy green beneath, nerves on both surfaces hairy like rachis. *Succeeding leaves* paripinnate, mucronate, lowest leaves curved round the stem. *Top of plant* hairy, green.

Seeds from 1 motherplant.

N.B. In Bogor the seeds of the four received dispatches germinated very badly. The description had to be made using only 2 specimens. No specimens were left for the description of the species at a second stage.

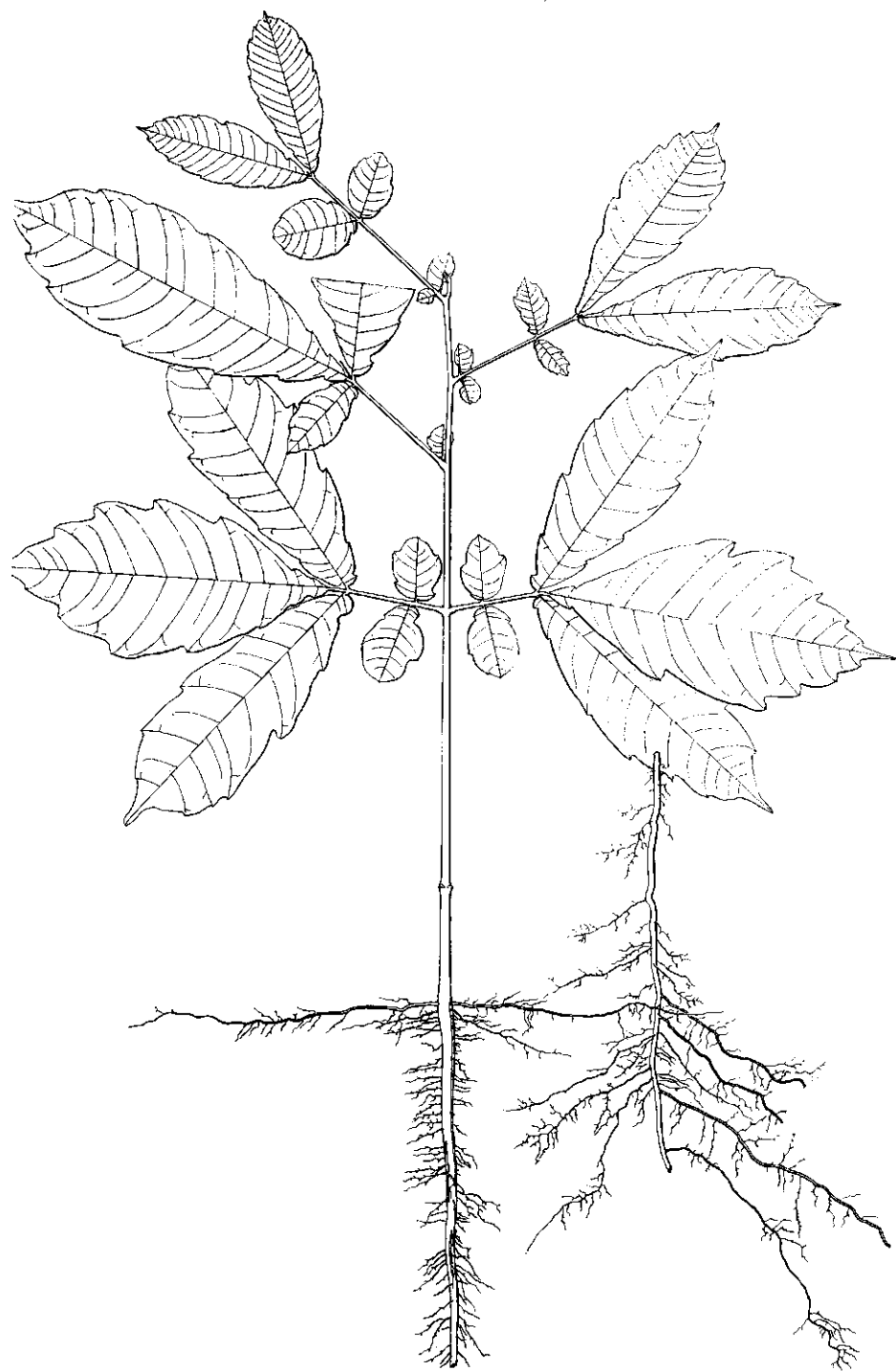


Fig. 129. *Pometia f. glabra* seedling with developed 1st pair of leaves, $1/2\times$.

***Pometia forma tomentosa* (BL.) JACOBS (*P. tomentosa* T. et B.)**

B. II: 139; K. et V. IX: 199

Sund.: bungsir. Jav.: kaju sapi, lengsar, sapen. Mad.: djagir, sopeh

Fig. 130

Size at 1st stage (1st 2 leaves only) 35–48 cm, 8–15 cm above collet; at 2nd stage (± 10 leaves) ± 35 cm above collet. *Roots* dirty yellow turning reddish yellow; tips white; primary root at 1st stage moderately flexuous, much thicker than lateral ones; collet gradually and slightly thickened; lateral roots at 1st stage very numerous, very flexuous, much branched. *Hypocotyl* epigeous, erect, straight, 3–6½ cm; at 1st stage 2½–3 mm thick, terete, smooth, brown or pale green, sometimes lengthwise and finely red streaked, with simple patent very short colourless hairs. *Cotyledons* epigeous, 2 rarely 3, unequal, sessile, usually largest one curved upwards and smallest one downwards or straight; blade obovate-oblong or obovate-lanceolate, with index 2½–4, 2–3½ cm by 7–10 mm, up to ¼ cm thick, thick-fleshy, flat or concave above, globose beneath, having a shortly acuminate obtuse or acute top and a narrowed partly amplexicaul sagittate base, indistinctly nerved, slightly crenate, dirty green above, dirty brown beneath, sometimes red-blotched, glabrous. *Epicotyl* 2–6 cm. *Stem* erect; at 2nd stage spiral owing to obtusangular connection of internodes, terete, smooth, brown, green above, with simple hairs. *Phyllotaxy* spiral but 1st 2 leaves opposite or subopposite. *Leaves* exstipulate, paripinnate but 1st leaf imparipinnate having 2 pairs of lateral leaflets, higher ones more pairs, ± 10 th leaf 5 pairs; rachis thickened at base, green, hairy like stem; leaflets opposite or subopposite, petiolulate, in 1st leaf sometimes sessile but terminal leaflet always petiolulate; petiolule up to 4 mm long, green, hairy; blades (leaflets in 1st pair of higher leaves excluded) ovate or ovate-oblong or ovate-lanceolate or obovate-lanceolate; in lateral leaflets often more or less falcate, with index 1½–5, thin, having an acuminate acute but in 1st leaf sometimes obtuse top, pinninerved, slightly prominently nerved above considerably so beneath, remotely dentate, slightly glossy green above, dull green beneath, on both surfaces especially on nerves hairy like stem, ciliate. *1st Leaf* rachis 2½–3½ cm; blades in terminal leaflets usually largest, in 1st pair as large as or larger or slightly smaller than in highest pair of leaflets, 2½–11 by 1–3½ cm, in lateral leaflets having a rounded or acute or cordate symmetrical or asymmetrical at posterior side lower in terminal leaflet acute base. *Leaves with 5 pairs* rachis mucronate; blades in 1st pair resembling stipules, falcate, curved around the stem; other blades ± 11 by 3 cm, base whether or not cordate, sometimes asymmetrical and shaped like lateral blades in 1st leaf. *Top of plant* at 1st stage densely hairy, green or red; at 2nd stage with dense golden hairs.

Seeds from 1 motherplant.

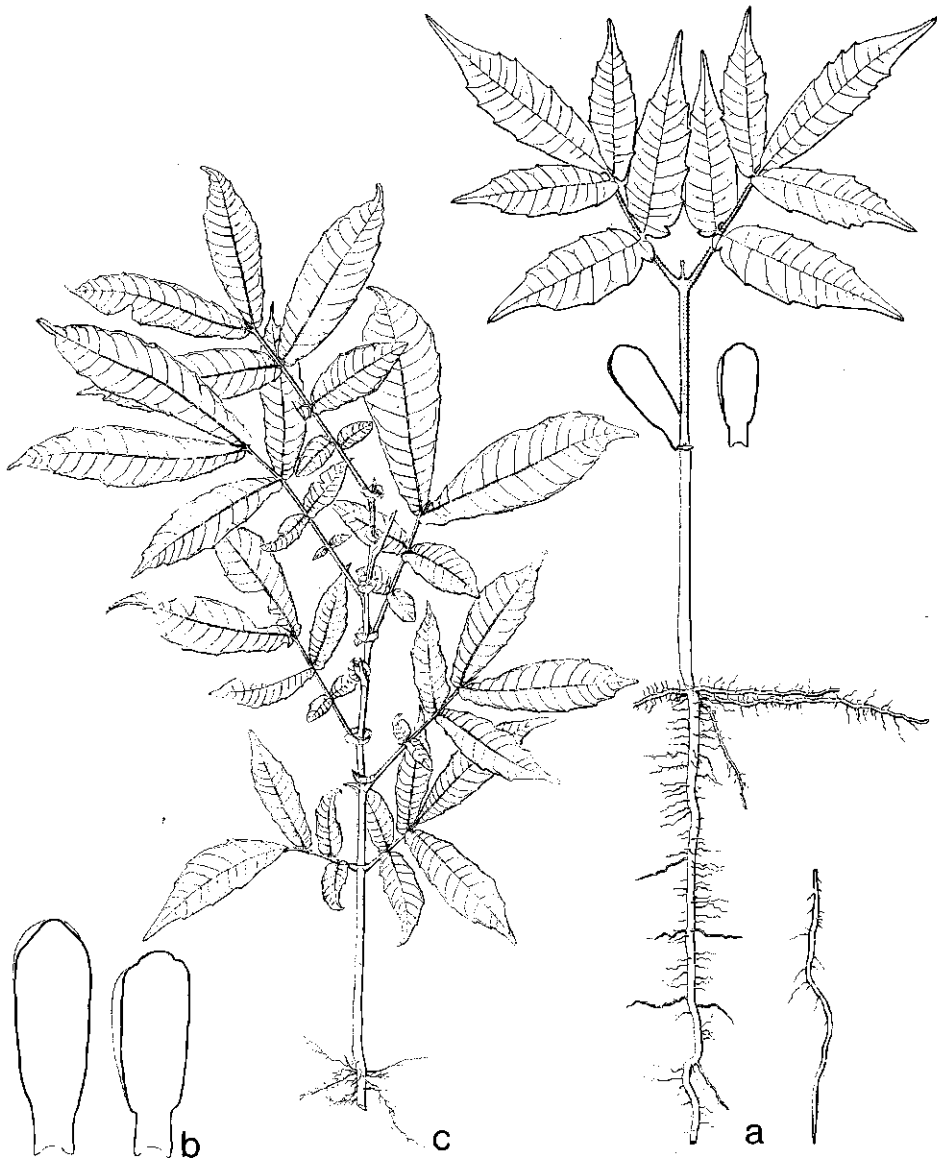


Fig. 130. *Pometia f. tomentosa* a. young seedling, $1/2 \times$; b. cotyledons, $1/1 \times$; c. older seedling, $1/4 \times$.

SCHLEICHERA WILLD.

B. II: 132, 136; K. et V. IX: 176; TROUP I: 229

***Schleichera oleosa* (LOUR.) OKEN (*S. trijuga* WILLD.)**

B. II: 136; K. et V. IX: 177; TROUP I: 229, fig. 95

Mal.: kusambi. *Sund.*: kosambi. *Jac.*: kesambi, sambi. *Mad.*: kasambhi, kosambhi.*Mak.*: bado. *Bug.*: ading

Fig. 131

Size at 1st stage (1st 2 leaves only) 17–52 cm, $4\frac{1}{2}$ –14 cm above collet; at 2nd stage (12–21 leaves) 34–51 cm above collet. *Roots* dark- or brownish yellow turning brown; tips white; primary root at 1st stage slightly or moderately flexuous, much thicker than lateral ones; collet gradually and moderately thickened; lateral roots at 1st stage moderate in number to very numerous, moderately or very flexuous, sparsely branched. *Hypocotyl* epigeous, erect, straight, $1\frac{1}{2}$ – $8\frac{1}{2}$ cm; at 1st stage 2–3 mm thick turning thinner, terete (TROUP: elliptical in section), smooth, red or green, red or white turning brown at base, with simple patent colourless hairs. *Cotyledons* epigeous, 2, opposite sometimes subopposite, usually unequal, larger one curved upwards, smaller one downwards, petiolate or sessile; petiole 0–5 mm, red or green, hairy like hypocotyl; blade oblong to lanceolate, with index 2–6, 11–30 by $3\frac{1}{2}$ –9 mm, thick-fleshy, flattened or concave above, sometimes an orbicular wart near the top of the smallest cotyledon, convex, beneath, having an obtuse top and an eared or acutely lobed sometimes circumsissile base (TROUP: sagittate or truncate), indistinctly nerved, red turning brownish dull green, glabrous. *Epicotyl* $2\frac{1}{2}$ –5 cm. *Stem* erect; at 2nd stage spiral owing to obtusangular connection of internodes, terete, smooth, green in upper part, brown below, in lower part small orbicular brown lenticels, with simple colourless hairs. *Phyllotaxy* spiral but 1st 2 sometimes 1st 4 leaves opposite or subopposite. *Leaves* exstipulate; 1st 2 leaves imparipinnate, 1 pair of leaflets, sometimes irregularly simple or 2-foliolate; next ones paripinnate; 3rd one only or 3rd to 15th ones 2 pairs; higher ones 3 pairs, sometimes alternating with some 2-paired ones, sometimes alternating with poorly developed very soon falling ones, rachis green, hairy like stem; leaflets opposite, sessile or shortly petiolulate; blades in lateral leaflets having an asymmetrical at anterior side acute but at posterior side rounded and sometimes semicordate but often broader base, pinninerved, margin undulate and waving up and down, both surfaces especially on nerves hairy like stem. *1st 2 Leaves* if regular: rachis 7–15 mm, $1\frac{1}{2}$ mm thick; lateral leaflets sessile, terminal one shortly petiolulate; blade oblong or ovate-oblong or obovate-oblong, with index 2–3, $2\frac{1}{2}$ – $8\frac{1}{2}$ by 1–4 cm, thin, having an acute top and in terminal leaflet an acute base, prominently nerved beneath, sometimes irregularly lobed, both surfaces slightly glossy green. *3-Paired leaves* rachis $5\frac{1}{2}$ –9 cm, $1\frac{1}{2}$ mm thick, much thickened at base, mucronate, with numerous small orbicular colourless glands; leaflets in lowest pair smallest, in highest pair largest; blades oblong to lanceolate or obovate-oblong or obovate-lanceolate, with index 2–4, 2–13 by 1–4 cm, thin-coriaceous, having an obtuse rarely



Fig. 131. *Schleicheria oleosa* a. young seedling, $1/2\times$; b. cotyledons, $1/1\times$; c. older seedling, $1/4\times$.

acute top, prominently nerved on both surfaces, slightly glossy or dull dark green above, slightly glossy light green beneath. *Top of plant* hairy, red or green.

Seeds from 4 motherplants from different localities.

SAPOTACEAE

B. II: 189; K. et V. I: 137; LUBB. II: 197; TROUP II: 636

Cotyledons epigeous, hypogeous or semihypogeous, foliaceous or fleshy. *Stem* terete, hairy or glabrous. *Phyllotaxy* spiral; 1st 2 leaves sometimes opposite. *Leaves* stipulate or exstipulate, simple, petiolate, pinninerved, hairy or glabrous. *Plant* with latex.

Cotyledons and (or) 1st leaf and (or) higher leaves (2nd stage) present

a. cot. epigeous, foliaceous, coriaceous; leaves exstipulate; 1st leaf blade obovate; higher leaves top rounded or very shortly acuminate *Manilkara kauki*

b. cot. usually semihypogeous, sometimes epigeous, rarely hypogeous, thick-fleshy; leaves stipulate; 1st leaf blade elliptic or oblong; higher leaves top distinctly acuminate *Palaquium amboinense*

MANILKARA ADANS.

B. II: 189, 190; K. et V. I: 154; LUBB. II: 201; TROUP II: 637

Manilkara kauki (L.) DUBARD (*Mimusops kauki* L.)

B. II: 191; K. et V. I: 156

Jav.: kitjik, sawo, s. djawa. *Mak.* and *Bug.*: nane. *Bima*: nane

Fig. 132

Size at 1st stage (1st leaf only) 20–40 cm, 7–10 cm above collet; at 2nd stage (8–12 leaves) 14–19 cm above collet. *Plant* with latex. *Roots* brownish yellow turning brown; tips white; primary root at 1st stage slightly flexuous, much thicker than lateral ones; collet gradually thickened; lateral roots at 1st stage very numerous, very flexuous, slightly or unbranched. *Hypocotyl* epigeous, erect, straight, $6\frac{1}{2}$ –9 cm; at 1st stage $1\frac{1}{2}$ –2 mm thick, terete, between cotyledons 2 longitudinal furrows, green or brown, with small green or brown lenticels, glabrous. *Cotyledons* epigeous, 2, equal, or asymmetrical and one another's mirror image, petiolate; petiole 1–2 mm, breadth > thickness, green, glabrous, gradually passing into blade; blade elliptic or ovate or obovate (B.: narrow), sometimes asymmetrical, with index $1\frac{1}{4}$ –2, $2\frac{1}{4}$ – $3\frac{1}{2}$ cm, coriaceous, having a rounded obtuse top and a rounded or acute base narrowed into petiole, palmately 3–5-nerved and midrib prominent on both surfaces, entire, dark green above, light green beneath but midrib lighter green, glabrous. *Epicotyl* $\frac{1}{2}$ –1 cm. *Stem* erect, straight; at

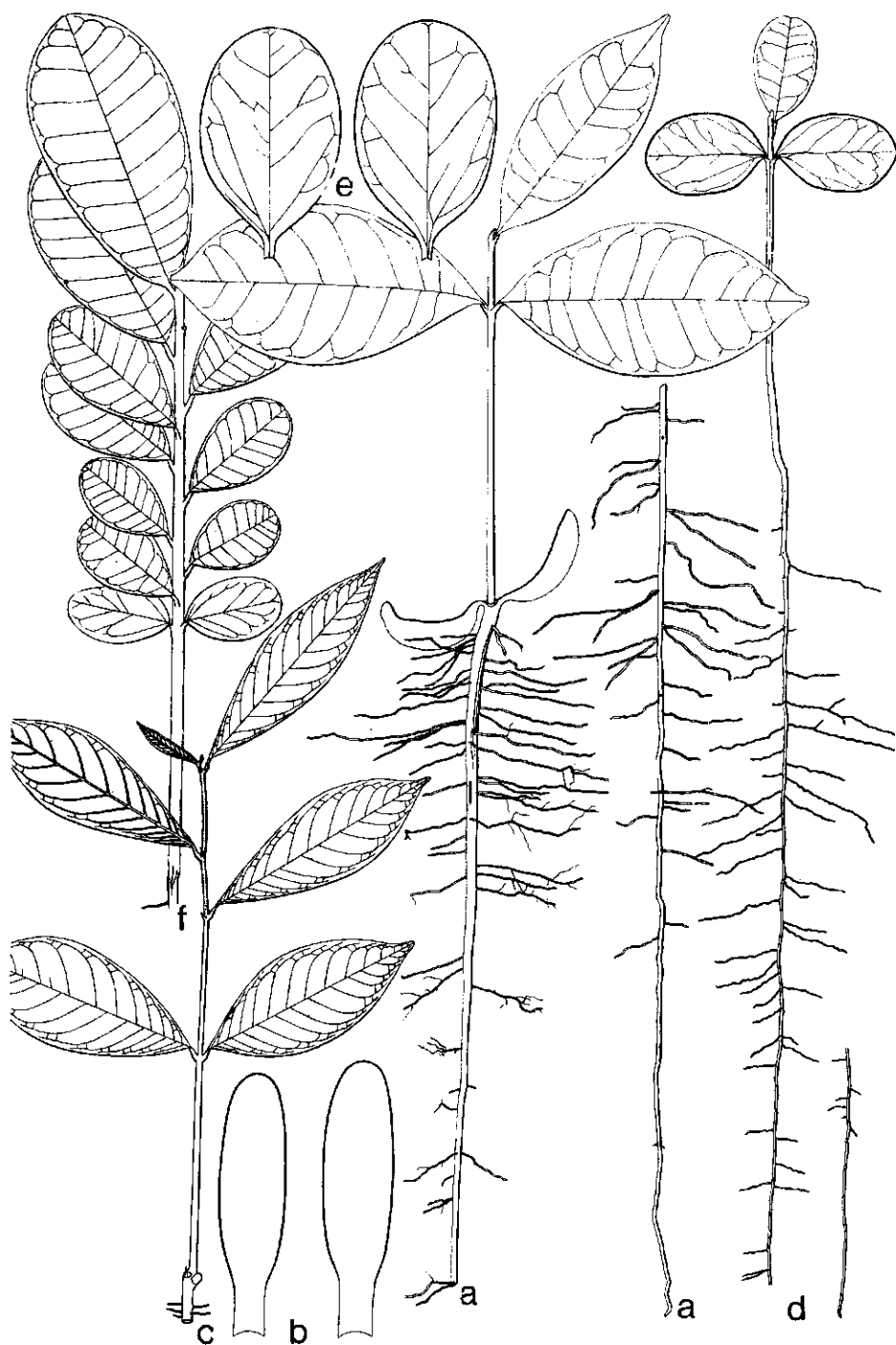


Fig. 132. *Palaquium amboinense* a. young seedling, $1/2\times$; b. cotyledons, $1/1\times$; c. older seedling, $1/4\times$. *Manilkara kauki* d. young seedling, $1/2\times$; e. cotyledons, $1/1\times$; f. older seedling, $1/2\times$.

2nd stage terete, smooth, green, glabrous. *Phyllotaxy* spiral. *Leaves* developed ones sometimes alternating with some incompletely developed ones; developed ones exstipulate (B.: *Mimusops* stipules fugacious; LUBB.: *Mimusops bolata* Gaertn. exstipulate), simple, petiolate; petiole up to $\frac{3}{4}$ cm, $1\frac{1}{2}$ mm thick, green, glabrous; blade with index up to 2, coriaceous, slightly conduplicate along midrib, having an acute base, pinninerved, entire, dull green beneath, glabrous. *1st Leaf* petiole channelled; blade obovate, $2\frac{1}{2}$ –4 by $1\frac{1}{2}$ – $2\frac{1}{2}$ cm, having a notched top, prominently midribbed on both surfaces, slightly glossy dark green above. *Highest leaves* (2nd stage) petiole flattened above, convex beneath; blade elliptic or oblong or obovate or obovate-oblong, up to 8 by 4 cm, having a rounded or very shortly acuminate obtuse sometimes notched top and an acute sometimes rounded base, prominently midribbed beneath, glossy dark green above but lighter on midrib, on under surface appressed simple colourless hairs. *Top of plant* hairy, green.

Seeds from 2 motherplants from different localities.

PALAQIUM BLANCO

B. II: 189, 193; K. et V. I: 142; TROUP II: 636

***Palaquium amboinense* BURCK (*P. javense* BURCK)**

B. II: 193; K. et V. I: 143

E. Java: kawang, njatu. *Mad.*: njatoh

Fig. 132

Size at 1st stage (1st 2 leaves) 38–64 cm, 9–18 cm above collet; at 2nd stage (4–5 leaves) 11–28 cm above collet. *Plant* with latex. *Roots*: primary root brown, white below, tips yellow; lateral roots white turning dirty brown; primary root at 1st stage slightly flexuous, much thicker than lateral ones; collet gradually and slightly thickened; lateral roots at 1st stage moderate in number, very flexuous, moderately branched. *Hypocotyl* hypogeous, $\frac{1}{4}$ – $1\frac{1}{2}$ cm, terete, brown. *Cotyledons* 2, usually semihypogeous, sometimes epigeous, rarely hypogeous, sometimes one completely or partly epigeous and the other hypogeous, usually unequal, sometimes diverging, sometimes upper surfaces in contact, petiolate; petiole $\pm \frac{1}{2}$ –1 cm, thick-fleshy; blade oblong or lanceolate, thick-fleshy, flattened or convex above, convex beneath, with index 2–4, $2\frac{1}{2}$ – $3\frac{1}{2}$ by 1 – $1\frac{1}{2}$ cm, in centre $\frac{1}{4}$ – $\frac{3}{4}$ cm thick, green or reddish brown. *Epicotyl* erect, straight, 6–12 cm, terete, smooth, green or brownish green, near top simple appressed brown hairs. *Stem* like epicotyl but at 2nd stage with golden brown hairs. *Phyllotaxy* spiral but 1st 2 leaves opposite. *Leaves* stipulate, simple, petiolate; stipules small, 3-angular, with dense brown hairs, inserted slightly or more distinctly opposite to leaf; petiole flattened above, convex beneath, green, hairy like stem; blade coriaceous, having an acuminate obtuse top and an acute base narrowed into petiole, pinninerved, prominently nerved beneath, entire, slightly glossy dark green above, both surfaces hairy

like stem. *1st 2 Leaves* petiole 3–7 mm, 1½–2 mm thick; blade elliptic or oblong, with index 2–2½, 5–10 by 2½–4½ cm, dull light green beneath. *Higher leaves* (2nd stage) petiole up to 1 cm; blade oblong or slightly ovate-oblong or obovate-oblong, index up to 3, up to 15½ by 6 cm, base taperpointed acute, midrib prominent on both surfaces, under surface with a leaden shine, both surfaces hairy like stem. *Top of plant* with dense brown hairs, in older plants with dense golden brown hairs.

Seeds from 1 motherplant.

STERCULIACEAE

B. I: 401, III: 646; K. et V. II: 135; LUBB. I: 263; TROUP I: 151

Cotyledons hypogeous or epigeous; if hypogeous: together at side of stem, covered with testa, their upper surfaces in close contact, thick-fleshy; if epigeous: diverging, foliaceous or coriaceous or thin. *Phyllotaxy* spiral but sometimes 1st 2 leaves opposite. *Leaves* stipulate, simple or palmately compound, petiolate; 1st leaves sometimes scale-shaped. *Plant* sometimes peltately hairy, hairs often stellate.

Cotyledons and (or) 1st developed leaf and (or) higher leaves present¹

1. a. cot. hypogeous, thick-fleshy; 1st leaf scale-shaped; developed leaves simple, blade oblong or lanceolate, peltately hairy *Heritiera littoralis*
b. cot. epigeous, coriaceous or thin; 1st leaf developed; leaves simple or compound, not peltately hairy 2
2. a. cot. blade coriaceous, elliptic, lengthwise involute; leaves palmately compound *Sterculia foetida*
b. cot. blade coriaceous or thin, not elliptic, not involute; leaves simple 3
3. a. cot. blade coriaceous, reniform; leaves peltate, blade with dense woolly or felty hairs beneath *Pterospermum javanicum*
b. cot. blade thin, rarely reniform; leaves not peltate, blade not with dense woolly or felty hairs beneath. 4
4. a. cot. blade broadly ovate or rarely reniform or slightly or more distinctly 3-angular or rhomboid, palmately 5-nerved; 1st leaf top acuminate; higher leaves blade cordiform, no stellate hairs *Kleinhovia hospita*
b. cot. blade orbicular or obcordiform or obreniform, palmately 3-nerved; 1st leaf top not acuminate; higher leaves obovate, or cordiform and possessing simple and stellate hairs 5

1 *Pterospermum acerifolium*: no seeds obtained, not in this key; description after TROUP.

5. a. cot. blade midrib not bifurcate below $\frac{2}{3}$ length; hypocotyl having simple and stellate hairs; higher leaves blade cordiform
Guazuma ulmifolia var. *tomentosa*
- b. cot. blade midrib bifurcate at $\frac{1}{2}$ length or lower; hypocotyl with simple hairs only; higher leaves blade obovate *Helicteres isora*

GUAZUMA MILL.

B. I: 404, 408; III: 646

***Guazuma ulmifolia* LMK. var. *tomentosa* K. SCHUM.**

(B. I: 408)

Mal.: djati blanda. *Jav.*: djati londa, djatos landi

Fig. 133

Size at 1st stage (1st leaf only) ± 5 –23 cm, $1\frac{1}{2}$ – $5\frac{1}{2}$ cm above collet; at 2nd stage (± 21 –27 leaves) 22–56 cm above collet. *Roots* off white turning yellowish white; primary root at 1st stage very flexuous, moderately thicker than lateral ones; lateral roots at 1st stage moderate in number or very numerous, very flexuous, sparsely or much branched. *Hypocotyl* epigeous, erect, straight, 9–25 mm; at 1st stage $\frac{3}{4}$ –1 mm thick, terete, smooth, green, white or brown at base, with simple and stellate colourless hairs. *Cotyledons* epigeous, 2, equal, petiolate; petiole 2–5 mm, $\frac{1}{2}$ mm thick, flattened above, convex beneath, green, hairy like hypocotyl; blade orbicular, 7–10 by 7–11 mm, thin, having a rounded obtuse sometimes emarginate or notched top and a rounded base narrowed into petiole, palmately 3-nerved but middle nerve thickest, entire, dull green, on both surfaces or only beneath having sparse simple very short hairs, ciliate. *Epicotyl* erect, straight, 7–22 mm. *Stem* erect, straight, terete, smooth; at 2nd stage green, in lower part grey, on upper part stellate much branched yellow hairs which come off easily and very small orbicular colourless glands, lower part glabrous and having small orbicular yellowish brown lenticels. *Phyllotaxy* spiral. *Leaves* stipulate, simple petiolate; stipules 3-angular, yellowish green, with sparse simple colourless hairs; petiole terete, smooth, slightly thickened at top and base, green, hairy like stem; blade cordiform, thin, having a cordate base, crenate or serrate, simple and stellate hairs on both surfaces. *1st Leaf* petiole 5–10 mm long; blade with index 1 – $1\frac{1}{2}$, 12 – 17 by 11 – 14 mm, having an obtuse or acute top, palmately 5-nerved, prominently nerved beneath, middle nerves most distinct, dull green. *Highest leaves* (2nd stage) blade having an acuminate acute top, palmately 5–7-nerved, prominently nerved on both surfaces but especially beneath, slightly glossy green above, dull green beneath. *Top of plant* with dense woolly hairs.

Seeds from 1 motherplant.

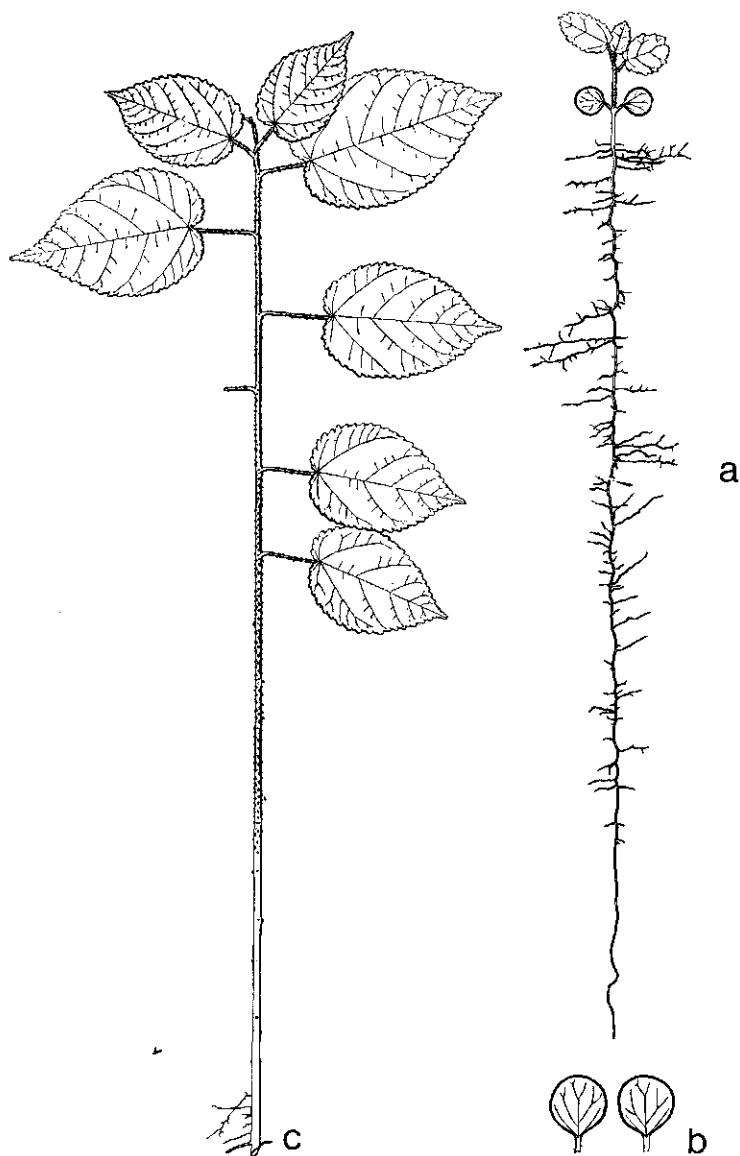


Fig. 133. *Guazuma ulmifolia* var. *tomentosa* a. young seedling, $1/2\times$; b. cotyledons, $1/1\times$; c. older seedling, $1/4\times$.

HELICTERES L.

B. I: 403, 410; TROUP I: 162

***Helicteres isora* L.**

B. I: 410; TROUP I: 162

Sund.: kekontolan (?), puteran. *Jav.*: dlumpang, dlumpangan

Fig. 134

Size at 1st stage (1st 2 leaves only) 10–25 cm, $\frac{1}{2}$ –2 cm above collet; at 2nd stage (8–11 leaves) 6–16 cm above collet. *Roots* off white; primary root at 1st stage very flexuous, slightly or not thicker than lateral ones; lateral roots at 1st stage very numerous, very flexuous, sparsely branched. *Hypocotyl* epigeous, erect, straight, 3–12 mm; at 1st stage 1 mm thick, terete, smooth, white, with simple patent colourless hairs. *Cotyledons* epigeous, 2, equal, petiolate; petiole 2–3 mm, slightly broadened, green, hairy like hypocotyl; blade obcordiform or obreniform or suborbicular, with index 1–1 $\frac{1}{2}$, 4–6 by 5–7 $\frac{1}{2}$ mm, thin, having an emarginate top and a truncate base shortly narrowed into petiole, palmately 3-nerved, prominently nerved beneath, with midrib bifurcate at $\frac{1}{2}$ length or lower, dull green, hairy like hypocotyl on both surfaces but sometimes glabrous above. *Epicotyl* erect, straight, 2–8 mm. *Stem* at 2nd stage erect, spiral owing to obtusangular connection of internodes, terete, smooth, base abruptly much thickened, with woolly stellate much branched colourless hairs. *Phyllotaxy* spiral. *Leaves* stipulate, simple, petiolate; stipules subulate, green, with long colourless simple hairs and stellate ones; petiole green, hairy like stem; blade thin, having a cordate base, crenate or serrate, dull green, hairs above like those on stem and simple ones beneath. *1st Leaf* petiole 2–4 mm; blade cordiform, with index ± 1 , 6–9 by 5–11 mm, having an obtuse or acute top, palmately 3–5-nerved, prominently nerved beneath. *Highest leaves* (2nd stage) stipules 4–7 mm long; blade obovate, with index 1–1 $\frac{1}{2}$, thick-woolly to touch, having a shortly acuminate acute top, slightly lobed near top, palmately 7-nerved, nerves slightly prominent above and considerably so beneath. *Top of plant* with dense stellate much branched colourless hairs.

Seeds from 4 motherplants from different localities.

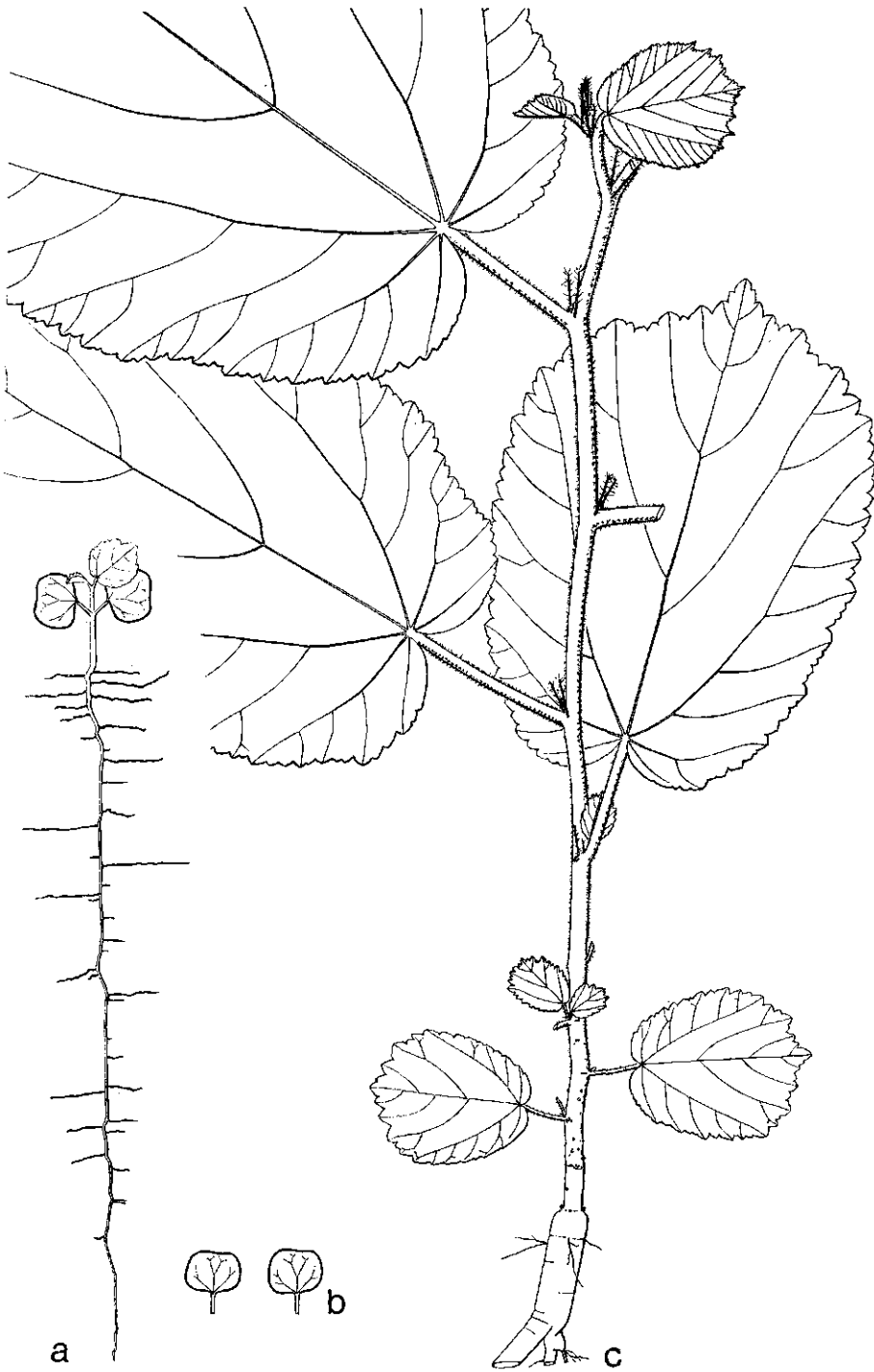


Fig. 134. *Helicteres isora* a. young seedling, $1/1\times$; b. cotyledons, $1/1\times$; c. older seedling, $1/1\times$.

HERITIERA DRYAND. ex W. AIT.

B. I: 402, 415; K. et V. II: 170; LUBB. I: 271; TROUP I: 153

Heritiera littoralis DRYAND. ex W. AIT.

B. I: 416; K. et V. II: 170; LUBB. I: 271; TROUP I: 159

Mal.: atung laut (*Mol.*), dungun. *Sund.*: tjerlang laut. *Jav.*: balang pasir, dungun, lawang. *Tern.*: rorumu. *Alf. Minah.*: dungu, lawanan, wolo i membe

Fig. 135

Size at 1st stage (1st developed leaf only) 20–80 cm, 18–35 cm above collet; at 2nd stage (± 5 developed leaves) ± 50 cm above collet. *Roots* yellow; primary root at 1st stage slightly flexuous, much thicker than lateral ones; collet gradually and slightly to much thickened; lateral roots at 1st stage moderate in number to very numerous, moderately flexuous, sparsely or unbranched. *Hypocotyl* hypogeous, whether or not straight, 1–2 cm; at 1st stage laterally compressed, whether or not with white stellate lenticels, dirty yellow, glabrous. *Cotyledons* hypogeous, 2, whether or not equal, covered with testa, their upper surfaces in close contact, petiolate; petiole $1\frac{1}{2}$ –2 cm, 3 mm thick, fleshy, broadened, dirty yellow; blade sagittate, irregularly semiglobose, flat above, convex beneath, thick-fleshy, $2\frac{1}{2}$ – $2\frac{1}{2}$ by $2\frac{1}{2}$ –4 cm, in centre $1\frac{1}{2}$ – $2\frac{1}{4}$ cm thick, having an obtuse top and a cordate minutely and acutely lobed base, entire, reddish yellow, stellate lenticels beneath. *Epicotyl* erect, straight, sometimes with a curved base, $5\frac{1}{2}$ –10 cm. *Stem* erect, straight, sometimes spiral owing to obtusangular connection of internodes, peltately hairy, shields irregularly edged greyish white whether or not with brown centre, near base white stellate lenticels but in higher pairs only ferrugineous ones, near top no lenticels. *Phyllotaxy* spiral but 1st 2 leaves opposite or subopposite. *Leaves* stipulate; stipules 2–4 mm long, subulate, reddish brown or dark greenish grey, peltately hairy like upper part of stem, shields reddish brown or green sometimes having a black centre. *1st–2nd Sometimes 1th–7th leaf* scale-shaped. *Developed leaves* simple, petiolate; petiole terete, hairy like upper part of stem; blade oblong or lanceolate, coriaceous, having a rounded or cordate sometimes eared or peltate base, pinninerved, entire, with sparse peltate hairs above and peltate hairs beneath (the shields whether or not having a dark centre). *1st Developed leaf* petiole ± 4 mm, up to 2 mm thick, greyish green; blade up to 14 by 5 cm, having an acuminate acute or obtuse top, glossy green above, dull greyish green beneath. *Highest leaves* (2nd stage) petiole $\pm 1\frac{1}{4}$ cm, 3 mm thick, considerably contracted at $\frac{1}{2}$ length; blade ± 19 by $6\frac{1}{2}$ cm, having an acuminate acute top, sometimes undulate, dull green above, silvery grey beneath and brown punctate (centres of the peltate hairs). *Top of plant* peltately hairy; brown or red; youngest leaves often red.

Seeds from 3 motherplants from different localities.

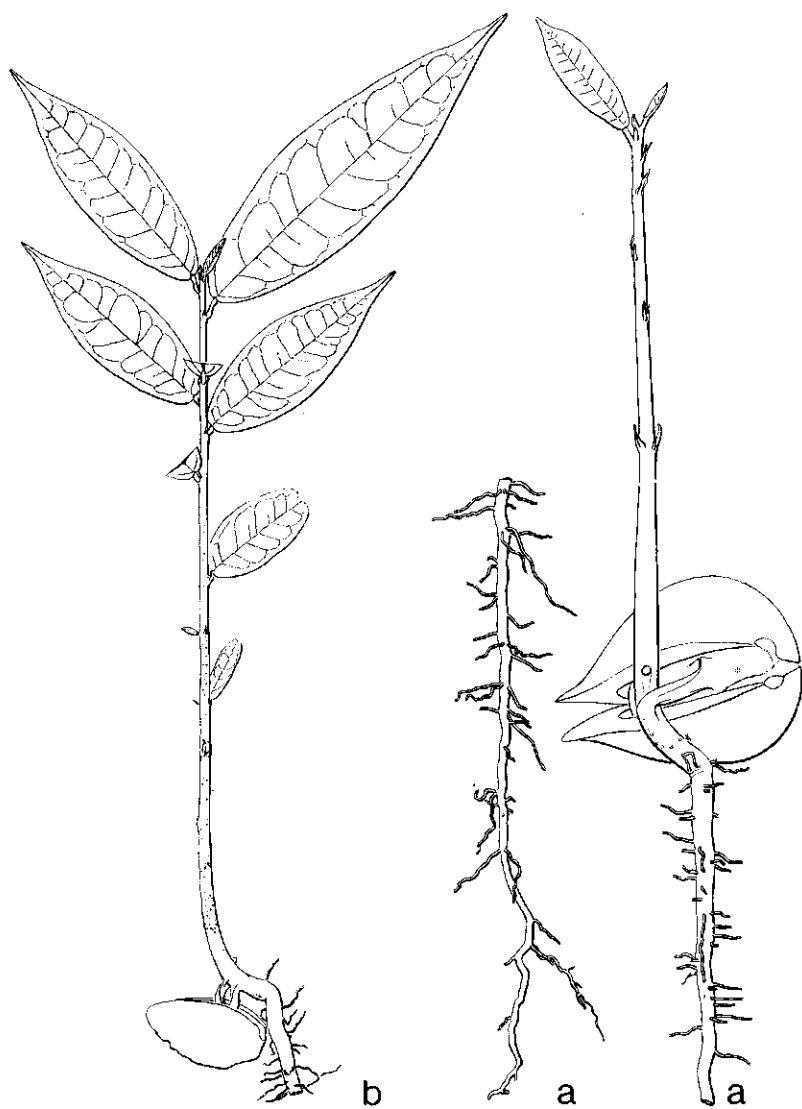


Fig. 135. *Heritiera littoralis* a. young seedling, $1/2\times$; b. older seedling, $1/4\times$.

KLEINHOVIA L.

B. I: 403, 410; K. et V. II: 177

***Kleinhovia hospita* L.**

B. I: 411; K. et V. II: 178

Mal.: kinar (*Amb.*), mangar (*Lamp.*), ngaro (*Tern.*). *Sund.*: tangkele, tangkolo. *Jav.*: ketima, ketimaha, ketimanga, tima, timanga. *Mad.*: mangar. *Bal.*: katima-a. *Mak.*: timaha, ka-u-wasa. *Alf. Minah.*: bintangar, wintangar

Fig. 136

Size at 1st stage (1st 2 leaves only) 7–21 cm, $2\frac{1}{2}$ –6 cm above collet; at 2nd stage (12–31 leaves) 12–42 cm above collet. *Roots* off white turning dirty yellow; primary root at 1st stage very flexuous, slightly thicker than lateral ones; collet gradually and slightly thickened; lateral roots at 1st stage moderate in number or very numerous, sparsely to much branched. *Hypocotyl* epigeous, erect, straight, $2\frac{1}{4}$ –5 cm; at 1st stage 1–1½ mm thick, tapering upwards, terete, smooth, pale green, white at base, with very short simple colourless hairs. *Cotyledons* epigeous, 2, equal, petiolate; petiole 2–8 mm, flattened above, convex beneath, green, hairy like hypocotyl; blade broadly ovate or slightly or more distinctly 3-angular or rhomboid rarely reniform, with index 1–1½, 9–12 by 10–17 mm, thin, having an obtuse or slightly emarginate top and a truncate or cuneate or exculptate base shortly narrowed into petiole, palmately 5-nerved, prominently nerved beneath, entire, slightly glossy green, glabrous. *Epicotyl* erect, straight, $\frac{1}{2}$ –2½ cm. *Stem* erect, straight, sometimes spiral owing to obtusangular connection of internodes. *Phyllotaxy* spiral. *Leaves* stipulate, simple, petiolate; stipules narrowly 3-angular, green, hairy; petiole smooth, green, hairy like hypocotyl; blade cordiform, sometimes palmately 3-lobed, having an acuminate acute top and a cordate base, thin, palmately 5–7-nerved, prominently nerved beneath, coarsely serrate or dentate, dull light green, hairy like hypocotyl. *1st Leaf* stipules small; petiole 5–19 mm, $\frac{1}{2}$ mm thick; blade with index $1\frac{1}{2}$ –2, 13–30 by 7–22 mm. *Highest leaves* (2nd stage) stipules \pm 6 mm long; petiole 5–8 cm, 1–2 mm thick, having thickened top and base; blade with index slightly > 1, 8–12 by $6\frac{1}{2}$ –11 cm. *Top of plant* hairy, green; youngest leaves sometimes glossy.

Seeds from 4 motherplants from different localities.

PTEROSPERMUM SCHREB.

B. I: 403, 409; K. et V. II: 181; TROUP I: 160

Cotyledons epigeous, 2, petiolate; petiole hairy; blade foliaceous, palmately nerved. *Stem* erect, terete, hairy. *Phyllotaxy* spiral or alternate. *Leaves* stipulate, simple, petiolate, peltate; petiole hairy; blade radiately nerved, hairy.

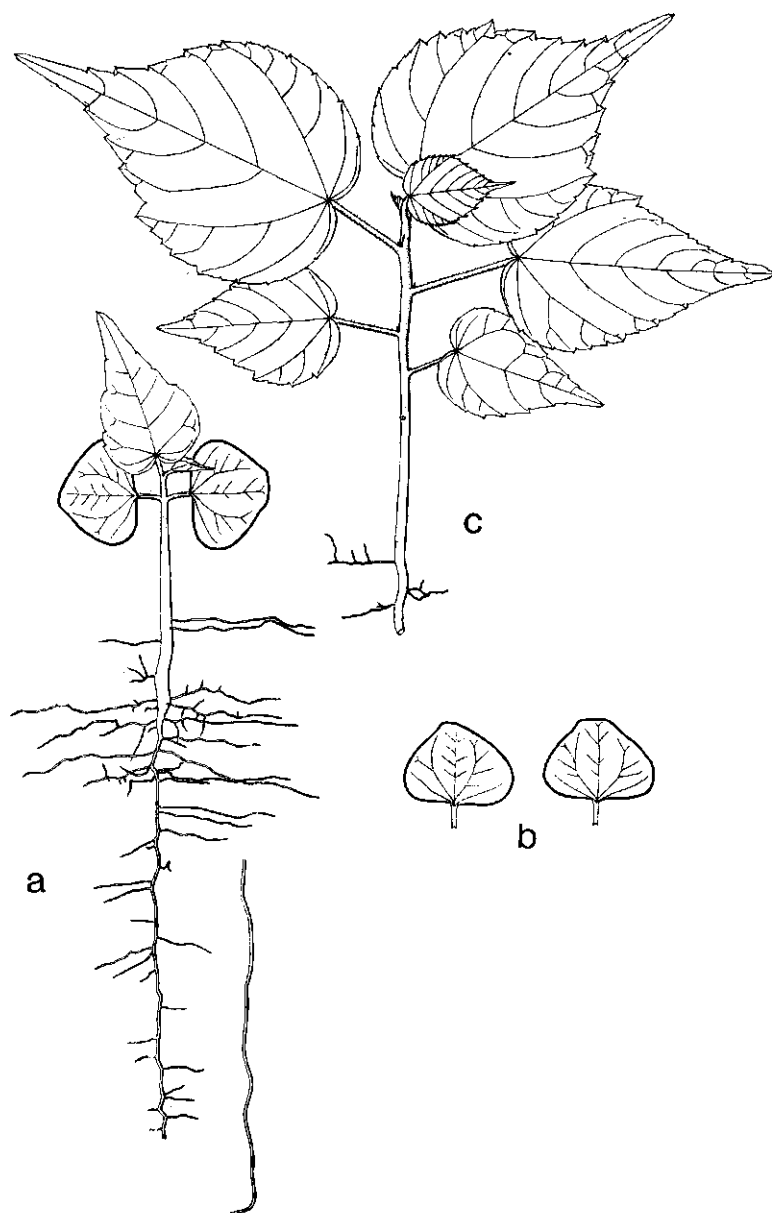


Fig. 136. *Kleinhovia hospita* a. young seedling, $1/1 \times$; b. cotyledons, $1/1 \times$; c. older seedling, $1/1 \times$.

Cotyledons present

1. a. cot. sometimes bifid, palmately 5-nerved, stem white hairy . *P. acerifolium*
- b. cot. never bifid, palmately 3-nerved; stem colourless or brown hairy . . .
P. javanicum

***Pterospermum acerifolium* WILLD.** (= ? *P. diversifolium* BL.)

B. I: 409; K. et V. II: 183; TROUP I: 160, fig. 67

Mal.: bajur nasi, marelang. *Sund.*: tjerlang. *Jav.*: balang, b. djawa, wadang, walang.

Bal.: balang. *Alf. Minah.*: lawanan, walo, w. sela

After TROUP: "Roots: primary root long, terete, tapering, greyish brown, woody; lateral roots numerous, fine, fibrous, distributed down main root. Hypocotyl distinct from the root, 1.5–1.8 in. long, terete or slightly compressed, fusiform, white turning green, tomentose. Cotyledons: petiole 0.15–0.2 in. long, tomentose; lamina 0.7–0.8 in. by 0.6–0.9 in., foliaceous, sub-orbicular, entire or bifid, palmately 5-veined from the base. Stem erect, terete, white tomentose; internodes 0.1–0.5 in. long. Leaves simple, alternate. Stipules 0.1 in. long, linear. Petiole (early leaves) 0.5–1.2 in. long, tomentose. Lamina (early leaves) 1.8–3 in. by 1–2 in., ovate acuminate, peltate, entire or irregularly or obscurely toothed, dark green and glabrous or stellate pubescent above, white tomentose beneath, radiately 7- or 8-veined".

Seeds not obtained.

***Pterospermum javanicum* JUNGH.**

B. I: 410; K. et V. II: 186

Mal.: bajur. *Sund.*: bajur, tjajur. *Jav.*: bajur, wadang, waju, walang. *Mad.*: phendjur
Fig. 137

Size at 1st stage (1st leaf only) 13–26 cm, 4½–9 cm above collet; at 2nd stage (± 20–30 leaves on main stem) 50–75 cm above collet. *Roots* light brown; tips white turning dirty yellow; primary root at 1st stage moderately flexuous, moderately thicker than lateral ones; collet gradually and slightly thickened; lateral roots at 1st stage moderate in number, very flexuous, slightly or unbranched. *Hypocotyl* epigeous, erect, straight, 2½–4½ cm; at 1st stage 1–1½ mm thick, terete, smooth, green, with dense felty stellate much branched colourless hairs. *Cotyledons* epigeous, 2, equal, petiolate; petiole 2–3 mm, ½ mm thick, flattened above, convex beneath, green, hairy like hypocotyl; blade reniform, with index ¾–1, 6–9 by 10–17 mm, having a rounded obtuse sometimes slightly exculptate top and an exculptate base, thick-coriaceous, palmately 3-nerved, entire, dark glossy green above, dull green beneath, glabrous. *Epicotyl* 2½–3 cm. *Stem* erect, straight; at 2nd stage terete, smooth, green or brownish green, with woolly stellate much branched colourless or brown hairs. *Phyllotaxy* spiral. *Leaves* stipulate, simple, petiolate, peltate, size gradually increasing with succeeding leaves but in highest leaves (2nd stage) blades abruptly smaller and more asymmetrically-

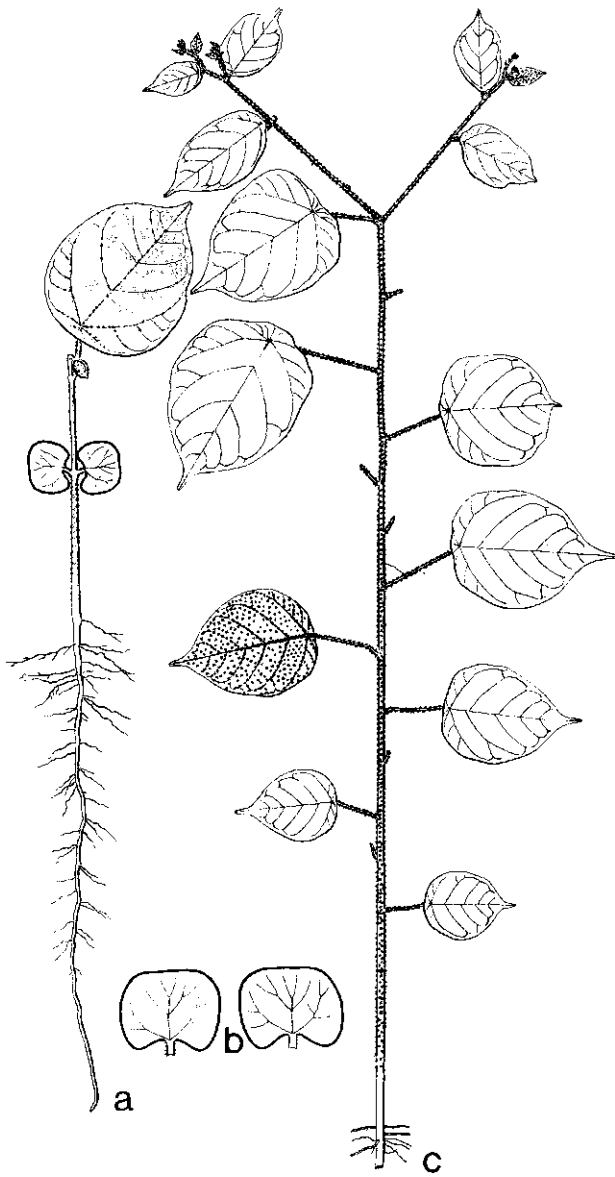


Fig. 137. *Pterospermum javanicum* a. young seedling, $1/2\times$; b. cotyledons, $1/1\times$; c. older seedling, $1/4\times$.

elliptic and these leaves possessing axillary branches, developed leaves often alternating with scale-shaped ones; petiole having its top near the margin of the blade, terete, smooth, hairy like stem but brown; blade thin, thick-woolly or felty to touch, having an acuminate acute top, radiately nerved. *1st Leaf* stipules small; petiole 8–12 mm; 1 mm thick; blade ovate, with index slightly >1 , $3\frac{1}{4}$ – $4\frac{1}{2}$ by $3\frac{1}{4}$ –4 cm, radiately nerved with 5 distinct nerves and some thin ones (middle one thickest), entire or irregularly and radiately lobed, dull or slightly glossy green, with thin stellate much branched yellowish white hairs above coming off easily, dense felty stellate much branched white hairs beneath. *Highest leaves* (2nd stage) stipules linear, a slightly or more distinctly rounded ear at base; petiole thickened at top and base; blade ovate, radiately multinerved, entire, dull dark green above, with sparse stellate white or brown hairs above but at the insertion of the petiole in the blade densely hairy above, with dense woolly stellate brownish grey hairs beneath; largest leaves: petiole 5– $6\frac{1}{2}$ cm, $1\frac{1}{2}$ mm thick, blade with index $1\frac{1}{4}$ – $1\frac{3}{4}$, 9–11 cm (from the insertion of the petiole to the top) by 6–9 cm. *Top of plant* with dense felty white hairs turning brownish white woolly.

Seeds from 3 motherplants from different localities.

STERCULIA L.

B. I: 402, 411; K. et V. II: 138; LUBB. I: 268; TROUP I: 151

Sterculia foetida L.

B. I: 411; K. et V. II: 139; LUBB. I: 268, fig. 217; TROUP I: 153

Mal.: kelumpang, kepuh. *Sund.*: kepuh, kepoh. *Jav.*: djankang, kepuh, kepoh. *Mad.*: djhangkang, kalompang. *Mak.*: bungoro, kalumpang. *Bug.*: alupang, kalupa. *Alf. Minah.*: maru kapes

Fig. 138

Size at 1st stage (1st 2 leaves only) and at 2nd stage up to 8–77 cm, 8–30 cm above collet. *Roots* off white; tips white; primary root at 1st and 2nd stage slightly or moderately flexuous, much thicker than lateral ones; collet gradually much thickened; lateral roots very numerous, very flexuous, sparsely branched. *Hypocotyl* epigeous, erect, straight, 4–14 cm; at 1st and 2nd stage 4–6 mm thick at base, tapering upwards, terete, smooth, green, white at base, with dense patent simple colourless hairs. *Cotyledons* epigeous, 2, equal, petiolate; petiole 1–4 mm, broadened, green, hairy like hypocotyl; blade elliptic, with index $1\frac{1}{2}$ –2, $3\frac{1}{2}$ –5 cm long (measuring and drawing difficult because the blade is lengthwise revolute and the top is sometimes revolute too), thick-coriaceous, having an acute top and a minutely eared base, palmately 7-nerved of which 3 nerves are thick, prominently nerved above and indistinctly so beneath, entire, pale green above, pale yellow beneath, hairy above like hypocotyl, glabrous beneath. *Epicotyl* 3– $14\frac{1}{2}$ cm. *Stem* erect, straight; at 1st and 2nd stage

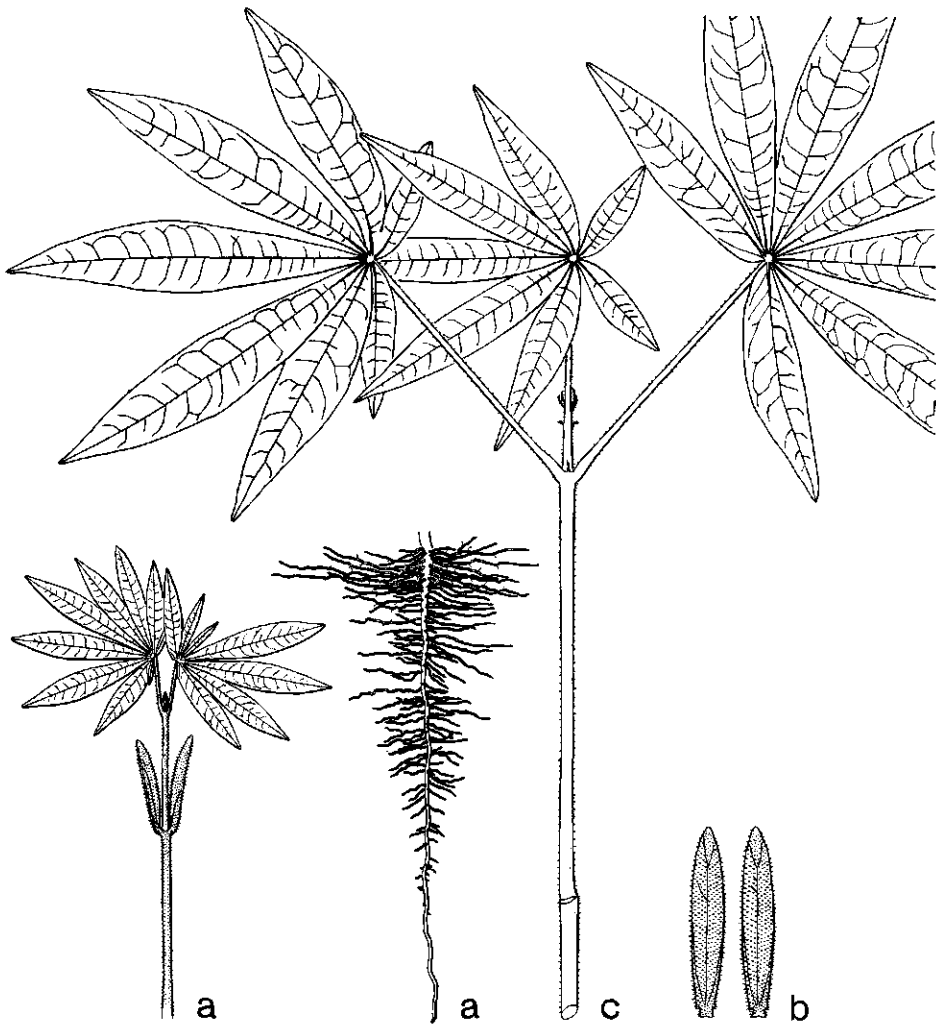


Fig. 138. *Sterculia foetida* a. young seedling, $1/4\times$; b. cotyledons, $1/1\times$; c. older seedling, $1/2\times$.

terete, smooth, green, with colourless glandular sticky long-stipulate hairs. *Phyllotaxy* spiral but 1st 2 leaves opposite or subopposite. *1st 2 Leaves* stipulate, palmately 5-8-usually 6-7-foliolate; stipules usually connate, 3-angular, ± 4 mm long, green, hairy; rachis $2\frac{1}{2}$ - $11\frac{1}{2}$ cm, $1\frac{1}{2}$ mm thick, thickened at base, terete, slightly and lengthwise furrowed, green or red, hairy like stem; leaflets sessile; blades lanceolate, thin, with index 3-9, $1\frac{1}{2}$ -13 by $\frac{1}{2}$ - $2\frac{1}{2}$ cm, having an acute top and base, pinninerved, prominently midribbed on both surfaces, entire, slightly and revolutely marginate, dull dark green above, dull greyish green beneath, on both surfaces hairy like stem, ciliate. *Top of plant* light green, with dense sticky hairs like stem.

Seeds from 5 motherplants from different localities.

STYRACACEAE

B. II: 203; K. et V. VII: 130; LUBB. II: 205

STYRAX L.

B. II: 203; K. et V. VII: 131

Styrax benzoin DRYAND.

B. II: 203; K. et V. VII: 132

Mal.: bantjung (*Palemb.*), kaju kemenjan, k. kamijan, menjan

Fig. 139

Size at 1st stage (1st leaf only) ± 18 -30 cm, 10-17 cm above collet; at 2nd stage (6-9 leaves) 23-34 cm above collet. *Roots* white turning brownish yellow; tips white; primary root at 1st stage slightly flexuous, much thicker than lateral ones; collet gradually much thickened; lateral roots at 1st stage moderate in number, slightly or moderately flexuous, patent, sparsely to much branched. *Hypocotyl* epigeous, erect, straight, sometimes curved at base, 3-10 cm; at 1st stage 2 mm thick at top and 4-5 mm at base, gradually tapering upwards, terete, irregularly and finely lengthwise ridged, yellowish white, with numerous lengthwise stretched small red blotches, white at base, glabrous or hairy, with sparse simple colourless hairs. *Cotyledons* epigeous, 2, equal, sessile, 1 or 2 hairy buds inserted above the axil and placed above each other; blade obovate or elliptic or ovate, with index $1\frac{1}{3}$ - $1\frac{1}{2}$, ± 2 by $1\frac{1}{2}$ cm, coriaceous, having a rounded obtuse top and a rounded semi-amplexicaul base, palmately 7-nerved of which middle nerve thickest, waving up and down at margin, dull dark or slightly glossy green above but white on nerves, glossy brown or whitish green beneath but light green on nerves, glabrous; sometimes at $\frac{1}{2}$ length of hypocotyl loosely attached to it a part of the seedrest which could be taken for fleshy cotyledons. *Epicotyl* $\pm 4\frac{1}{2}$ -7 cm. *Stem* erect; at 2nd stage spiral owing to obtusangular connec-

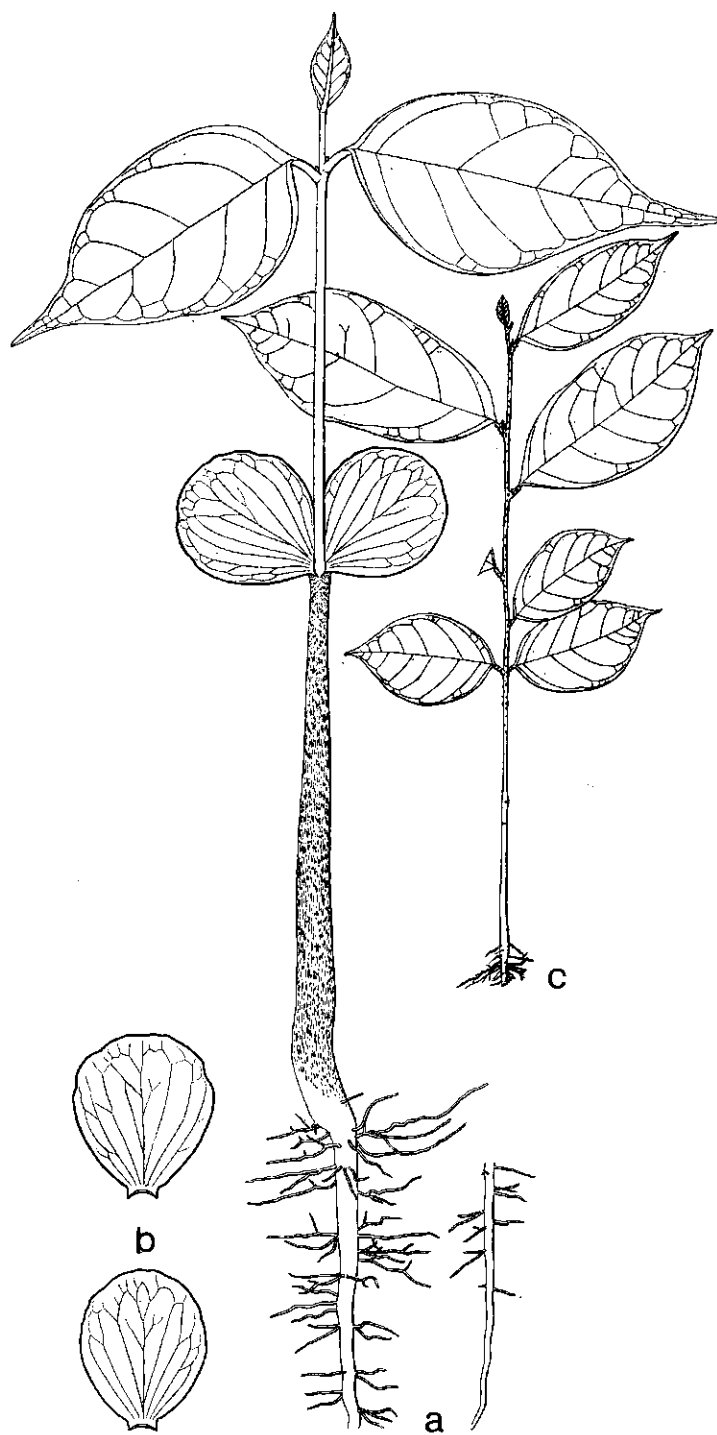


Fig. 139. *Styrax benzoin* a. young seedling, $1/1\times$; b. cotyledons, $1/1\times$; c. older seedling, $1/4\times$.

tion of internodes, terete, smooth, densely and felty hairy, hairs stellate much branched colourless. *Phyllotaxy* spiral, but 1st 2 leaves opposite or subopposite. *Leaves* exstipulate, simple, petiolate; petiole flattened above, convex beneath, green, hairy like stem; blade thin, having an acuminate acute top and a rounded or acute sometimes slightly exculptate base, pinninerved, and nerves sunk above but prominent beneath, entire, dull green above, dull grey beneath but green on nerves, hairy like stem on both surfaces especially on nerves, besides these hairs beneath very dense and finely felty very small stellate much branched hairs; on under surface some scattered golden scales. *1st Leaf* petiole 5–8 mm, 1–1½ mm thick; blade ovate, with index 2, 6–8 by 3–4 cm. *Highest leaves* (2nd stage) petiole ± 1 cm, 2 mm thick; blade oblong, with index 2½–3, 14–17 by 6–6½ cm. *Top of plant* at 1st and 2nd stage densely and white felty owing to stellate much branched hairs.

Seeds from 2 motherplants from different localities.

THEACEAE

B. I: 318, III: 645; K. et V. III: 208, *Ternstroemiaceae*; LUBB. I: 236, *Ternstroemiaceae*; TROUP I: 29, *Ternstroemiaceae*.

Cotyledons 2, epigeous, foliaceous, petiolate. *Stem* terete, hairy. *Phyllotaxy* spiral. *Leaves* exstipulate, simple, petiolate.

1. A. Cotyledons and (or) 1st leaf present 2
 - B. Higher leaves present¹ 4
2. a. cot. blade 1-nerved, 15 mm long or longer; 1st leaf blade finely serrate or -dentate, not ciliate 3
 - b. cot. blade palmately 3-nerved, not > 14 mm long; 1st leaf blade entire or near top remotely dentate or serrate, ciliate . . . *Schima wallichii* ssp. *noronhae*
3. a. cot. equal; blade base whether or not eared *Gordonia excelsa*
 - b. cot. equal, or asymmetrical and one another's mirror image; blade base not eared *Laplacea integerrima*
4. a. higher leaves blades finely serrate or dentate, not ciliate . *Gordonia excelsa*
 - b. higher leaves blades entire or near top remotely dentate or serrate, ciliate
Schima wallachi ssp. *noronhae*

1 *Laplacea integerrima* not in this part of the key because not enough older seedlings were available.

GORDONIA ELLIS

B. I: 319, 320, III: 645; K. et V. III: 288

***Gordonia excelsa* (BL.) BL.**

B. I: 320, III: 546; K. et V. III: 289

Sund.: tangulu. *Alf. Minah.*: kumarakas in talun, marerer tuwama

Fig. 140

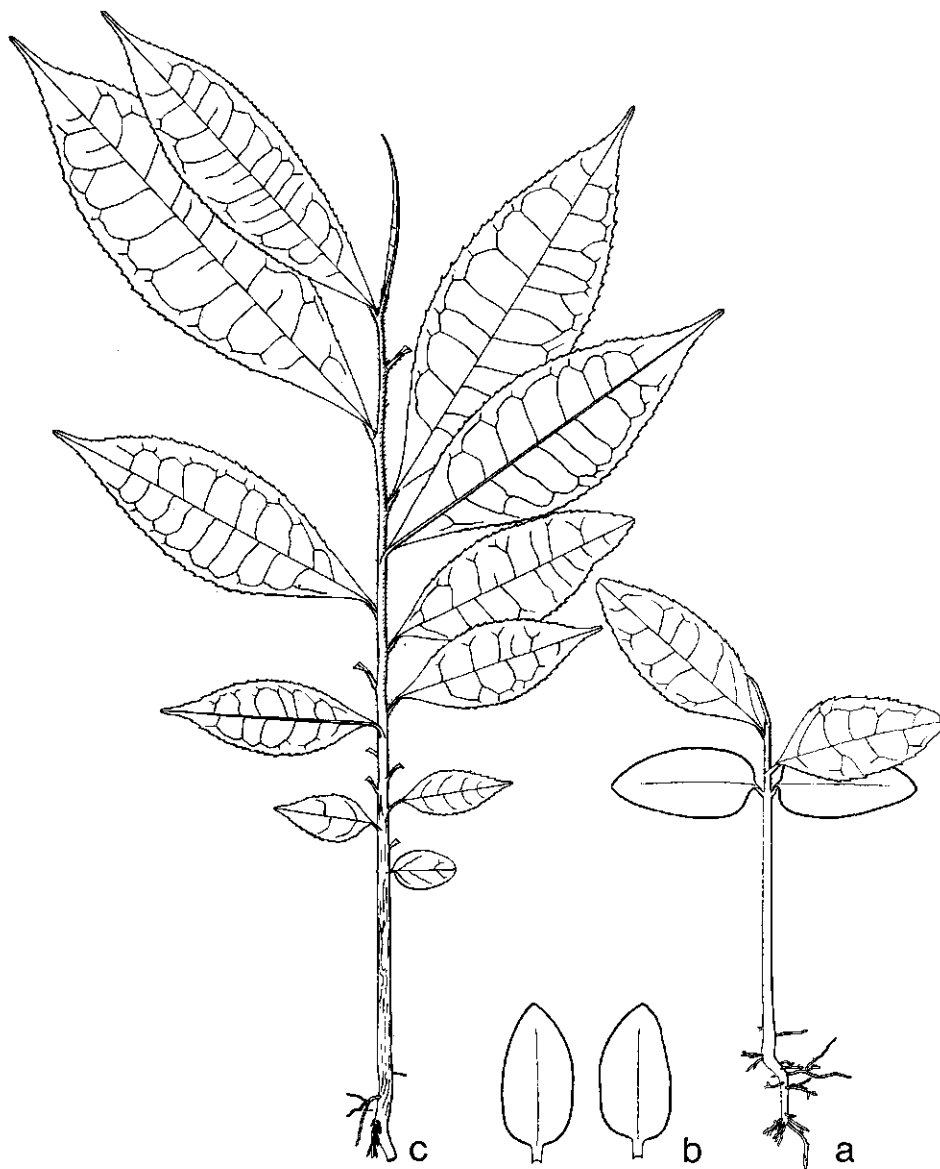


Fig. 140. *Gordonia excelsa* a. young seedling, $1/1 \times$; b. cotyledons, $1/1 \times$; c. older seedling, $1/2 \times$.

Size at 1st stage (1st leaf only) 4–10½ cm, 3–7 cm above collet; at 2nd stage (13–16 leaves) 14–22 cm above collet. *Roots* permanently off white; primary root at 1st stage moderately or very flexuous, slightly thicker than lateral ones; collet gradually and slightly thickened; lateral roots at 1st stage few, moderately or very flexuous, sparsely or unbranched. *Hypocotyl* epigeous, erect, straight, sometimes curved at base, 3–5 cm; at 1st stage 1–1½ mm thick, tapering upwards, sometimes abruptly thickened at base, terete, smooth, pale green, white at base, usually glabrous. *Cotyledons* epigeous, 2, equal, shortly petiolate; blade ovate or ovate-oblong or elliptic or oblong, with index 1½–2½, 1½–2 cm by 7 mm, coriaceous, having an obtuse top and a rounded whether or not slightly eared base, 1-nerved, entire, dull dark green above, dull green beneath, glabrous. *Epicotyl* erect, straight, 3–7 mm; at 1st stage terete, smooth, green, with simple colourless hairs. *Stem* erect, straight; at 2nd stage terete, laterally compressed at nodes, smooth, green, hairy like epicotyl. *Phyllotaxy* spiral. *Leaves* exstipulate, simple, petiolate; blade pinninerved, midrib prominent beneath. *1st Leaf* blade elliptic, sometimes irregular, with index 2, 2–2½ by 1 cm, thin, having an obtuse mucronate top and an acute base narrowed into petiole, finely serrate or dentate, dull light green on both surfaces, midrib beneath sometimes hairy like epicotyl. *Highest leaves* (2nd stage) petiole up to ½ cm, channelled, green, hairy like epicotyl; blade oblong or lanceolate, with index up to 3½, up to 14 by 4½ cm, thin-coriaceous, having an acuminate obtuse caducously mucronate top and an acuminate base narrowed into petiole, with midrib sunk above but prominent beneath, irregularly dentate and the teeth alternately directed upwards and downwards, slightly glossy green above, light green with a leaden shine beneath, glabrous above, midrib beneath hairy like epicotyl. *Top of plant* hairy, green.

Seeds from 1 motherplant.

LAPLACEA H.B.K.

B. I: 319, 320; K. et V. III: 293 (*Haemocharis* SALISB.)

Laplacea integerrima MIQ. (*Haemocharis integerrima* (MIQ.) K. et V.)

B. I: 321; K. et V. III: 294

Sund.: huru mandjel, madjel

Fig. 141

Size at 1st stage (1st leaf only) 6½–11 cm, 4½–7 cm above collet¹. *Roots* at 1st stage colourless; primary root at 1st stage moderately flexuous, moderately thicker than lateral ones; collet not thickened; lateral roots at 1st stage moderate in number, very flexuous, unbranched. *Hypocotyl* epigeous, erect, straight, 4–6 cm; at 1st stage

¹ No seedlings at 2nd stage obtained.

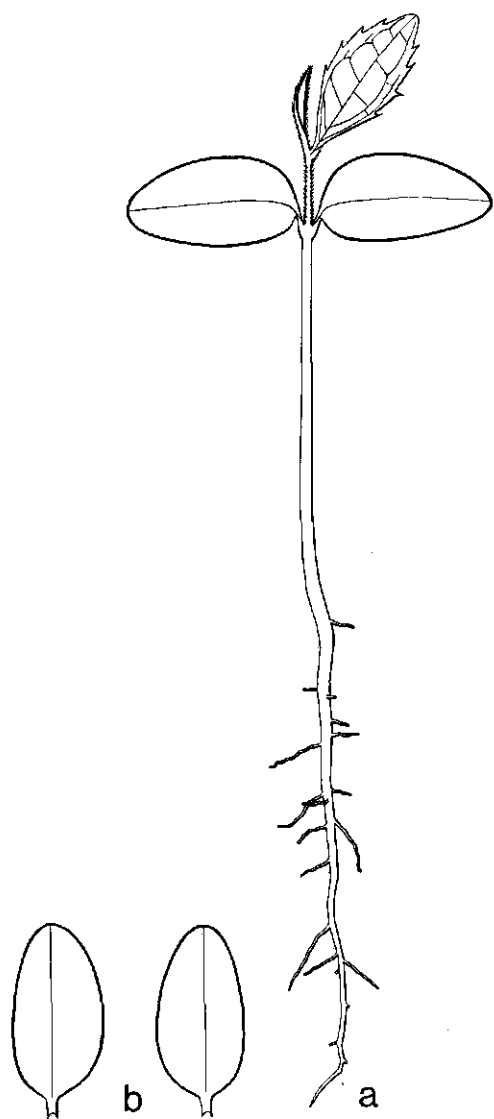


Fig. 141. *Laplacea integerrima* a. young seedling, 1/1 ×; b. cotyledons, 1/1 ×.

1–1¼ mm thick, terete, smooth, pale green, very short-hairy near top. *Cotyledons* epigeous, 2, equal, or asymmetrical and one another's mirror image, petiolate; petiole \pm 2–3 mm, flattened above and beneath, gradually passing into blade; blade oblong or ovate-oblong or obovate-oblong, with index 2–2½, 17–24 by 7–11 mm, thin-coriaceous, having an obtuse top and a rounded base narrowed into petiole, 1-nerved, entire, dull dark green above, dull green beneath, glabrous. *Epicotyl*

$\pm \frac{1}{2}$ cm, with simple colourless hairs. *Stem* terete, hairy like epicotyl. *Phyllotaxy* spiral. *Leaves* (1st leaf and some next ones present) exstipulate, simple, petiolate; petiole slightly channelled, gradually passing into blade, green, hairy beneath like epicotyl; blade thin, having an obtuse mucronate top and an acuminate base narrowed into petiole, pinninerved, with midrib sunk above but prominent beneath, serrate or dentate and the teeth irregularly directed alternately upwards and downwards, slightly glossy green on both surfaces, midrib beneath hairy like epicotyl. *1st Leaf* petiole up to $\pm \frac{1}{2}$ cm; blade elliptic, sometimes ovate or oblong, with index $1\frac{1}{2}$ –2, up to $\pm 2\frac{1}{4}$ by 1 cm, top taperpointed. *Next leaves* blade top acuminate. *Top of plant* hairy, green.

Seeds from 1 motherplant.

SCHIMA REINW. ex BL.

B. I: 319, 321; K. et V. III: 282; TROUP I: 29

***Schima wallichii* (DC.) KORTH. ssp. *noronhae* (REINW. ex BL.) BLOEMBERGEN (*S. noronhae* REINW. ex BL.)**

B. I: 321; K. et V. III: 283; TROUP I: 29

Sund.: *puspa*

Fig. 142

Size at 1st stage (1st leaf only) 6–13 cm, 3–4½ cm above collet; at 2nd stage (\pm 19–45 leaves) 18–54 cm above collet. *Roots* white turning brown; primary root at 1st stage very flexuous, slightly thicker than lateral ones; collet gradually and slightly thickened; lateral roots at 1st stage very numerous, very flexuous. *Hypocotyl* epigeous, erect, 2–3½ cm; at 1st stage $\frac{3}{4}$ mm thick, tapering upwards, terete, smooth, red or reddish green, pale green at top and white at base, with simple very short patent colourless hairs. *Cotyledons* epigeous, 2, asymmetrical, one another's mirror image, petiolate, petiole 2–3 mm, breadth > thickness, pale green, hairy like hypocotyl; blade asymmetrically ovate, with index 1–1½, 7–14 by 5–11 mm, thin, having an obtuse top and a narrowed base, palmately 3-nerved, entire, sometimes lobed at one side, silky and green above, dull light green beneath, glabrous. *Epicotyl* erect, straight, 5–11 mm; at 1st stage terete, smooth, red or pale green, with simple colourless hairs. *Stem* erect; at 2nd stage spiral owing to obtusangular connection of internodes, terete, smooth, green or red in upper part, brown below, reddish yellow lenticels, with simple colourless hairs. *Phyllotaxy* spiral. *Leaves* exstipulate, simple, petiolate; petiole red or green, hairy like stem; blade pinninerved, prominently midribbed beneath, entire or near top remotely dentate or serrate, on both surfaces hairy like stem, ciliate. *1st Leaf* petiole 2–3 mm; blade ovate or elliptic, with index $1\frac{1}{2}$ –2, 13–19 by 7–9 mm, thin, dull light green. *Highest leaves* (2nd stage) petiole up to 1 cm, flattened above, convex beneath; blade oblong to lanceolate, with index up to $3\frac{1}{2}$, up to 14½ by $5\frac{1}{4}$ cm, thin-coriaceous,

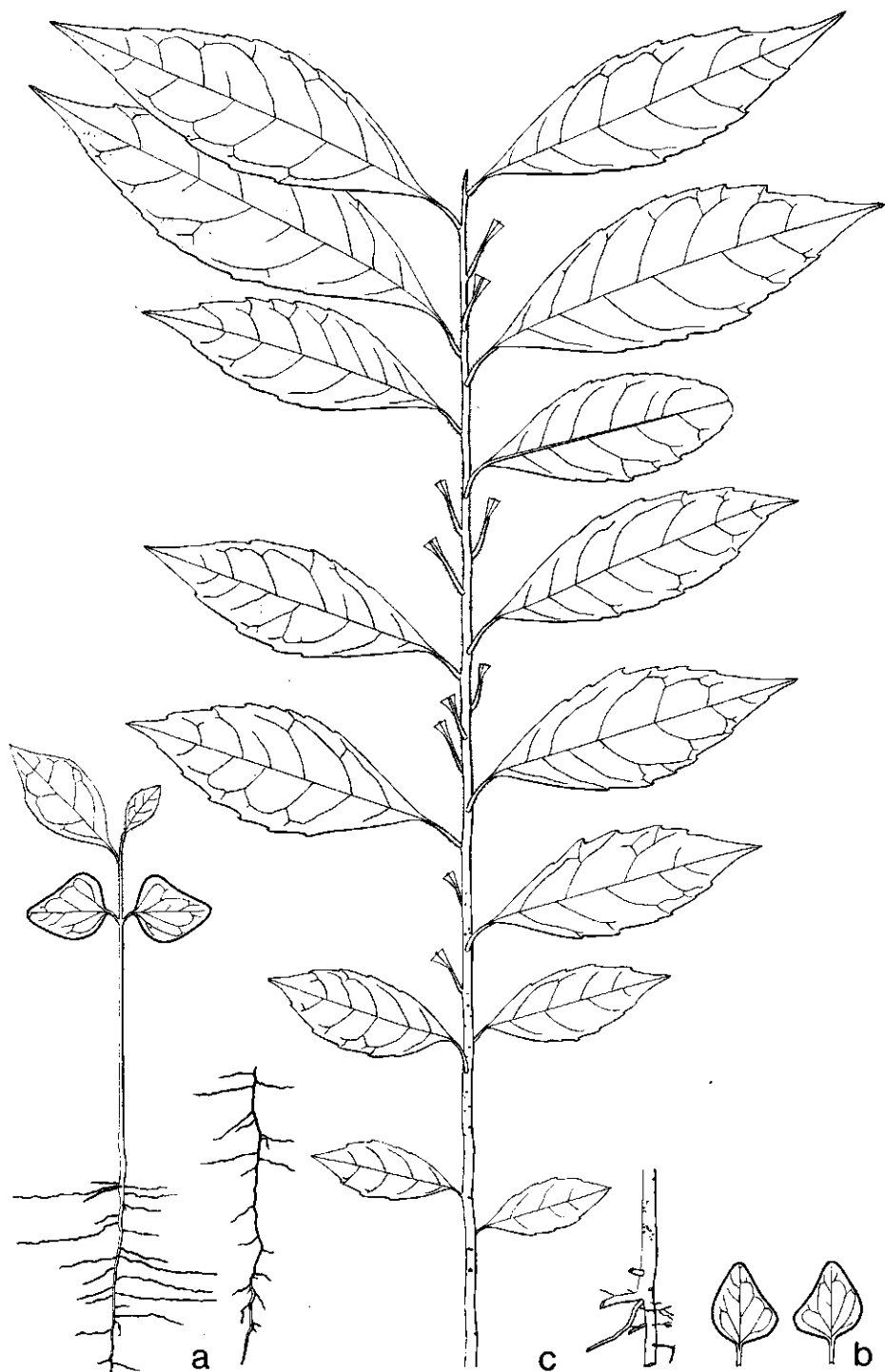


Fig. 142. *Schima wallichii* ssp. *noronhae* a. young seedling, $1/1\times$; b. cotyledons, $1/1\times$; c. older seedling, $1/2\times$.

having an acuminate acute top and an acuminate base narrowed into petiole, slightly glossy green above, dull light green beneath. *Top of plant* hairy, later with dense silky hairs.

Seeds from 2 motherplants from different localities.

TILIACEAE

B. I: 388; K. et V. I: 206; LUBB. I: 275; TROUP I: 162

Cotyledons epigeous, 2, equal, or asymmetrical and one another's mirror image, petiolate, foliaceous, hairy or glabrous. *Stem* terete. *Phyllotaxy* spiral, in older plants often distichous-alternate. *Leaves* stipulate, simple, petiolate. Each plant has on some of its parts stellate much or 2-branched hairs and sometimes simple ones too.

Cotyledons and (or) 1st leaf and (or) higher leaves present

1. a. cot. obreniform; leaves with dense and felty hairs beneath, higher leaves peltate *Schoutenia ovata*
b. otherwise 2
2. a. cot. petiole 1-1½ mm; blade elliptic or ovate, index ± 1½-2, 10-16 mm long; 1st leaf blade 12-25 mm long; higher leaves petiole ± 12 mm *Microcos tomentosa*
b. cot. petiole 2-3 mm, blade orbicular or ovate, index ± 1, 4-7 mm long; 1st leaf blade 6-10 mm long; higher leaves petiole ± 5-7 mm long *Grewia eriocarpa*

GREWIA L.

B. I: 388, 392; K. et V. I: 221

Grewia eriocarpa JUSS. (*G. celtidifolia* JUSS., *G. Koordersii* BURRET)

B. I: 393; K. et V. I: 221, 223

Sund.: talok. *Jav.*: talok

Fig. 143

Size at 1st stage (1st 2 leaves) 5–10 cm, 1½–2 cm above collet; at 2nd stage (\pm 17–38 leaves) 20–48 cm above collet. **Roots** off white turning brown; primary root at 1st stage very flexuous, not or only slightly thicker than lateral ones; collet gradually and slightly thickened; lateral roots at 1st stage moderate in number to very numerous, very flexuous, moderately to much branched. **Hypocotyl** epigeous, erect, straight, \pm 12–20 mm but length indistinct owing to presence of adventitious roots; at 1st stage ½–1 mm thick, terete, smooth, pale green or off white or greenish white, with simple

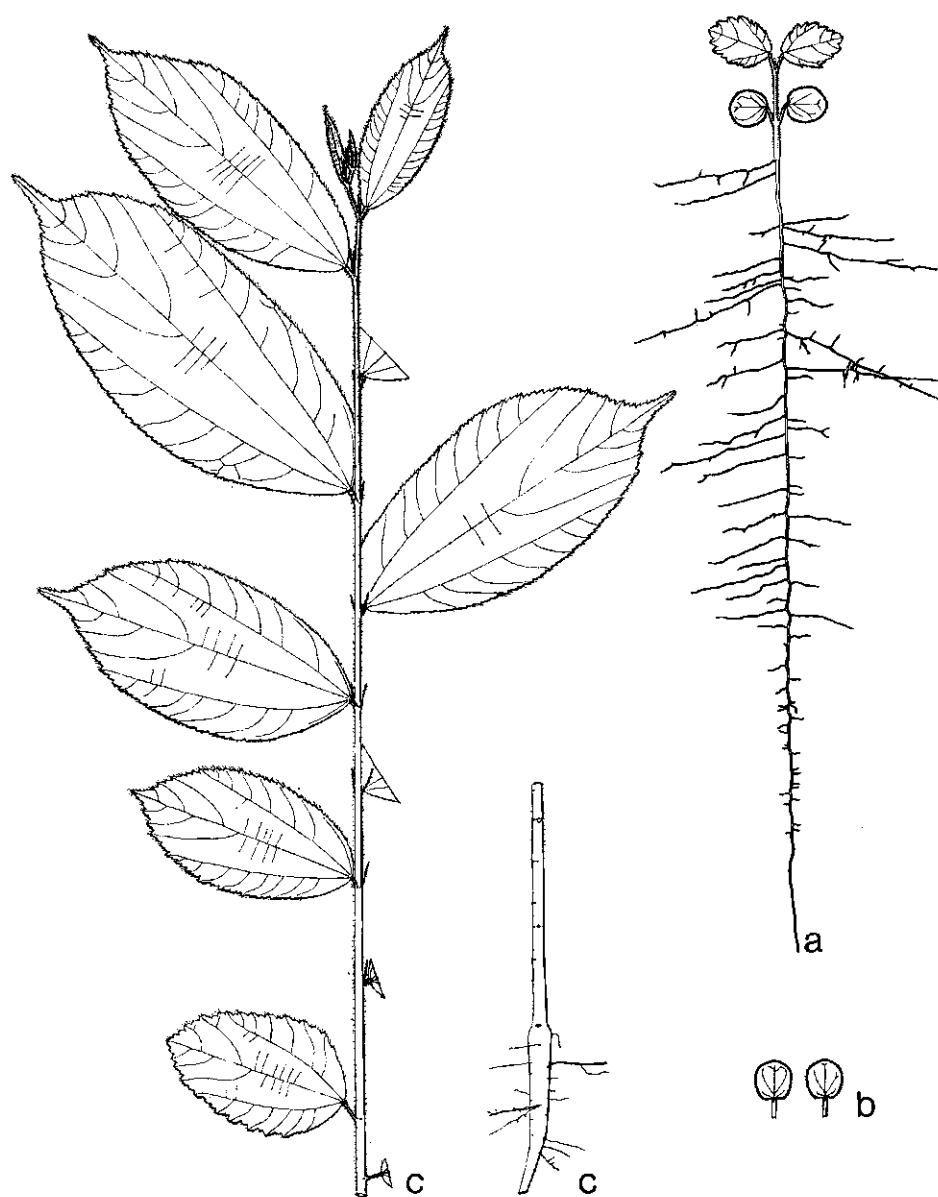


Fig. 143. *Grewia eriocarpa* a. young seedling, $1/1 \times$; b. cotyledons, $1/1 \times$; c. older seedling, $1/2 \times$.

patent colourless hairs. *Cotyledons* epigeous, 2, equal, petiolate; petiole $\pm 2-3$ mm, pale green, hairy like hypocotyl; blade orbicular or ovate, with index ± 1 , $\varnothing 4-7$ mm, thin, having a rounded obtuse top and a rounded or slightly exculptate base, palmately 3-5-nerved, entire, on both surfaces dull green, hairy like hypocotyl. *Epicotyl* 6-10 mm. *Stem* erect; at 2nd stage feather-shaped with a sideward bend, zigzag, terete, abruptly much thickened at base, smooth, green, sometimes in upper part red and brown below, stellate much branched colourless hairs unequal in size. *Phyllotaxy* spiral but sometimes 1st 2 leaves subopposite, higher leaves (2nd stage) distichous-alternate. *Leaves* stipulate, simple, petiolate; stipules narrowly 3-angular, green, hairy; petiole terete, smooth, red or green, hairy like stem, sometimes with 2-branched hairs and simple colourless ones; blade thin, palmately 3-5-nerved, both surfaces dull green. *1st Leaf* petiole 2-4 mm; blade ovate or elliptic, with index slightly > 1 , 6-10 by 5-8 mm, thin, having an acute top and a slightly cordate base, prominently nerved beneath, coarsely serrate, both surfaces dull green and hairy like stem or with simple hairs. *Highest leaves* (2nd stage) stipules longer than petiole, near base margin revolute or flat; petiole 5-7 mm, thickened at top; blade ovate or elliptic or oblong or oblong-ovate or obovate-oblong, with index $2-2\frac{1}{2}$, up to 9-15 $\frac{1}{2}$ by 4-6 cm, having a shortly acuminate acute top and a rounded asymmetrical base broadest at anterior side, prominently nerved on both surfaces, serrate, on both surfaces simple and stellate hairs. *Top of plant* green or red, hairy.

Seeds from 2 motherplants from different localities.

MICROCOS L. (often considered congeneric with *Grewia* L.)

B. 393; K. et V. I: 217, 226; TROUP I: 164, 166

Microcos tomentosa J.E. SMITH (*Grewia microcos* Auct. non L., *G. paniculata* ROXB. ex DC.)

B. I: 393; K. et V. I: 225, 226; TROUP I: 166

Mal.: lijak (*Lamp.*), memantut (*Bangka*), tjenderai (*Malakka*). *Sund.*: drowak. *Jav.*: dluwak, dluwang

Fig. 144

Size at 1st stage (1st leaf only) up to ± 17 cm, $\pm 2\frac{1}{2}$ cm above collet; at 2nd stage (18-27 leaves) 15-47 cm above collet. *Roots* yellowish white or off white sometimes turning yellowish brown; primary root at 1st stage moderately to very flexuous, moderately thicker than lateral ones; collet not or gradually and slightly thickened; lateral roots at 1st stage very numerous, very flexuous, moderately branched. *Hypocotyl* epigeous, erect, straight, 2-3 $\frac{1}{2}$ cm; at 1st stage ± 1 mm thick, tapering upwards, terete, smooth, green, white or dirty yellow at base, with simple colourless hairs. *Cotyledons* epigeous, 2, equal, sometimes asymmetrical and one another's mirror

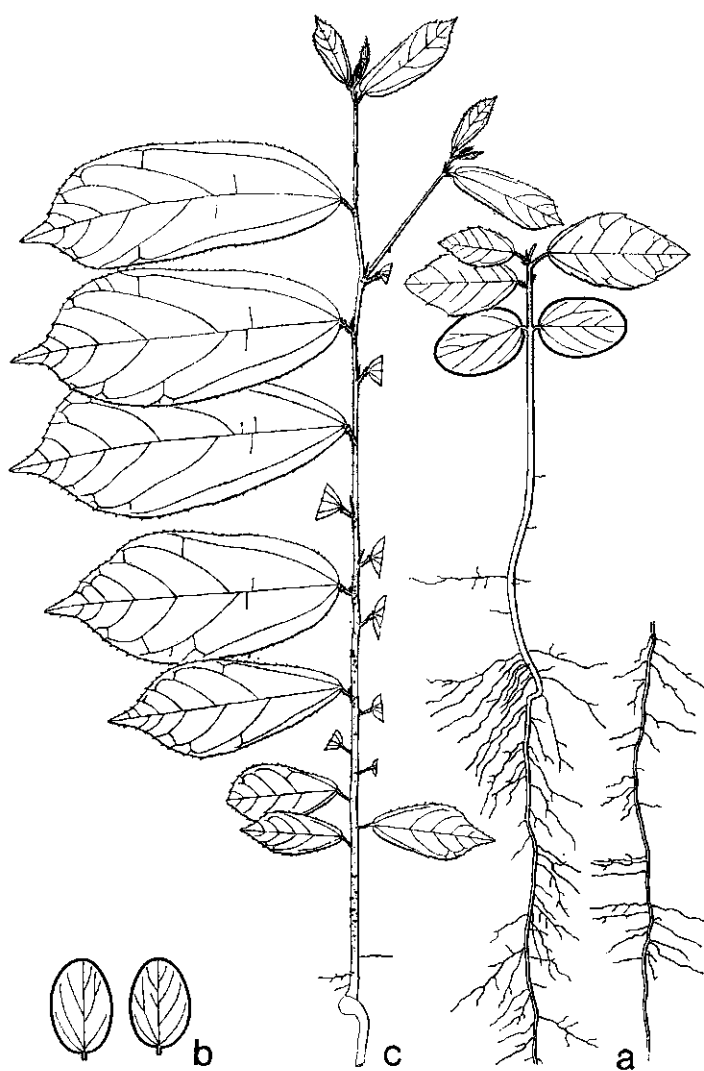


Fig. 144. *Microcos tomentosa* a. young seedling, 1/1 × ; b. cotyledons, 1/1 × ; c. older seedling, 1/4 ×.

image, petiolate; petiole 1–1½ mm, green, hairy like hypocotyl; blade elliptic or ovate, with index 1½–2, 10–16 by 6–12 mm, thin, having a rounded obtuse top and a rounded or slightly exsculptate base, palmately 5-nerved, prominently nerved beneath, entire, green, both surfaces but especially above hairy like hypocotyl. *Epicotyl* 4–15 mm. *Stem* erect; at 2nd stage often feather-shaped with a sideward bend, terete, smooth, green, with simple colourless hairs and some stellate much branched ones. *Phyllotaxy* spiral, later tending to alternate. *Leaves* stipulate, simple, petiolate; stipules green; petiole hairy like stem; blade thin, palmately nerved, slightly dentate or serrate, both surfaces hairy. *1st Leaf* stipules lineate; petiole 3–4 mm; blade ovate or elliptic or cordiform, with index 1½–2, ±12–25 by 10–25 mm, top acute, base rounded or cordate. *Highest leaves* (2nd stage) stipules ovate-lanceolate or narrowly 3-angular, up to 9 mm long, sometimes doubly topped, green; petiole up to ±12 mm and 3 mm thick, top and base much thickened; blade obovate or obovate-oblong sometimes almost rhomboid, with index ±2¼–2½, ±9½–18 by 4–8 cm, having an acuminate acute top and a rounded base, palmately 3-nerved. *Top of plant* hairy, green.

Seeds from 4 motherplants from different localities.

SCHOUTENIA KORTH.

B. I: 388, 391; K. et V. I: 210

Schoutenia ovata KORTH. (*Actinophora fragrans* WALL. ex R. BR., *Pterospermum burmannianum* HOCHR.)

B. I: 392; K. et V. I: 211

Sund.: harikukun. *Jav.*: landji (name of young form), walikukun. *Mad.*: kokon
Fig. 145

Size at 1st stage (1st leaf only) 6½–24 cm, 3–7 cm above collet; at 2nd stage (11–13 leaves) 15–24 cm above collet. *Roots* yellowish brown turning dirty yellow; tips white; primary root at 1st stage moderately to very flexuous, moderately to much thicker than lateral ones; collet not or gradually and slightly thickened; lateral roots at 1st stage moderate in number to numerous, very flexuous, sparsely branched. *Hypocotyl* epigeous, erect, straight, 2–5 cm; at 1st stage 1–1½ mm thick tapering upwards, terete, smooth, green, white or brown at base, with simple and stellate much branched colourless or yellowish brown hairs. *Cotyledons* epigeous, 2, equal, or asymmetrical and one another's mirror image, petiolate; petiole 2–5 mm, green, hairy like hypocotyl; blade obreniform, sometimes irregular, with index ½–2½, 5–10 by 7–19 mm, thin, having an emarginate sometimes irregularly undulate top and a rounded rarely acute sometimes cordate base, palmately 3–5-nerved, often at ½ length bifidly prominently nerved beneath, entire, dull green, glabrous. *Epicotyl* ½–2 cm. *Stem* erect; at 2nd stage feather-shaped with a sideward bend, terete, with dense ferruginous

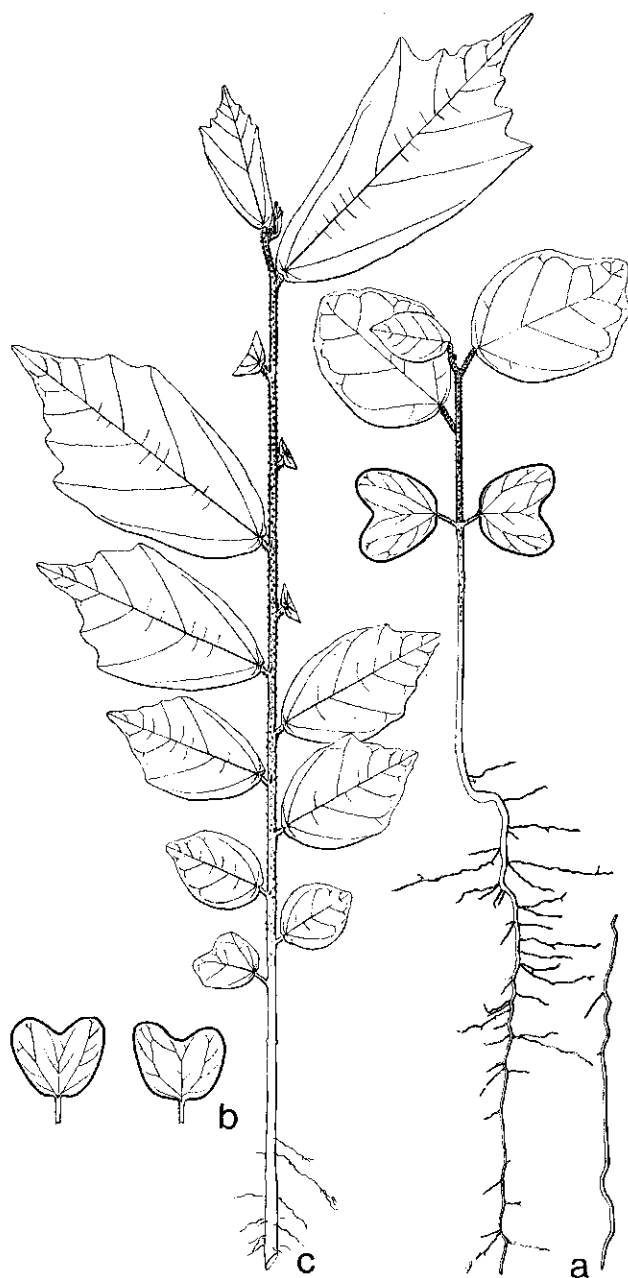


Fig. 145. *Schoutenia ovata* a. young seedling, $1/1\times$; b. cotyledons, $1/1\times$; c. older seedling, $1/2\times$.

stellate much branched hairs. *Phyllotaxy* lowest leaves spirally arranged, succeeding ones distichous-alternate. *Leaves* stipulate, simple, petiolate; stipules subulate, hairy like stem; petiole terete, hairy like stem; blade thin, dull green above, hairs near base above stellate but dense felty stellate much branched beneath. *1st Leaf* petiole 3–5 mm; blade ovate or obovate or elliptic or irregular, with index 1–2, $1\frac{1}{2}$ – $2\frac{1}{2}$ by 1–2 cm, having an obtuse top, palmately 3-nerved, prominently nerved beneath, entire, or near top irregularly lobed or undulate, dull whitish grey beneath. $\pm 10th$ *Leaf* stipules 2–4 mm long; petiole 3–6 mm, $1\frac{1}{2}$ mm thick; blade peltate (but the top of the petiole very near the margin of the blade), rhomboid-oblong, sometimes obovate-rhomboid rarely ovate or elliptic, with index 2–3, $6\frac{1}{2}$ – $10\frac{1}{2}$ by $2\frac{1}{2}$ – $4\frac{1}{2}$ cm, having an acuminate acute or obtuse top, palmately multi-nerved but central 3 nerves thickest, prominently nerved beneath, coarsely undulate or dentate near top, brownish grey beneath. *Top of plant* with dense woolly yellowish brown stellate hairs; youngest leaves red or green.

Seeds from 6 motherplants from different localities.

ULMACEAE

B. II: 10; K. et V. XII: 638; TROUP III: 854

TREMA LOUR.

B. II: 11; K. et V. XII: 649; TROUP III: 860

Trema orientalis (L.) BL. (*T. amboinensis* Auct. non (WILLD.) BL.)

B. II: 12; K. et V. XII: 655; TROUP III: 860

Mal.: kemirai, mengkarai, same (*Menado*). *Sund.*: kuraj. *Jav.*: anggrung. *Alf. Minah.*: samaki, tajapu

Fig. 146

Size at 1st stage (1st 2 leaves only) 19–26 cm, $1\frac{1}{2}$ – $3\frac{1}{2}$ cm above collet; at 2nd stage (± 12 –16 leaves) 26–44 cm above collet. *Roots* brownish yellow or off white; primary root at 1st stage very flexuous, slightly thicker than lateral ones; collet gradually and moderately thickened; lateral roots at 1st stage few, very flexuous, unbranched. *Hypocotyl* epigeous, erect, straight, 13–27 mm; at 1st stage $\frac{1}{2}$ mm thick, terete, smooth, red or pale green, base white, with simple short declivous colourless hairs. *Cotyledons* epigeous, 2, equal, petiolate; petiole 1–2 mm, broadened, green, with simple patent colourless hairs; blade ovate or oblong, with index 2–3, 8–11 by 4–5 mm, thin, having an obtuse top and a rounded base narrowed into petiole, indistinctly nerved, entire, dark green on both surfaces, hairy like petiole. *Stem* erect; at 2nd stage spiral owing to obtusangular connection of internodes, terete but angular near top, some-

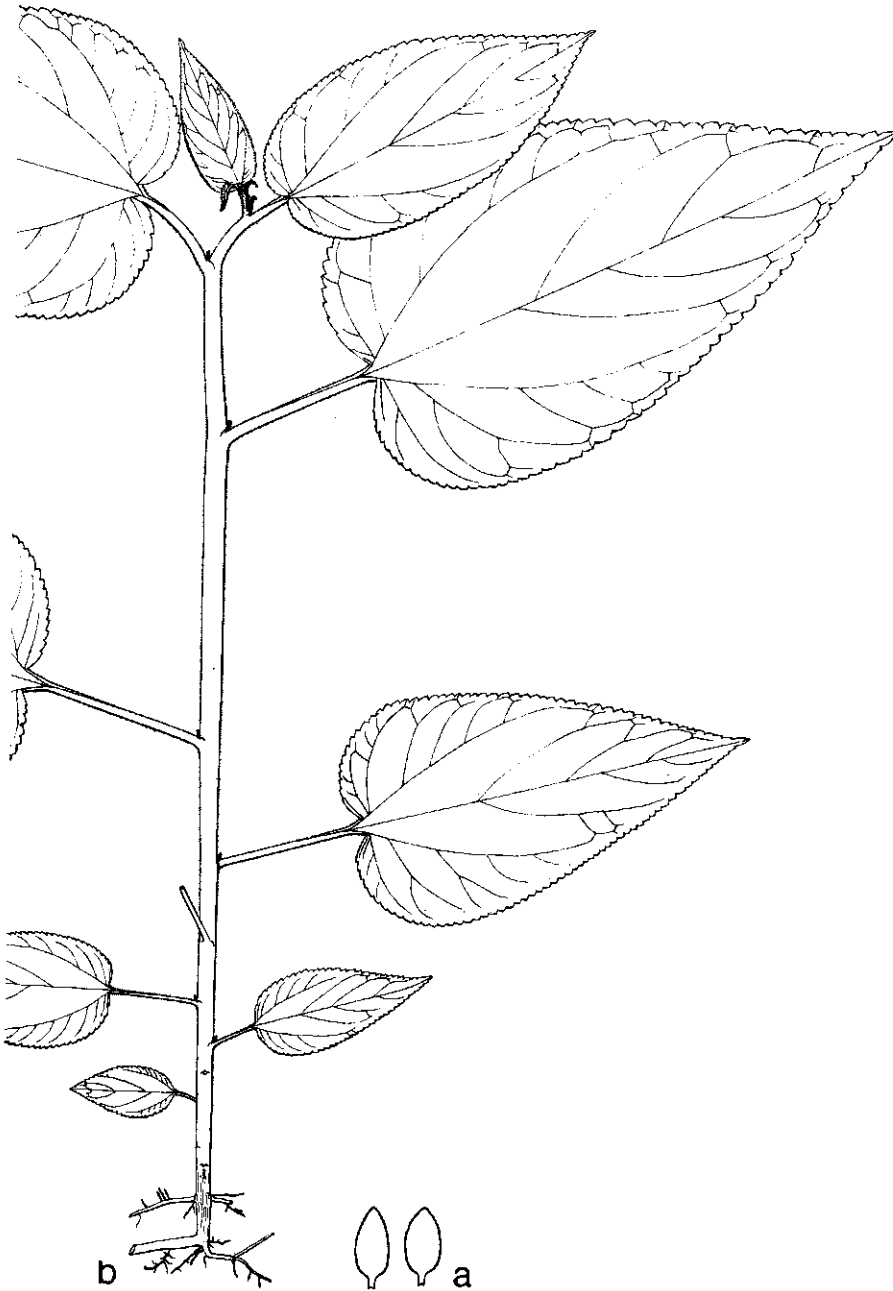


Fig. 146. *Trema orientalis* a. cotyledons, $1/1\times$; b. older seedling, $1/2\times$.

times at $\frac{1}{2}$ length thicker than near base, green sometimes brownish red, hispid, with simple patent colourless hairs of unequal length. *Phyllotaxy* spiral, but 1st 2 leaves opposite. *Leaves* stipulate, simple, petiolate, along branches sometimes alternating with a scale-shaped one; stipules narrow-3-angular, green; blade on both sides and petiole hairy like stem; blade thin, rough, thick to touch. *1st Leaf* petiole flattened above, convex beneath, green; blade ovate or elliptic, having an acute top and a rounded base, prominently nerved beneath, coarsely serrate, both surfaces dull green. *Highest leaves* (2nd stage) petiole up to 6 cm, terete, lengthwise 1-furrowed above, green or brownish red; blade cordiform, with index up to 2, up to 23 by 14 cm, having an acuminate acute top and a cordate base and the part of the blade between the 3 nerves protruding below the incision at the base, 3-palmately nerved but central nerve thickest and nerves sunk above and prominent beneath, crenate or serrate, dull green above, dull greyish green beneath. *Top of plant* hairy, green.

Seeds from 1 motherplant.

VERBENACEAE

B. II: 594; K. et V. VII: 163; LUBB. II: 367; TROUP II: 697

Cotyledons epigeous or hypogeous, 2, equal or unequal, or slightly oblique and one another's mirror image; petiolate; if hypogeous: together at side of stem and upper surfaces in close contact, covered with remains of seed. *Stem* terete or 4-angular. *Phyllotaxy* decussate. *Leaves* exstipulate, simple or compound; if compound: palmately or pinnately so.

- | | |
|--|---|
| A. Cotyledons and 1st pair of leaves present | 1 |
| B. Higher leaves (2nd stage) present | 7 |
| 1. a. cot. hypogeous, together at side of stem, covered with remains of seed,
rarely diverging; 1st pair of leaves entire | 2 |
| b. cot. epigeous, not together at side of stem, diverging; 1st pair of leaves not
entire | 3 |
| 2. a. epicotyl glabrous; 1st and 2nd pair of leaves very small, sometimes irregular
<i>Clerodendrum serratum</i> | |
| b. epicotyl hairy; 1st pair of leaves blade ovate or elliptic, 7-9 mm long . . .
<i>Gmelina elliptica</i> | |
| 3. a. cot. blade entire or coarsely 2-4-dentate; 1st pair of leaves blade pinna-
tilobate to -partite <i>Peronema canescens</i> | |
| b. cot. blade entire, 1st pair of leaves not lobed or partite | 4 |
| 4. a. aerial part of plant with numerous red glands <i>Tectona grandis</i> | |
| b. otherwise | 5 |

5. a. epicotyl and stem very coarsely hairy *Premna tomentosa*
b. otherwise 6
6. a. cot. blade to 5 mm long; top not emarginate . *Stachytarpheta jamaicensis*
b. cot. blade $6\frac{1}{2}$ mm long or longer, top often emarginate *Vitex*
7. a. highest leaves (2nd stage) pinnately compound . . . *Peronema canescens*
b. these leaves palmately compound *Vitex*
c. these leaves simple 8
8. a. these leaves palmately lobed *Gmelina elliptica*
b. otherwise 9
9. a. stem and top of plant stellately hairy, no red glands . *Premna tomentosa*
b. without stellate hairs, whether or not with red glands 10
10. a. stem, leaves and top of plant with red glands *Tectona grandis*
b. otherwise 11
11. a. stem terete near base, 4-angular near top; highest leaves (2nd stage) blade index $1\frac{1}{2}$ (excluded the very long-narrowed base), serrate
Clerodendrum serratum
b. stem 4-angular; highest leaves (2nd stage) blade index 3, coarsely serrate .
Stachytarpheta jamaicensis

CLERODENDRUM L.

Wrong spelling: *Clerodendron*. B. II: 594, 595, 607; K. et V. VII: 211; LUBB. II: 372

***Clerodendrum serratum* (L.) MOON**

B. II: 608

Mal.: senggugu, tindja-u hendak (*Lamp.*). *Sund.*: senggugu, singugu. *Jav.*: sagunggu, srigunggu. *Mad.*: kertase, pinggir tosek

Fig. 147

Size at 1st stage (1st pair of leaves only) 7–13 cm, 2–4 cm above collet; at 2nd stage (± 6 –9 pairs of leaves) 20–35 cm above collet. *Roots* permanently white; primary root at 1st stage moderately flexuous, moderately or only slightly or not thicker than lateral ones; collet gradually and slightly to moderately thickened; lateral roots at 1st stage moderate in number, very flexuous, unbranched. *Hypocotyl* hypogeous, very short. *Cotyledons* hypogeous, 2, equal or unequal, together at side of stem, their upper surfaces in close contact, covered with remains of seed, petiolate; blade obovate or elliptic, 3 by $2\frac{1}{2}$ mm, fleshy, having an obtuse top and a base gradually passing into petiole, entire. *Epicotyl* at 1st stage erect, straight, $\frac{1}{2}$ – $1\frac{1}{2}$ cm, 4-angular, white, glabrous. *Stem* at 2nd stage erect, straight, terete near base, 4-angular near top, green, glabrous or near top sparsely hairy. *Phyllotaxy* decussate. *Leaves* exstipulate, simple, petiolate; petiole flattened above, convex beneath, green, glabrous; blade thin, pinninerved, serrate, dull green and glabrous above. *First 2 pairs of leaves* very small,

entire, sometimes irregular. *2nd Sometimes 3rd pair of leaves* petiole 1–3 mm; blade elliptic, with index 1–2, 6–17 by 5–10 mm, having an acute top and an acuminate narrowed base, prominently midribbed beneath, remotely serrate, hairy or glabrous, if hairy: only beneath very sparse simple very short patent colourless hairs. $\pm 8th$ *Pair of leaves* petiole 1 cm, 2 mm thick; blade obovate oblong, with index 3, 14–15 by 5 cm, having an acuminate acute top and a long-acuminate narrowed base, prominently nerved beneath, white or bluish violet above, dull greyish green beneath, glabrous. *Top of plant* hairy.

Seeds from 4 motherplants from different localities.

GMELINA L.

B. II: 594, 606; K. et V. VII: 196; TROUP II: 769

Gmelina elliptica J.E. SMITH (*G. villosa* ROXB.)

B. II: 606; K. et V. VII: 197

Mal.: bulangan, kemendiang (*Lamp.*). *Sund.*: wareng. *Jav.*: wareng

Fig. 147

Size at 1st stage (1st pair of leaves only) up to 8 cm, 2 cm above collet; at 2nd stage (± 20 pairs of leaves) ± 30 cm above collet. *Roots* permanently yellowish white; collet at 1st stage gradually and slightly thickened. *Hypocotyl* hypogeous, very short. *Cotyledons* hypogeous, 2, asymmetrical and one another's mirror image, together at side of stem, their upper surfaces in close contact, covered with remains of seed, sessile; blade asymmetrical, oblong, ± 9 by 4 mm, thick-fleshy, flat above, semi-globose beneath, having a notched top and a narrowed base, entire, greenish whitish yellow, on both surfaces simple colourless hairs. *Epicotyl* at 1st stage erect, ± 13 mm, 1 mm thick, dark purplish red near top, green below, small orbicular white glands, with simple colourless hairs. *Stem* at 2nd stage erect, straight, terete, smooth, dark purplish red, hairy like epicotyl. *Phyllotaxy* decussate but 1st 2 pairs of leaves sub-decussate. *Leaves* exstipulate, simple, petiolate; petiole channelled, possessing small orbicular white glands, hairy like epicotyl; blade having an acute top, 3-plinerved, entire, ciliate, both surfaces hairy like epicotyl. *1st Pair of leaves* petiole 2 mm, green; blade elliptic or ovate, sometimes 2–3-lobed and terminal lobe largest, ± 7 –9 by 5 mm, having a rounded or acute base, prominently nerved beneath, both surfaces dull green. $\pm 20th$ *Pair of leaves* petiole $1\frac{1}{2}$ cm, purplish red; blade ovate, palmately 5-lobed and terminal lobe longest, ± 3 by $2\frac{1}{2}$ cm, having an acute base, with nerves sunk above and prominent beneath, dull dark green above, dull light greyish green beneath. *Top of plant* hairy; youngest leaves glossy light green.

Seeds from 1 motherplant.

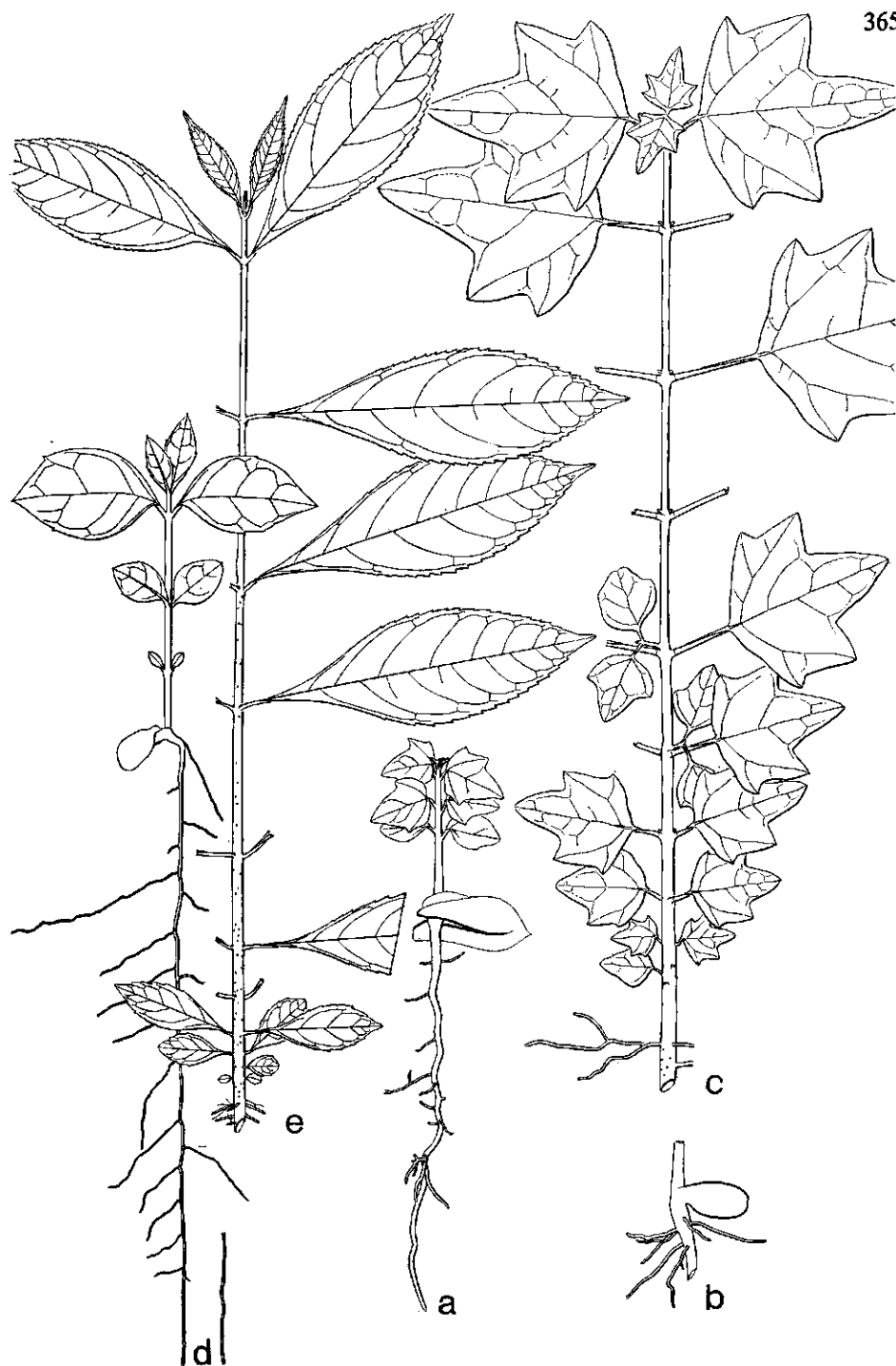


Fig. 147. *Gmelina elliptica* a. young seedling, $1/1\times$; b. cotyledons, $1/1\times$; c. older seedling, $1/1\times$.
Clerodendrum serratum d. young seedling, $1/1\times$; e. older seedling, $1/2\times$.

PERONEMA JACK

B. II: 594, 612; K. et V. VII: 213

Peronema canescens JACK

B. II: 612; K. et V. VII: 214

Sund.: djati sabrang, ki sabrang. *Mal.*: sungkai, sungkai melaju. *S. and E. Born.*: lurus

Fig. 148

Size at 1st stage (1st pair of leaves only) $2\frac{1}{2}$ –11 cm, 7–15 mm above collet; at 2nd stage (7–8 pairs of leaves) 6–16 cm above collet. *Roots* permanently off white; primary root at 1st stage very flexuous, slightly thicker than lateral ones; collet gradually and slightly thickened; lateral roots at 1st stage moderate in number, moderately branched. *Hypocotyl* epigeous, erect, straight, 6–11 mm; at 1st stage $\frac{3}{4}$ mm thick, terete, smooth, reddish purple or green, green at base; with simple patent short colourless hairs. *Cotyledons* epigeous, 2, equal, petiolate; petiole $1\frac{1}{2}$ –2 cm, green, hairy like hypocotyl; blade ovate, with index $\pm 1\frac{1}{2}$, 3–5 by 2–5 mm, thin, having an emarginate top and a truncate or slightly exculptate base, indistinctly nerved, entire or coarsely 2–4-dentate, green on both surfaces but lighter beneath, both surfaces hairy like hypocotyl. *Epicotyl* 2–3 mm. *Stem* erect, straight, terete; at 2nd stage laterally compressed at nodes, green, with simple patent very short colourless hairs. *Phyllotaxy* decussate. *Leaves* exstipulate; lowest leaves simple; higher ones imparipinnate, number of leaflets increasing with succeeding leaves; 11th or 13th up to 12th or 16th pair of leaves 5 pairs of leaflets. *1st Pair of leaves* simple, petiolate; petiole 2–3 mm, winged, green, hairy like stem; blade pinnatipartite or pinnately lobed, possessing 2–3 pairs of lobes, ovate, with index $1\frac{1}{2}$ – $1\frac{1}{2}$, 6–7 by 4–5 mm, thin, having an acute top and an acute decurrent base, pinninerved, prominently nerved beneath, serrate, dull light green, both surfaces hairy like stem. *Imparipinnate leaves* rachis thickened at base, between pairs of leaflets widely 2-winged, green, hairy like stem; leaflets opposite or subopposite, sessile, in highest pairs largest; blades elliptic to lanceolate, thin, hispid, having an acutely taperpointed or acuminate acute top and an acute or asymmetrically rounded base, but a long-acuminate base in terminal leaflets and in lateral leaflets a base at posterior side decurrent into rachis, pinninerved and nerves sunk above but prominent beneath, serrate, dull green above, dull greyish green beneath, glabrous above, or both surfaces hairy like stem. *Leaves with 5 pairs of leaflets* rachis 4–9 cm; blades index $1\frac{1}{2}$ – $4\frac{1}{2}$, $\frac{1}{2}$ –9 cm by 3–20 mm. *Top of plant* hairy, green or purple, in older plants bluish purple.

Seeds from 1 motherplant.**PREMNA** L.

B. II: 594, 595, 602; K. et V. VII: 197; TROUP II: 778

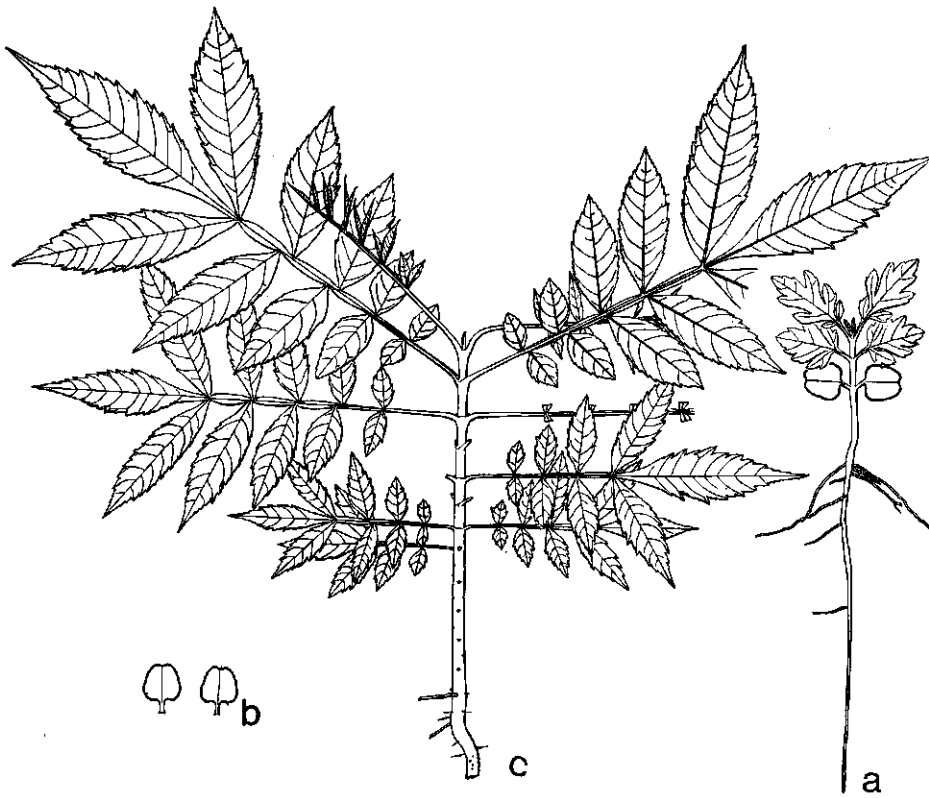


Fig. 148. *Peronema canescens* a. young seedling, $1/1\times$; b. cotyledons, $1/1\times$; c. older seedling, $1/2\times$.

***Premna tomentosa* WILLD. (*P. flavida* MIQ.)**

B. II: 602; K. et V. VII: 179; TROUP II: 778

Mal.: bebulan hendak (*Lamp.*). *Sund.*: bungbulan, bulang. *Jav.*: bolong, gadungan, gembolang

Fig. 149

Size at 1st stage (1st pair of leaves only) 6–13 cm, 2–5 cm above collet; at 2nd stage (7–16 pairs of leaves) 8–81 cm above collet. *Roots* white to yellowish white; primary root at 1st stage very flexuous, slightly or not thicker than lateral ones; collet abruptly much thickened; lateral roots at 1st stage moderate in number, very flexuous, sparsely or unbranched. *Hypocotyl* epigeous, erect, straight, 15–37 mm; at 1st stage 1–1½ mm thick, tapering upwards, terete, smooth, green, base white, with simple patent colourless hairs. *Cotyledons* epigeous, 2, equal, petiolate; petiole 2–3 mm, green, hairy like hypocotyl; blade ovate sometimes elliptic, with index 1–1½, 5–10 by 3½–8 mm, thin-coriaceous, having an emarginate or notched top and a rounded or slightly exculptate base, indistinctly nerved, entire, dull dark green above, dull greyish green beneath, ciliate, both surfaces hairy like hypocotyl. *Epicotyl* 3–10 mm; with very coarse simple branched and unbranched colourless hairs. *Stem* erect, straight; at 2nd stage 4-angular near top, terete below, much laterally compressed near nodes, green sometimes tinged with brown; with very coarse yellowish brown stellate hairs and thicker longer simple colourless ones but the latter sometimes branched. *Phyllotaxy* decussate. *Leaves* exstipulate, simple, petiolate; petiole coloured and hairy like stem but sometimes only with simple hairs; blade thin, pinninerved, prominently nerved beneath, dull green above, dull greyish green beneath, both surfaces hairy like petiole especially on nerves. *1st Pair of leaves* petiole 2–4 mm; blade elliptic or ovate, with index 1½–2, 8–14 by 6–10 mm, having an obtuse or acute top and an acute or rounded base, coarsely serrate, entire near base. *Highest leaves* (2nd stage) petiole up to 18 cm, up to ½ cm thick, flattened above, convex beneath, gradually thickened at base; blade elliptic or oblong, sometimes obovate, with index up to 2, up to 37 by 20 cm, having a shortly acuminate top and a rounded base, crenate or doubly crenate, top of crenatures abruptly acuminate. *Top of plant* stellately hairy; green or brownish green.

Seeds from 1 motherplant.**STACHYTARPHETA VAHL**

B. II: 594, 597; LUBB. II: 369

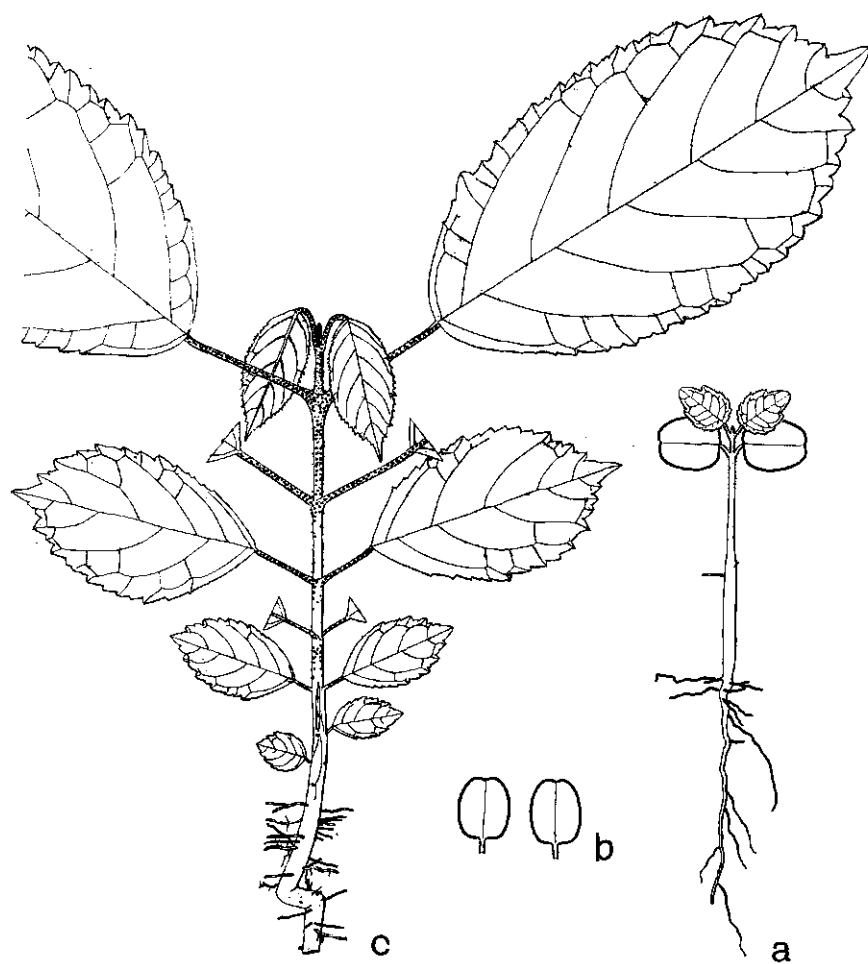


Fig. 149. *Premna tomentosa* a. young seedling, $1/1\times$; b. cotyledons, $1/1\times$; c. older seedling, $1/2\times$

***Stachytarpheta jamaicensis* (L.) VAHL**

B. II: 598

Sund.: djarong lalaki. *Jav.*: gadjihan

Fig. 150

Size at 1st stage (1st pair of leaves only) up to 15 cm, 2 cm above collet; at 2nd stage (± 6 pairs of leaves) ± 20 cm above collet. *Roots* white turning off white; primary root at 1st stage collet not thickened, or abruptly thickened into disk-shape. *Hypocotyl*



Fig. 150. *Stachytarpheta jamaicensis* a. young seedling, 1/1 \times ; b. cotyledons, 1/1 \times ; c. older seedling, 1/2 \times .

epigeous, erect, straight, $\pm 1\frac{1}{2}$ cm; at 1st stage sometimes having a base abruptly thickened into disk-shape, $\pm \frac{3}{4}$ mm thick, bluish black, lower parts white, simple colourless hairs near top. *Cotyledons* epigeous, 2, equal, petiolate; petiole 1 mm, breadth > thickness, green, hairy like hypocotyl; blade ovate, up to 5 by 3 mm, thin, having an obtuse or acute top and a rounded base narrowed into petiole, pinninerved, entire, dull green, near base hairy like hypocotyl. *Epicotyl* ± 5 mm. *Stem* erect, straight; at 2nd stage 4-angular, with simple patent colourless hairs. *Phyllotaxy* decussate. *Leaves* exstipulate, simple, petiolate; petiole green, hairy like stem; blade thin, having an acute top and an acuminate decurrent base, pinninerved, prominently nerved beneath, coarsely serrate, dull green above, dull light green beneath, both surfaces hairy like stem. *1st Pair of leaves* petiole ± 4 mm, breadth > thickness; blade elliptic or ovate, with index $1\frac{1}{2}$, ± 10 by 7 mm. *Highest leaves* (2nd stage) petiole ± 3 cm, winged; blade ovate, with index $1\frac{1}{2}$ (excluded the very long-decurrent base), ± 8 by 6 cm. *Top of plant* hairy, green.

Seeds from 1 motherplant.

TECTONA L. f.

B. II: 595, 601; K. et V. VII: 164; TROUP II: 697

Tectona grandis L. f.

B. II: 601; K. et V. VII: 165; TROUP II: 697, fig. 270; TEN OEVER: 63, fig. 3-9; WIND: 397, fig. 2

Jav.: djati. *Names of young plants*: *Sund.*: dodolan, *Jav.*: deleg

Fig. 151

Size at 1st stage (1st pair of leaves only) 8-20 cm, 2-5 $\frac{1}{2}$ cm above collet, often still connected with remains of seed; at 2nd stage (6-9 pairs of leaves) 20-50 cm above collet. *Roots* off white turning dirty yellow; primary root at 1st stage moderately to very flexuous, moderately thicker than lateral ones; collet abruptly thickened at one side; at 2nd stage much thickened under the collet; lateral roots at 1st stage few to moderate in number, moderately to very flexuous, sparsely to moderately branched. *Hypocotyl* epigeous, erect, straight, sometimes curved near base, $1\frac{1}{2}$ -4 $\frac{1}{2}$ cm; at 1st stage $1\frac{1}{2}$ -3 $\frac{1}{2}$ mm thick, laterally compressed near top, terete near base, smooth, white or pink, pale green at top, with small orbicular red glands and simple colourless hairs. *Cotyledons* epigeous, 2, equal, petiolate; petiole 3-6 mm, breadth > thickness, slightly channelled, light green, glandular and hairy like hypocotyl; blade elliptic or ovate, slightly vaulted or outstretched, with index $1-1\frac{1}{4}$, 10-17 by 8-14 mm, thick-coriaceous (TROUP: fleshy), having a notched or emarginate top and a slightly exsculptate base narrowed into petiole (TROUP: cordate or truncate), indistinctly palmately 5-nerved but a distinct slightly sunk midrib above, entire, rarely slightly lobed, glandular and hairy like hypocotyl. *Epicotyl* erect, straight, $\frac{1}{4}$ -2 $\frac{1}{2}$ cm; at 1st stage

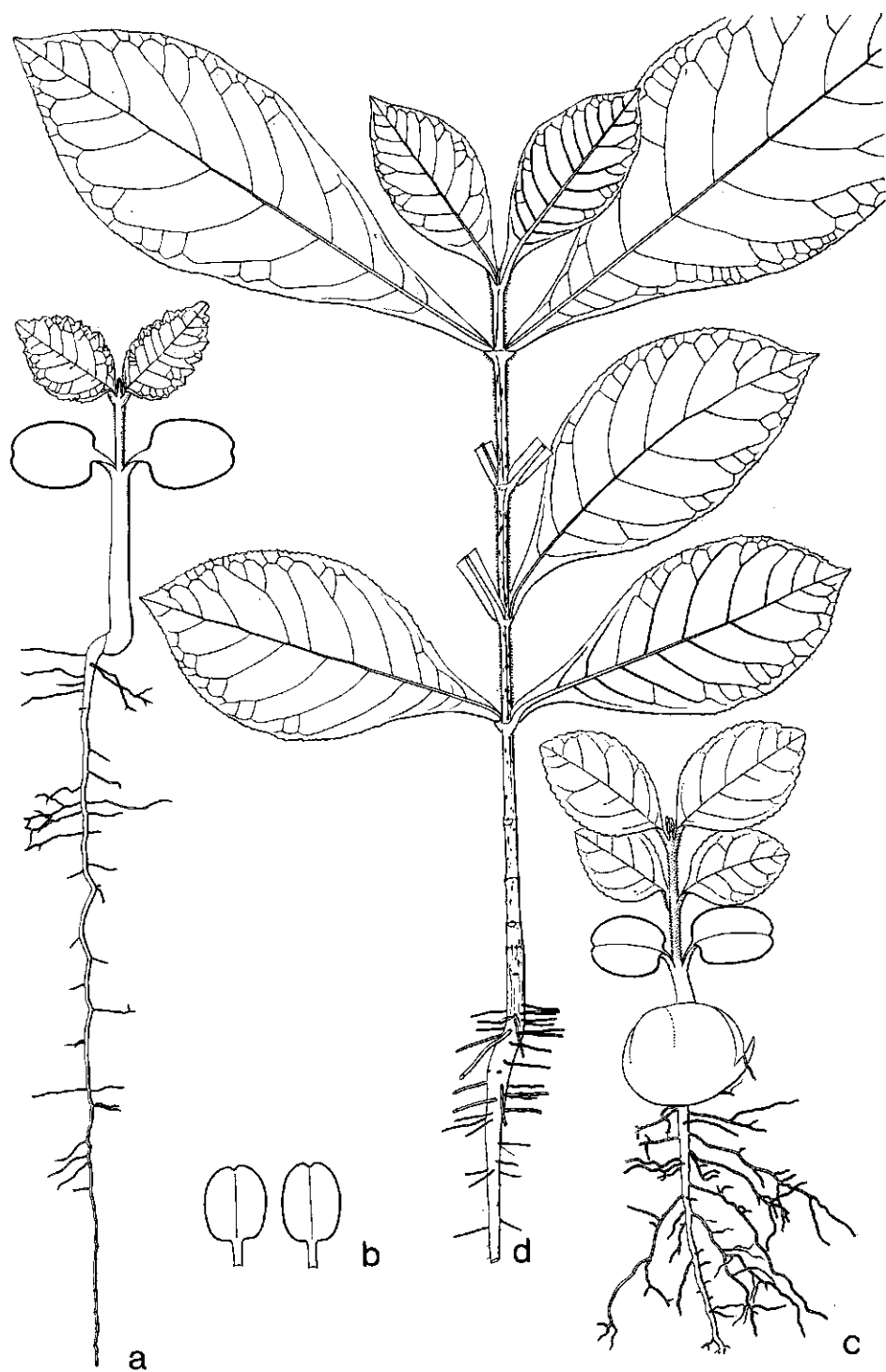


Fig. 151. *Tectona grandis* a. young seedling, 1/1 ×; b. cotyledons, 1/1 ×; c. seedling with developed 1st leaf, 1/1 ×; d. older seedling, 1/4 ×.

terete, smooth, glandular and hairy like hypocotyl. *Stem* erect, straight; at 2nd stage obtusely 4-angular near top, lengthwise grooved, terete below, green, with numerous small orbicular red glands, coarse simple branched and unbranched patent colourless hairs. *Phyllotaxy* decussate. *Leaves* exstipulate, simple, lowest leaves sessile or very shortly petiolate, succeeding ones petiolate; blade thin, thick-coarse to touch owing to hairiness, pinninerved, crenate or dentate or serrate (TROUP: serrate or crenate), higher leaves sometimes almost entire; dull green on both surfaces, glandular and hairy like stem especially beneath. *1st Pair of leaves* blade ovate or elliptic or obovate, with index 1-2, $1\frac{1}{2}$ - $3\frac{1}{2}$ by $1-2\frac{1}{4}$ cm, top acute, base acuminate narrowed, nerves prominent beneath. *Highest leaves* (2nd stage) petiole much varying in size, flattened above, convex beneath, green, glandular and hairy like stem; blade obovate-oblong, index 2-3, top shortly acuminate acute or obtuse, base long-acuminate acute or rounded, nerves slightly prominent above and considerably so beneath (TROUP: depressed on upper surface), yellowish green (TROUP: hispid above). *Top of plant* glandular and hairy like stem; young leaves green or red; the red colour of young leaves not caused by glands but by red cell-sap in the epiderm (CH. COSTER).

Seeds from 5 motherplants from different localities.

VITEX L.

B. II: 595, 604; K. et V. VII: 198; LUBB. II: 372; TROUP II: 776

Cotyledons epigeous, 2, equal, rarely asymmetrical and one another's mirror image, petiolate: blade elliptic or ovate, coriaceous or thin-coriaceous, top often emarginate. *Phyllotaxy* decussate. *Leaves* exstipulate; lowest ones simple, petiolate, followed by palmately compound ones: successively 1-, 2-, 3-, sometimes 4- and 5-foliolate leaves.

1. A. Cotyledons and (or) 1st pair of leaves present 2
 - B. Higher leaves (2nd stage, with the 1st 5-foliolate ones) present 4
2. a. cot. blade >16 mm long, glabrous; 1st pair of leaves blade oblong, petiole channelled, unwinged *V. glabrata*
 - b. cot. blade <15 mm long, hairy on both surfaces; 1st pair of leaves blade ovate-cordiform or ovate-oblong, petiole not channelled, whether or not winged 3
3. a. cot. blade index slightly >1; 1st pair of leaves petiole unwinged, blade base cordate *V. quinata*
 - b. cot. blade index $1\frac{1}{2}$ -2; 1st pair of leaves: petiole winged, blade base acuminate decurrent *V. pubescens*
4. a. stem 4-winged near top *V. quinata*
 - b. otherwise 5

5. a. terminal leaflet widest far above $\frac{1}{2}$ length *V. glabrata*
 b. terminal leaflet widest at or slightly above $\frac{1}{2}$ length *V. pubescens*

***Vitex glabrata* R. Br.**

B. II: 605; K. et V. VII: 208; TROUP II: 777

Sund.: bigbul. *Jav.*: gentileng, ketileng, laban ketileng, tileng

Fig. 152

Size at 1st stage (1st pair of leaves only) 11–37 cm, 5–8 cm above collet, usually still connected with remains of seed; at 2nd stage (8–21 pairs of leaves) 15–62 cm above collet. *Roots* permanently off white; primary root at 1st stage very flexuous, moderately thicker than lateral ones; collet much thickened at one side; lateral roots at 1st stage moderate in number, very flexuous, sparsely branched. *Hypocotyl* epigeous, erect, straight, $3\frac{1}{2}$ –5 cm; at 1st stage $1\frac{1}{2}$ –2 mm thick, tapering upwards, terete, smooth, green or purple, base white, with simple short patent colourless hairs. *Cotyledons* epigeous, 2, equal, petiolate; petiole 3–5 mm, flattened above, convex beneath, green or purple, hairy like hypocotyl; blade elliptic, with index $1\frac{1}{2}$ –2, 17–25 by 10–14 mm, coriaceous, having an emarginate top and a rounded base narrowed into petiole, indistinctly nerved, entire, dull green, glabrous. *Epicotyl* 1–2½ cm, with simple colourless hairs. *Stem* erect, straight; at 2nd stage terete, laterally compressed below nodes, green near top, brown below, with simple very short colourless hairs. *Phyllotaxy* decussate. *Leaves* exstipulate; lowest ones simple, followed by 1-foliolate ones, then by 2-foliolate leaves, \pm 8th pair and some higher ones 3-foliolate, \pm 14th and higher pairs palmately 5-foliolate. *1st Pair of leaves* petiole $\frac{3}{4}$ cm, channelled, green or purple, with simple very short curved colourless hairs; blade oblong, with index 2–3, 3 – $3\frac{1}{2}$ by 1–2 cm, thin, having an acuminate acute top and an acute base, pinninerved and nerves sunk above but prominent beneath, coarsely serrate, dull green above, dull greyish green beneath, ciliate, on midrib beneath hairy like stem. *5-Foliolate leaves* rachis up to 10 cm, up to 3 mm thick, thickened at base, slightly flattened above, convex beneath, green, often dark bluish purple above, hairy like stem; leaflets petiolulate; petiolules 3–15 mm, in terminal leaflet longest, green or bluish purple, hairy like stem; blades usually oblong in highest lateral leaflets, obovate-oblong in terminal one, with index $2\frac{1}{2}$, up to 15 by 6 cm, in terminal leaflet largest, thin, having an acuminate acute top and an acute taperpointed sometimes cuneate base, pinninerved and nerves sunk above but prominent beneath, crenate or serrate, green, slightly glossy above dull beneath, ciliate, on nerves beneath hairs like those on stem. *Top of plant* hairy.

Seeds from 1 motherplant.

N.B. Only 3 specimens reached the 2nd stage, only one possessing 5-foliolate leaves.

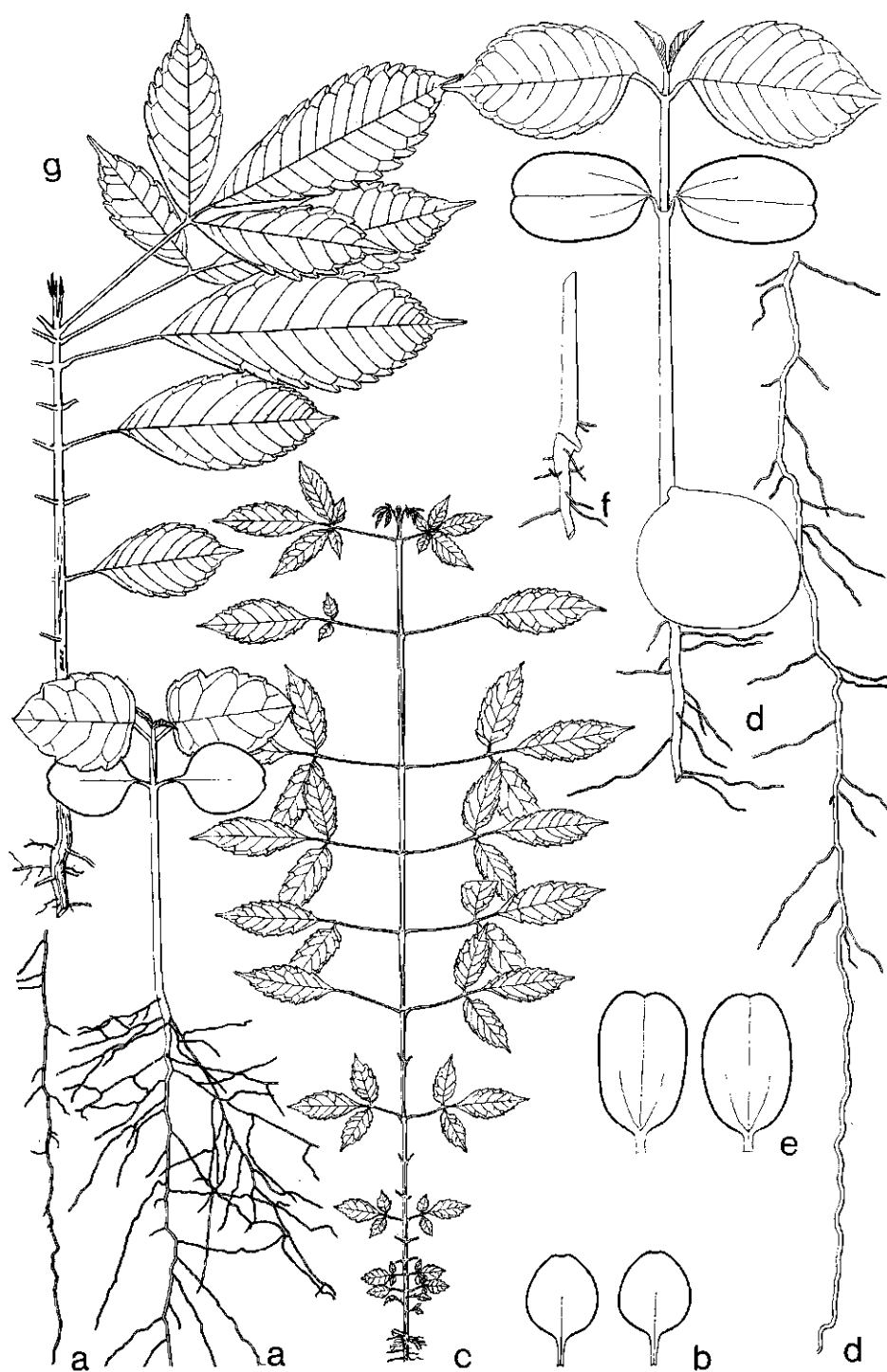


Fig. 152. *Vitex quinata* a. young seedling, $1/1 \times$; b. cotyledons, $1/1 \times$; c. older seedling, $1/8 \times$. *Vitex glabrata* d. young seedling, $1/1 \times$; e. cotyledons, $1/1 \times$; f. collet, $1/1 \times$; g. older seedling, $1/2 \times$.

Vitex pubescens VAHL (*V. latifolia* Auct. non MILL.)

B. II: 606; K. et V. VII: 202; TROUP II: 776

Mal.: alaban (*S.W.C.*), halaban, haniban (*Lamp.*), laban, leban, maneh (*Atjeh*), meban. *Djak.*: aloban. *Sund.*: hejas, ki arak, laban. *Jav.*: laban, 1. ketileng, 1. sungu.

Mad.: labhan

Fig. 153

Size at 1st stage (1st pair of leaves only) 6–15 cm, 2–4 cm above collet, usually still connected with remains of seed; at 2nd stage (\pm 13–15 pairs of leaves) 55–111 cm above collet. *Roots* off white or dirty yellow turning grey; primary root at 1st stage very flexuous, slightly thicker than lateral ones; collet abruptly or gradually and slightly thickened; lateral roots very numerous, very flexuous, moderately branched. *Hypocotyl* epigeous, erect, straight, sometimes curved at base, $1\frac{1}{2}$ – $3\frac{1}{2}$ cm; at 1st stage $1\frac{1}{2}$ mm thick, tapering upwards, terete, smooth, or with very fine lengthwise shallow furrows, purplish red near top, white or yellowish white below, with simple colourless hairs. *Cotyledons* epigeous, 2, equal, rarely asymmetrical and one another's mirror image, petiolate; petiole 2–4 mm, breadth > thickness, green, hairy like hypocotyl; blade elliptic or ovate, with index $1\frac{1}{2}$ –2, $6\frac{1}{2}$ –14 by 4–10 mm, thin-coriaceous, having a rounded obtuse or emarginate or notched top and a rounded base narrowed into petiole, indistinctly nerved, entire, both surfaces dull green, simple patent hairs on both surfaces. *Epicotyl* 4–12 mm, with simple colourless hairs. *Stem* erect, straight; at 2nd stage 4-angular near top, terete below, hairy like epicotyl, with numerous lengthwise elliptic yellowish red lenticels and sometimes small orbicular yellow glands. *Phyllotaxy* decussate. *Leaves* exstipulate; lowest pairs simple, followed by 1-foliolate ones possessing a winged rachis, then by 2-foliolate leaves, \pm 11th or 13th and higher ones 3-foliolate, succeeding ones 4- and 5-foliolate, sometimes with small yellow orbicular glands. *1st Pair of leaves* shortly petiolate; petiole 3 mm, winged, green, hairy like epicotyl; blade ovate-oblong, with index 2– $2\frac{1}{2}$, 12–35 by 5–15 mm, thin, having an acute top and an acuminate decurrent base, pinninerved, prominently nerved beneath, coarsely serrate, slightly glossy or dull green above, dull light green beneath, hairy like epicotyl especially on nerves, sometimes glandular. *3-Foliolate leaves* rachis up to $10\frac{1}{2}$ cm, $1\frac{1}{2}$ mm thick, thickened at base, flattened above, convex beneath, slightly 2-winged, green, hairy like epicotyl; leaflets shortly petiolulate; petiolules 1–3 mm; blades lanceolate sometimes obovate-lanceolate, in lateral leaflets smallest, with index 3– $3\frac{1}{2}$, up to 19 by 7 cm, thin, having an acuminate acute top and an acuminate or taperpointed acute or rounded base, pinninerved, on both surfaces prominently nerved, coarsely serrate near top, sometimes undulate, sometimes coarsely dentate or irregularly lobed, sometimes entire, on both surfaces dull green, hairy especially on nerves like epicotyl. *Top of plant* hairy, green or red.

Seeds from 3 motherplants from different localities.

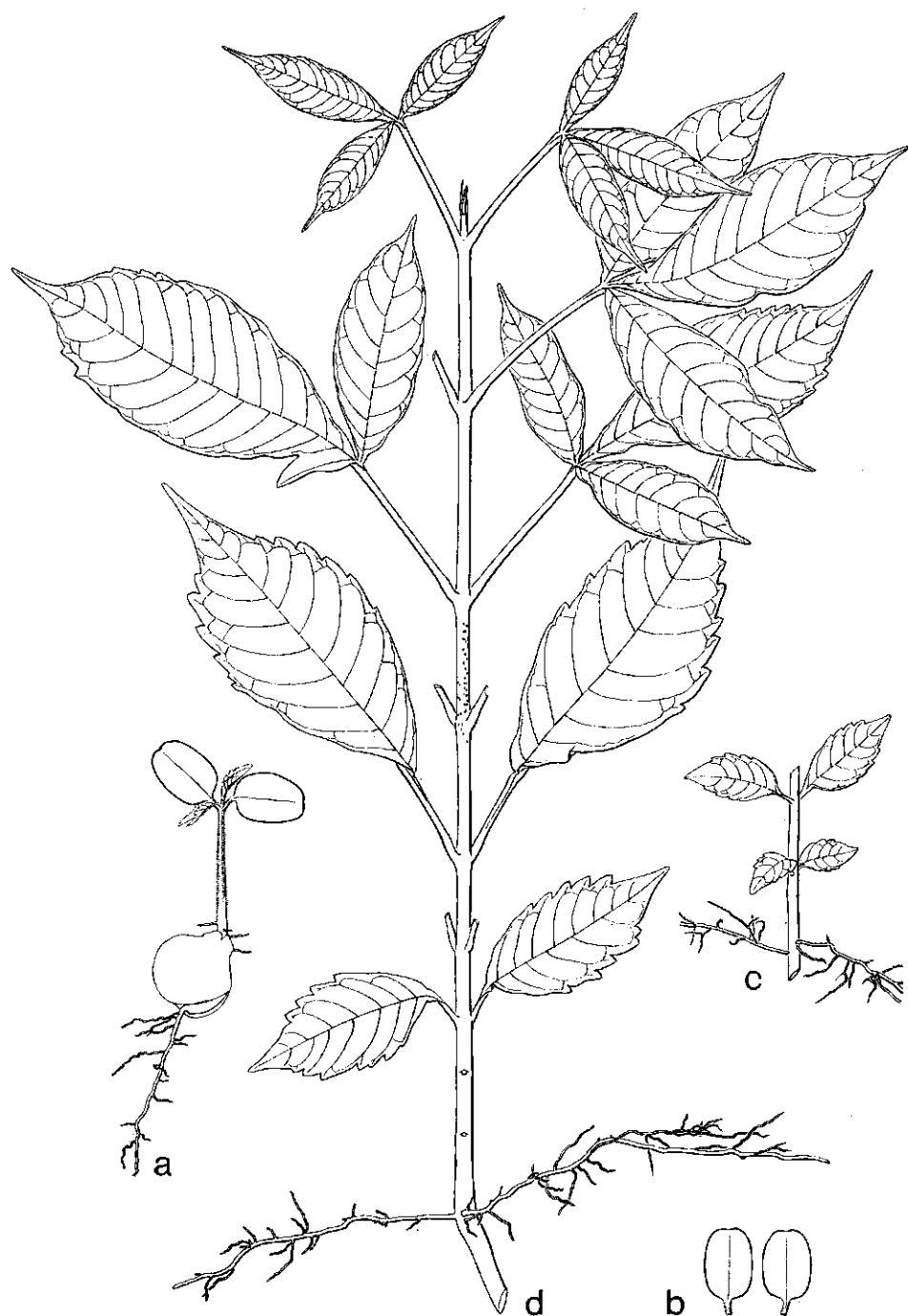


Fig. 153. *Vitex pubescens* a. young seedling, $1/1\times$; b. cotyledons, $1/1\times$; c. seedling with developed 1st leaf, $1/2\times$; d. older seedling, $1/4\times$.

Vitex quinata (LOUR.) F.N. WILL (*V. heterophylla* ROXB., *V. sumatrana* MIQ., *V. velutina* K. et V.)

B. II: 606; K. et V. VII: 204

Mal.: leban bunga (?). *Sund.*: ki bangbara, laban. *Jav.*: kaju semut, ketileng, kutileng, laban ketileng, laban kuning, laban semut, tileng

Fig. 152

Size at 1st stage (1st pair of leaves only) 7–36 cm, 2½–5 cm above collet, often still connected with remains of seed; at 2nd stage (\pm 17–21 pairs of leaves) 77–107 cm above collet. *Roots* off white turning dirty grey; primary root at 1st stage very flexuous, slightly thicker than lateral ones; collet gradually and slightly or not thickened; lateral roots at 1st stage very numerous, very flexuous, moderately branched. *Hypocotyl* epigeous, erect, straight, 2–3½ cm; at 1st stage 1½ mm thick, terete, smooth, green, base white, with dense simple short patent colourless hairs. *Cotyledons* epigeous, 2, equal, or slightly asymmetrical and one another's mirror image, petiolate; petiole 2–4 mm, breadth > thickness, green, hairy like hypocotyl; blade ovate or elliptic, with index slightly > 1, 9–13 by 7–12 mm, coriaceous, having an obtuse or emarginate top and a rounded narrowed base, pinninerved, entire, dull dark green above, dull greyish green beneath, hairy on both surfaces like hypocotyl. *Epicotyl* 3–15 mm, with simple hairs. *Stem* erect, straight; at 2nd stage 4-angular and 4-winged near top, terete below, green near top, dirty grey below, with simple patent very short colourless hairs and numerous small orbicular yellowish green glands; nodes slightly and annulately thickened, reddish brown. *Phyllotaxy* decussate. *Leaves* exstipulate; lowest ones simple, followed successively by: sometimes some 2-foliolate leaves, numerous 3-foliolate ones and sometimes some 4-foliolate ones, finally 14th or 16th and higher leaves 4-foliolate. *1st Pair of leaves* petiole 3–6 mm, ½ mm thick, flattened above, convex beneath, hairy like stem; blade ovate-cordiform, with index 1½–1½, 1–2 cm by 13–16 mm, thin, having an acute top and a cordate base, pinninerved, prominently nerved beneath, coarsely serrate, slightly glossy light green above, dull light green beneath, ciliate, both surfaces hairy like stem. *5-Foliolate leaves* rachis up to 11½ cm, up to \pm 3 mm thick, thickened at base, flattened above, convex beneath, green, hairy and glandular like stem; leaflets petiolulate; petioles 2–35 mm, slightly channelled, \pm 1–1½ mm thick, green, hairy and glandular like stem, in terminal leaflet longest, in highest lateral leaflets shortest; blades in lateral leaflets ovate-oblong, in terminal ones oblong and largest, with index 2–3, up to 16½ by 5 cm, thin, having an acuminate acute top and a rounded or acute or asymmetrically rounded base, pinninerved, prominently nerved beneath, coarsely serrate, green, glossy above, dull beneath, on both surfaces hairs and glands like those on stem but very sparse above. *Top of plant* hairy and glandular like stem, green or brownish red.

Seeds from 2 motherplants from different localities.

VITACEAEB. II: 86; K. et V. IX: 1, *Ampelidaceae*; LUBB. I: 347, *Ampelidaceae***LEEAL.**

B. II: 86, 93; K. et V. IX: 2

Cotyledons epigeous, 2, equal, petiolate, foliaceous, glabrous. *Stem* thickened above nodes. *Phyllotaxy* spiral. *Leaves* stipulate, thin; lowest leaves simple; highest leaves (2nd stage) imperfectly impari-bipinnate; stipules amplexicaul, adnate to petiole, leaving an annulate scar on stem; blades serrate or crenate. *Highest leaves* (2nd stage) with 2 or 3 pairs of opposite leaflets 1st order.

1. a. hypocotyl 4-angular; cotyledons entire; stem terete; 1st leaf petiole sparsely hairy, blade serrate; imperfectly impari-bipinnate leaves: blades slightly crispate, dull *L. aequata*
- b. hypocotyl 4-angular near top, lower part terete; cotyledons entire or slightly crenate; stem terete or multangular; 1st leaf petiole glabrous, blade crenate; imperfectly impari-bipinnate leaves: blades flat, slightly glossy . *L. sambucina*

N.B. It is difficult to distinguish one of these two species from the other.

***Leea aequata* L.**

B. II: 94; K. et V. IX: 4

Mal.: kaju ajer perampuan (*Mol.*). *Sund.*: ginggijang, sulangkar. *Jav.*: girang, g. djambut, girangan, lengki. *Mad.*: mali-mali. *Alf. Buru.*: uka. *Ternate*: kolotada (?)
Fig. 154

Size at 1st stage (1st leaf only) $3\frac{1}{2}$ – $6\frac{1}{2}$ cm above collet; at 2nd stage (± 11 –13 leaves) 80–132 cm above collet. *Roots* off white turning brownish yellow; (in the inspected specimens the tip had died); collet at 1st stage gradually much thickened. *Hypocotyl* epigeous, erect, straight, 2–5 mm; at 1st stage 1– $1\frac{1}{2}$ mm thick, 4-angular, pale green, glabrous. *Cotyledons* epigeous, 2, equal, petiolate; petiole 4–5 mm, slightly channelled, pale green, glabrous; blade ovate, with index $1-1\frac{1}{3}$, 13–16 by 10–16 mm, thin, having a rounded obtuse top and a rounded base narrowed into petiole but sometimes exculptate, palmately 5-nerved, prominently nerved beneath, entire, on both surfaces dull green, glabrous. *Epicotyl* 0–2 mm. *Stem* at 2nd stage erect, sometimes partly not quite erect, usually curved, terete, smooth, thickened above nodes, green, with small remote orbicular yellow scales. *Phyllotaxy* spiral. *Leaves* stipulate, thin, lowest leaves simple, next ones imparipinnate with 1 pair of leaflets, succeeding ones 2 pairs, ± 9 th or 11th and higher ones imperfectly impari-bipinnate; stipules amplexicaul, adnate to petiole, first folded together like a crest on the petiole, opening later, leaving annulate scar on stem. *1st Leaf* petiolate; petiole 7–15 mm, pale green, with

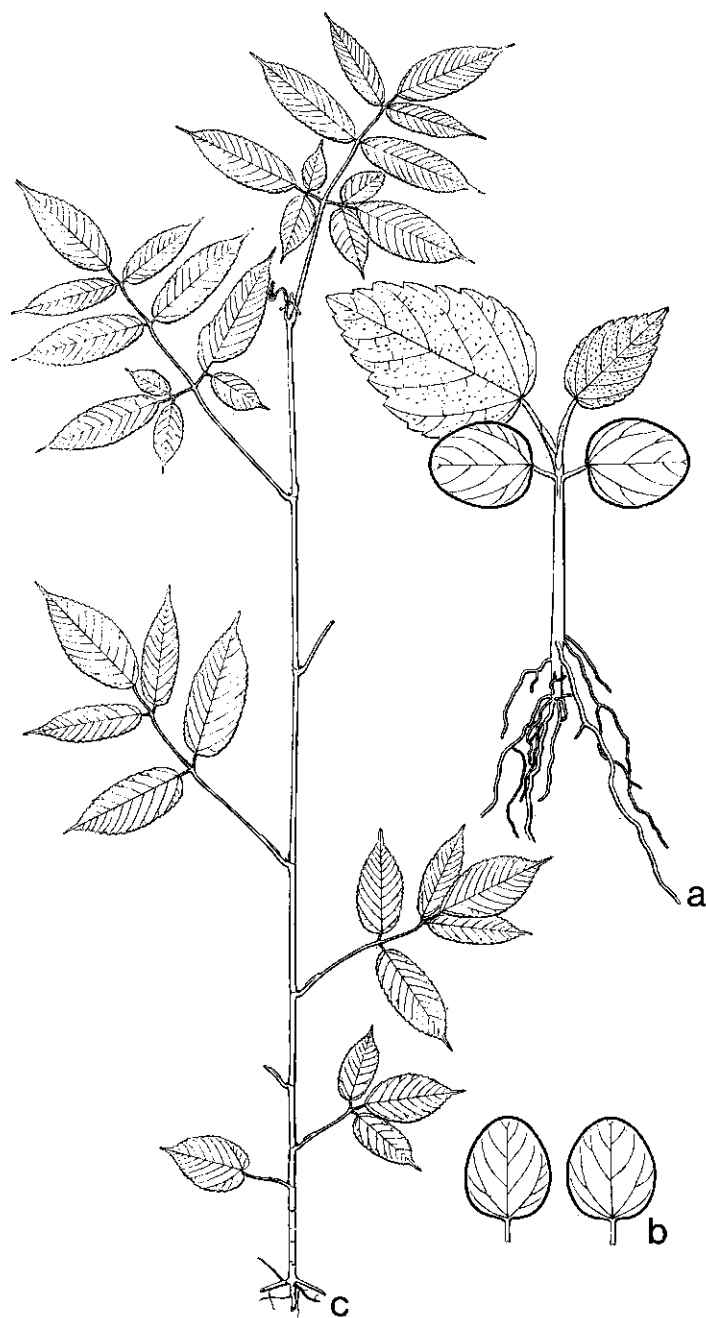


Fig. 154. *Leea aequata* a. young seedling, $1/1\times$; b. cotyledons, $1/1\times$; c. older seedling, $1/8\times$.

sparse simple colourless hairs; blade cordiform, with index $1\frac{1}{2}$ – $1\frac{2}{3}$, 2–3 by $1\frac{1}{2}$ – $2\frac{1}{2}$ cm, thin, thick-coarsely hairy to touch, having an acute top and a rounded or cordate base, palmately 5-nerved to pinninerved, on both surfaces prominently nerved, serrate, on both surfaces dull green and with simple stiff slightly curved hairs, with scales like stem but very soon falling. *Imperfectly impari-bipinnate leaves* 2–3-pinnate; stipules up to 4 mm long; common rachis 21–34 cm, angular, thickened at base and at insertions of pinnae, green, with unequally long simple patent colourless hairs; scaly like stem; with opposite pinnae, in lowest pair impari-bipinnate and 1 pair of leaflets 2nd order, in higher pairs no leaflets 2nd order; rachis 2nd order 2–5 cm, other characters like those of common one; petiolules $\pm\frac{1}{2}$ – $1\frac{1}{2}$ cm, green, hairy and scaly like rachis; blades ovate or oblong to lanceolate, with index 2–4, 5–12 by 2–8 cm, hispid, having an acuminate acute top and a rounded base, pinninerved, prominently nerved on both surfaces, serrate, slightly crispate, on both surfaces dull green and hairy like rachis, with numerous scales beneath like those on stem but colourless turning yellow. *Top of plant* hairy, green, scaly.

Seeds from 3 motherplants from different localities.

***Leea sambucina* (L.) WILLD.** ('often called *L. indica* (BURM. f.) MERR, but it is not sure that the name *Staphylea indica* BURM. f., Fl. Indica (1768) really refers to this species' after B. II: 94)

B. II: 94; K. et V. IX: 8

Mal.: mali-mali hantu (*Palemb.*), pohon tuwa, sengarengan (*Djak.*). *Sund.*: gingijang, ki tuwa, silangkar, sulangkar. *Jav.*: girang, kaju tuwa, tirah. *Mad.*: ghirang

Fig. 155

Size at 1st stage (1st leaf only) ± 20 cm, $3\frac{1}{2}$ –8 cm above collet; at 2nd stage (9–12 leaves) 61–80 cm above collet. *Roots* off white turning dirty yellow; primary root at 1st stage often dead, very flexuous, slightly thicker than lateral ones; collet gradually or abruptly and moderately thickened; lateral roots at 1st stage moderate in number, often taking the place of the primary root, very flexuous, moderately branched. *Hypocotyl* epigeous, erect, straight, $3\frac{1}{2}$ –7 cm sometimes (if the seed lies deep) up to 10 cm; at 1st stage $1\frac{1}{2}$ mm thick, 4-angular near top, terete in lower part, pale green, glabrous. *Cotyledons* epigeous, 2, equal, petiolate; petiole 3–5 mm, 1 mm thick, breadth > thickness, pale green, glabrous; blade ovate, with index 1– $1\frac{1}{2}$, 1–2 cm by 8–16 mm, thin, having an obtuse top and a rounded base narrowed into petiole but sometimes slightly exculptate, palmately 5-nerved and central nerve thickest, prominently nerved beneath, entire, or slightly crenate, on both surfaces dull green, glabrous. *Epicotyl* very short. *Stem* at 2nd stage erect or almost so, usually curved, terete or multangular, thickened above nodes, green, often red at nodes, with small orbicular black or yellow lenticels, glabrous. *Phyllotaxy* spiral. *Leaves* stipulate, thin, lowest leaves simple, next ones 1-foliolulate, succeeding ones imparipinnate possessing 1 pair of leaflets, then ones with 2 pairs, and highest ones (2nd stage) imperfectly impari-

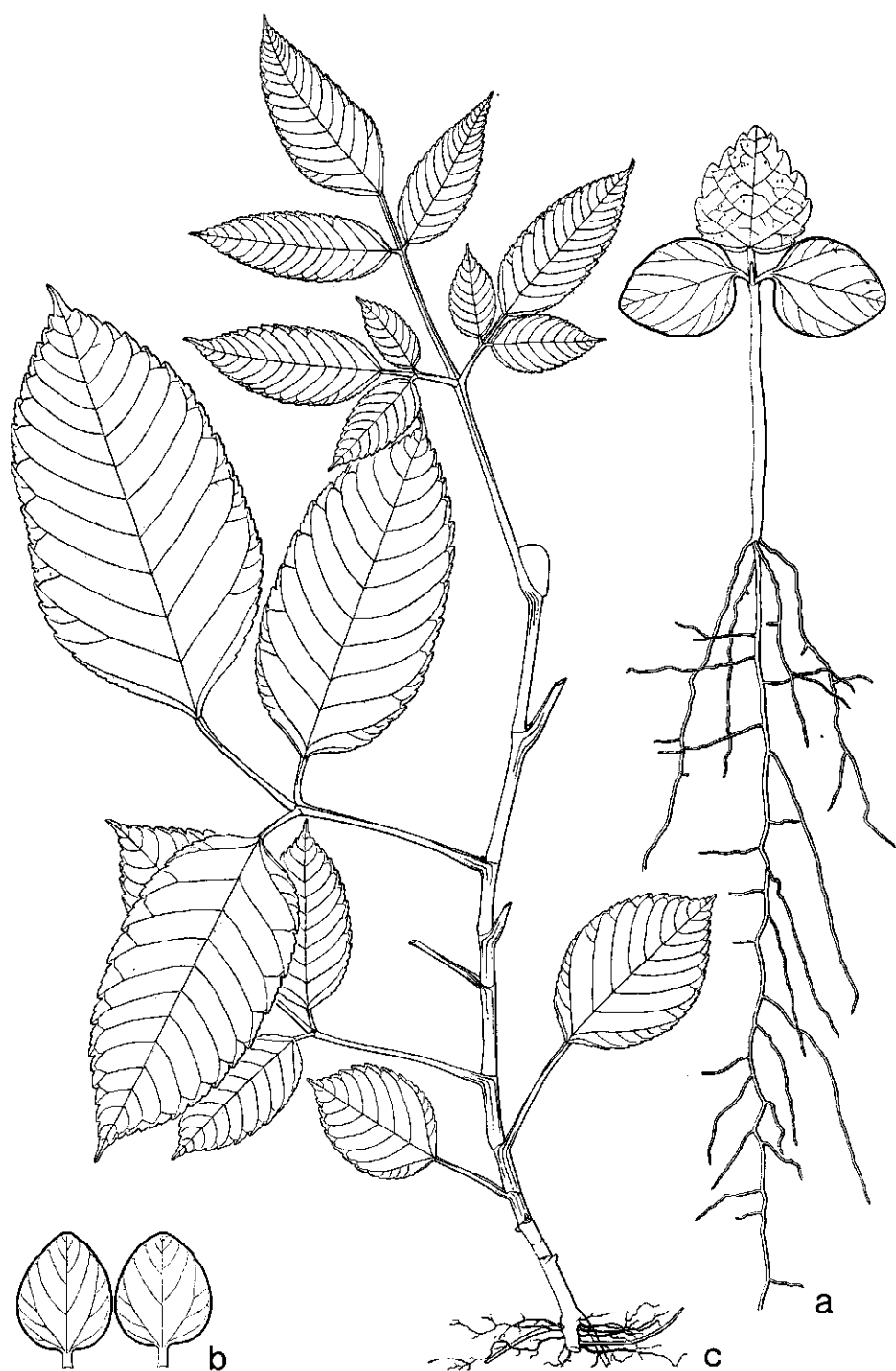


Fig. 155. *Leea sambucina* a. young seedling, $1/1\times$; b. cotyledons, $1/1\times$; c. older seedling, $1/4\times$.

bipinnate; stipules amplexicaul, adnate to petiole, folded together like a crest on the petiole, opening later, leaving annulate scar on stem. *1st Leaf* simple, petiolate; petiole $\pm 1\frac{1}{4}$ cm, 1 mm thick, 5-angular, having a channelled base, green, glabrous; blade ovate, with index ± 1 , 13–22 by 12–22 mm, having an obtuse top and an acute or rounded base, palmately 5-nerved and central nerve thickest, prominently nerved slightly above and considerably beneath, crenate, on both surfaces dull green, on upper surface coarse simple patent colourless hairs. *Imperfectly impari-bipinnate leaves*, 2 pairs of pinnae; common rachis thickened at base, green, glabrous, linear glands near base beneath and near insertions of pinnae; pinnae opposite, lowest pair imparipinnate with 1 pair 2nd order, in higher pairs no leaflets 2nd order; petiolules glabrous or with simple patent colourless hairs; blades ovate or elliptic to oblong, having an acuminate acute top and an acute or rounded base, pinninerved, prominently nerved on both surfaces, irregularly (sometimes doubly) crenate or serrate, on both surfaces slightly glossy green, sparsely hairy like petiolule, on very young leaves numerous fugacious colourless small globular glands and sparse small orbicular yellow scales. *Top of plant* covered with stipules.

Seeds from 2 motherplants from different localities.

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