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Flora of Sakaerat part one

RESEARCH CORPORATION OF THAILAND

in collaboration with

DEPARTMENT OF METEOROLOGY, OFFICE OF THE PRIME MINISTER  
NATIONAL STATISTICAL OFFICE, OFFICE OF THE PRIME MINISTER  
ROYAL FOREST DEPARTMENT, MINISTRY OF AGRICULTURE  
DEPARTMENT OF RICE, MINISTRY OF AGRICULTURE  
DEPARTMENT OF LAND DEVELOPMENT, MINISTRY OF NATIONAL DEVELOPMENT  
DEPARTMENT OF MINERAL RESOURCES, MINISTRY OF NATIONAL DEVELOPMENT  
CHULALONGKORN UNIVERSITY  
KASETSART UNIVERSITY  
MILITARY RESEARCH AND DEVELOPMENT CENTER, MINISTRY OF DEFENCE  
SEATO MEDICAL RESEARCH LABORATORY

COOPERATIVE RESEARCH PROGRAMME NO. 27  
TROPICAL ENVIRONMENTAL DATA (TREND)  
ECOSYSTEM STUDY OF TROPICAL DRY-EVERGREEN FOREST

RESEARCH PROJECT NO. 27/1  
DESCRIPTION OF TROPICAL DRY-EVERGREEN FOREST ECOSYSTEM

REPORT NO. 18  
FLORA OF SAKAERAT PART ONE

BY

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THAWATCHAI SANTISUK  
SALLY REYNOLDS

ASRCT, BANGKOK 1974

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## F O R E W O R D

This report has been prepared as a contribution to ASRCT Cooperative Research Programme No. 27: Tropical Environmental Data (TREND)—Ecosystem study of tropical dry-evergreen forest. It is a continuation of Report No. 3 on Research Project No. 27/1. The research was originally conducted pursuant to ARPA Order 917 under the management of the Earth Sciences Laboratory, U.S. Army Natick Laboratories (NLABS), Natick, Massachusetts, U.S.A. After expiration of the contract at the end of 1970, the research programme has been discontinued.

The report has been delayed in publication over a long period of time due to technical difficulties.

The Flora of Sakaerat Part One is not by far and large to be deemed as completion, future collections may turn up species overlooked. It is to be hoped that subsequent parts will be currently issued, when the whole collection has been studied.

## FLORA OF SAKAERAT PART ONE

By Tem Smitinand\*, Chamlong Phengkhlai\*, Chumsri Chaiyanand\*,  
Leena Phuphatanapong\*, Thawatchai Santicuk\*, and Sally Reynolds†

### SUMMARY

The first part of Flora of Sakaerat contains 22 families of vascular plants and is roughly 23.5% of the collection acquired during 1967-1970; there is no novelty.

A short description of the vegetation of Sakaerat is given together with ecological factors.

### INTRODUCTION

The botanical survey of Sakaerat and adjacent areas is one of many projects covered by TREND. This project is under the Tropical Forest Ecosystem to acquire basic data on the structural composition of species, with reference to their ecological and economical aspects and their phenological behaviour.

The vegetal study undertaken is aimed at the preparation of a Flora of Sakaerat, which is fundamental to various microclimatic investigations carried out at the TREND experiment station, namely, Meteorology, Vegetation Inventory, Biomass, Bacteriology, and Zoology.

A collection of herbarium specimens, acquired since the commencement of the project in June 1967, amounting to some 2,000 sheets is the nucleus of this study. Owing to the shortage of competent taxonomists and the lack of full-time botanists, the correct determination was relatively slow, and it is thus not possible to have the work complete within the period allocated.

Due to the above mentioned shortcomings, the systematic sequence has to be discarded, and the publication of the flora depends on available manuscripts. The first part of the Flora is thus containing 22 families of vascular plants. It is hoping that subsequent parts will be currently issued at intervals.

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\* Forest Herbarium, Royal Forest Department.

† Applied Scientific Research Corporation of Thailand.

List of plant families collected at Sakaerat

PHYTOPHYTES

1. Entodontiaceae
2. Fissidentiaceae

FERULIDOPHYTES

3. Adiantaceae
4. Dennstaedtiaceae
5. Polypodiaceae
6. Schizaeaceae
7. Thelypteridaceae

GYMNOSPERMS

8. Cycadaceae
9. Gnetaceae

MONOCOTYLEDONS

10. Araceae
11. Bambusaceae
12. Commelinaceae
13. Cyperaceae
14. Dioscoreaceae
15. Gramineae
16. Liliaceae
17. Marantaceae
18. Orchidaceae
19. Palmae
20. Zingiberaceae

DICOTYLEDONS

21. Acanthaceae
22. Amaranthaceae
23. Ampelidaceae
24. Anacardiaceae
25. Ancistrocladaceae
26. Annonaceae
27. Apocynaceae
28. Asclepiadaceae
29. Begoniaceae
30. Bignoniaceae

31. Burseraceae
32. Cannabinaceae (cultivated)
33. Caesalpiniaceae
34. Capparidaceae
35. Celastraceae
36. Combretaceae
37. Compositae
38. Connaraceae
39. Convolvulaceae
40. Cucurbitaceae
41. Dilleniaceae
42. Dipterocarpaceae
43. Ebenaceae
44. Elaeocarpaceae
45. Euphorbiaceae
46. Fagaceae
47. Flacourtiaceae
48. Guttiferae
49. Hypericaceae
50. Icacinaceae
51. Illicaceae
52. Irvingiaceae
53. Labiatae
54. Lauraceae
55. Leeaceae
56. Loganiaceae
57. Loranthaceae
58. Lythraceae
59. Malpighiaceae
60. Malvaceae
61. Melastomaceae
62. Meliaceae
63. Menispermaceae
64. Mimosaceae
65. Molluginaceae

- |                    |                      |
|--------------------|----------------------|
| 66. Moraceae       | 82. Roxburghiaceae   |
| 67. Myristicaceae  | 83. Rubiaceae        |
| 68. Myrsinaceae    | 84. Rutaceae         |
| 69. Myrtaceae      | 85. Sapindaceae      |
| 70. Nyctaginaceae  | 86. Scrophulariaceae |
| 71. Ochnaceae      | 87. Simaroubaceae    |
| 72. Olacaceae      | 88. Solanaceae       |
| 73. Oleaceae       | 89. Sterculiaceae    |
| 74. Opiliaceae     | 90. Symplocaceae     |
| 75. Papilionaceae  | 91. Theaceae         |
| 76. Passifloraceae | 92. Tiliaceae        |
| 77. Piperaceae     | 93. Ulmaceae         |
| 78. Polygalaceae   | 94. Urticaceae       |
| 79. Rhamnaceae     | 95. Verbenaceae      |
| 80. Rhizophoraceae | 96. Violaceae        |
| 81. Rosaceae       | 97. Vitaceae         |

Families studies

- |                      |                    |
|----------------------|--------------------|
| 1. Acanthaceae       | 12. Icacinaceae    |
| 2. Amaranthaceae     | 13. Irvingiaceae   |
| 3. Anacardiaceae     | 14. Lauraceae      |
| 4. Ancistrocladaceae | 15. Molluginaceae  |
| 5. Annonaceae        | 16. Myristicaceae  |
| 6. Apocynaceae       | 17. Ochnaceae      |
| 7. Asclepiadaceae    | 18. Rhamnaceae     |
| 8. Connaraceae       | 19. Rhizophoraceae |
| 9. Dilleniaceae      | 20. Rosaceae       |
| 10. Ebenaceae        | 21. Simaroubaceae  |
| 11. Gnetaceae        | 22. Theaceae       |

## TOPOGRAPHY

The Sakaerat Experiment Station covers an area of about 80 km<sup>2</sup>, approximately between 14°30' N latitude and 101°55' E longitude shown by the aerial photograph (Figure 1) taken in 1967 by the Royal Thai Survey Department, and the map (Figure 2) with an approximate scale of 1:25,000 blown up from the already mentioned aerial photograph. It lies along the 304<sup>th</sup> Highway (Nakhon Ratchasima—Chachoeng Sao), and is situated on a low sandstone escarpment of an altitude of 250-650 m.a.s.l. with a gentle gradient of 5-40% dipping towards the north-eastern aspect.

## ECOLOGICAL FACTORS

The precipitation of Sakaerat is between 1000-1200 mm with a continuous rainfall during March-October, whereas December-January is the period of minimum rainfall. To give a general idea of the atmospheric nature of the area, tables showing relative humidity, air temperature and rainfalls, collected at the Kasetsart training camp during 1967-1970 are herewith provided.

At the beginning of the hot dry season (January-February) the annual ground fire often cleaned the herbaceous undergrowth and litters (Figure 3). This ground fire was deliberately done by villagers in burning the dried-up Ya phak (Arundinaria pusilla) (Figures 4, 5, 6, 7) to providing new flush of leaves for grazing. The firing was usually done during January-February when litters accumulated and undergrowth dried up, and thus produced an intensive burning, causing the hindrance of growth of deciduous tree species and badly damaging the outlying evergreen species along the perimeter of the dry-evergreen forest. In this way the dry-evergreen forest has been yearly invaded by fire-tolerant species and gradually converted to the dry deciduous forest.



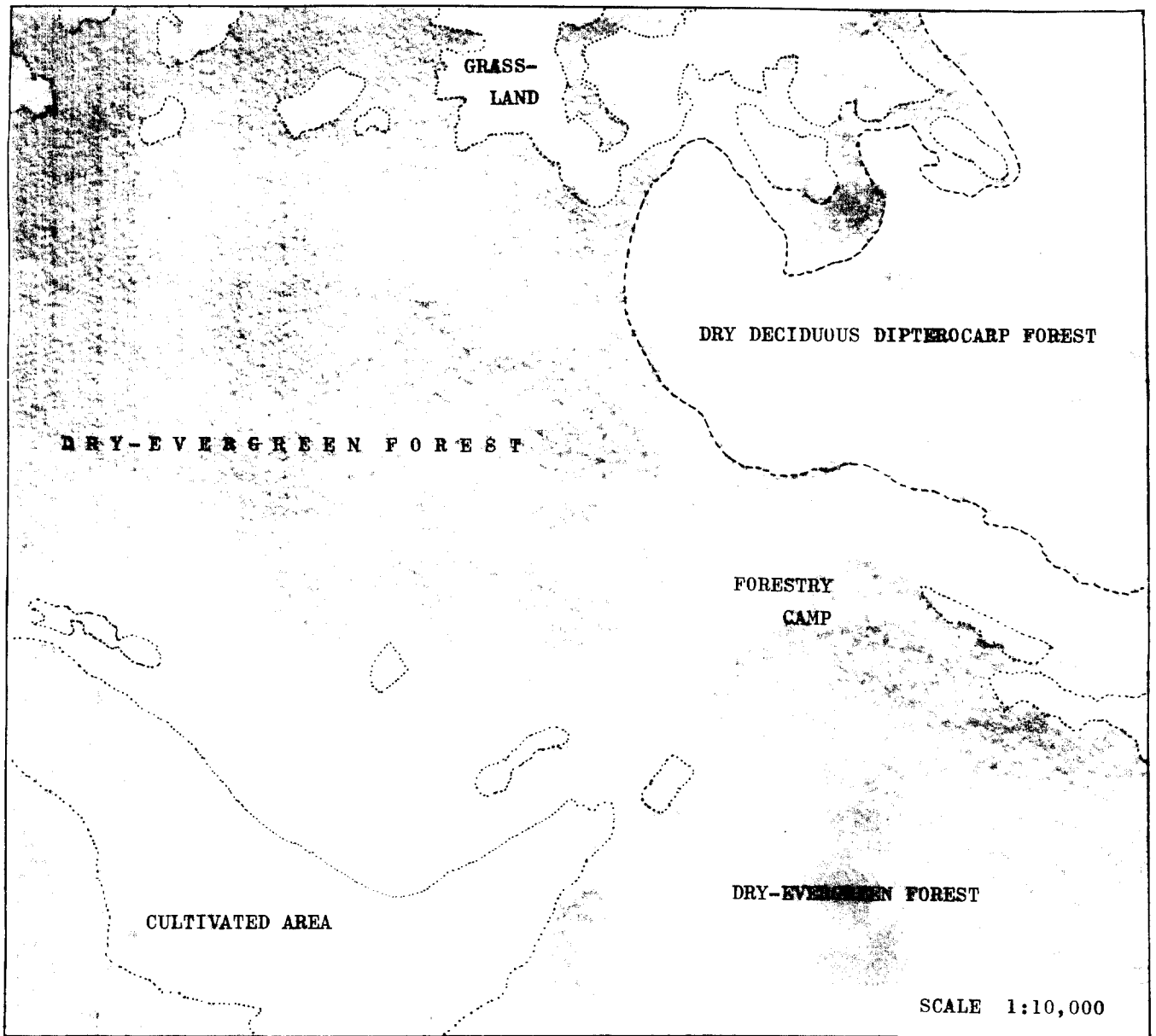
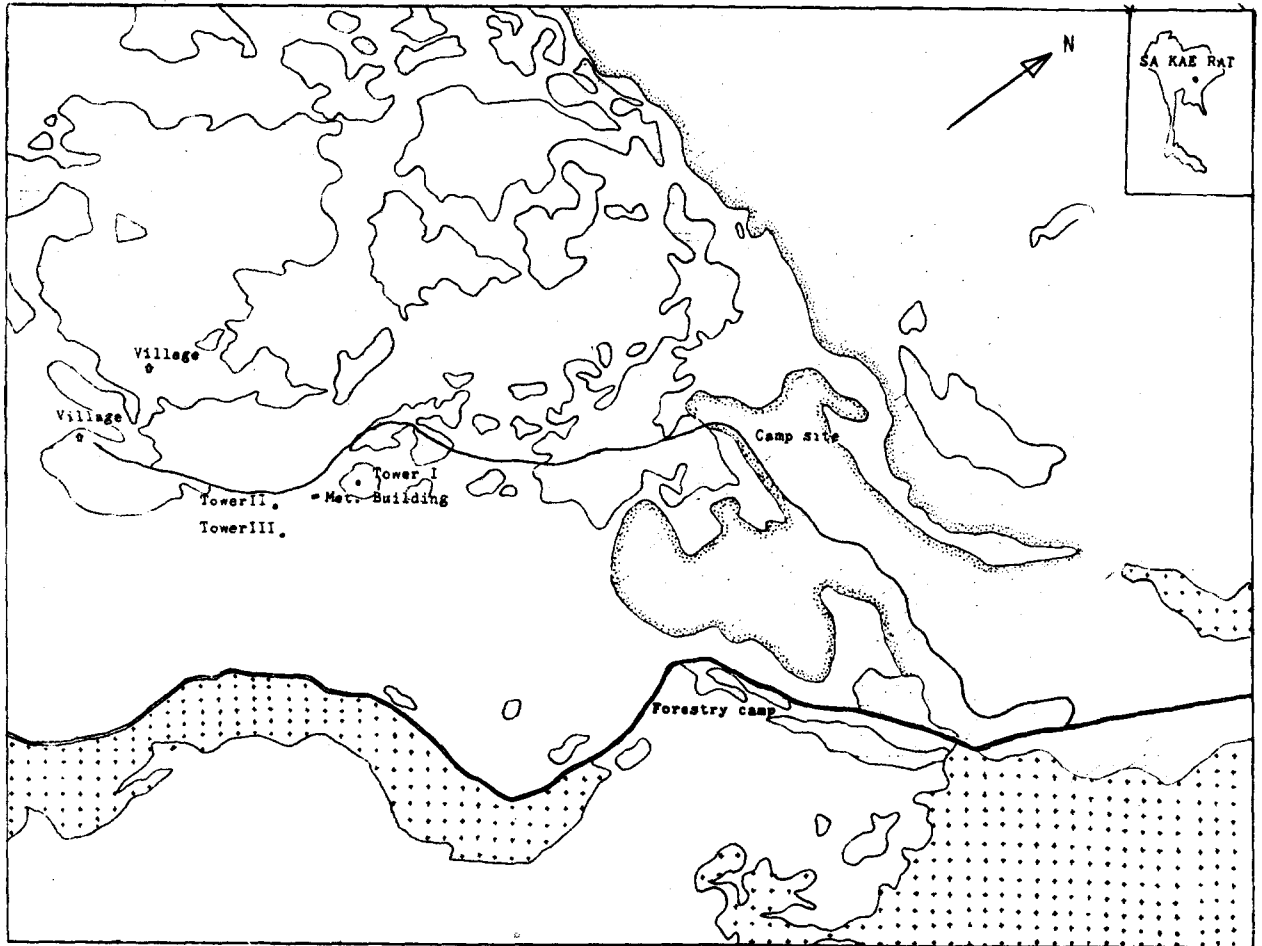







Figure 1. Aerial photograph showing topography of Sakaerat Experiment Station.

Figure 2. Map showing vegetation types of Sakaerat (scale 1:25,000).



-  DRY-EVERGREEN FOREST
-  DRY DECIDUOUS DIPTEROCARP FOREST
-  MIXED DECIDUOUS FOREST
-  GRASS LAND
-  CULTIVATED AREA

from airphotos flown in 1967 by the Royal Thai Survey Department, with an approximate scale of 1:25,000



Figure 3. During the hot dry season, the annual ground fire regularly cleans the herbaceous undergrowth and litters. The plant on the right is Cycas siamensis, the common evergreen dioecious shrub in the dry deciduous dipterocarp forest.



Figure 4. The underground formation of rhizomes of Arundinaria pusilla.



Figure 5. Arundinaria pusilla on a poor site in dry deciduous dipterocarp forest is averagely 25 cm high.



Figure 6. Arundinaria pusilla can reach about 1 m high on a favourable site near the edge of dry-evergreen forest.

TABLE 1. MONTHLY AVERAGE RELATIVE HUMIDITY AT SAKAERAT FORESTRY CAMP (in per cent)

Year	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1967	-	-	-	-	-	-	-	-	-	-	91	91
1968	89	78	75	79	79	79	79	78	84	89	85	82
1969	85	72	78	72	78	80	82	86	90	89	85	86
1970	85	77	73	80	-	-	-	-	-	-	-	-

TABLE 2. MONTHLY AVERAGE MAXIMUM AND MINIMUM TEMPERATURE AT SAKAERAT FORESTRY CAMP ( $^{\circ}$ C)

Year	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1967	-	-	-	-	-	-	-	-	-	-	29.5	27.3
											18.7	14.2
1968	29.6	31.3	33.7	32.9	32.6	32.4	32.9	32.4	31.6	30.2	31.2	31.9
	15.4	19.5	22.8	22.6	23.0	23.1	23.0	23.1	22.2	20.4	19.4	17.9
1969	32.0	33.3	34.5	34.5	33.9	32.3	30.6	31.2	30.8	30.5	27.8	27.1
	20.0	21.0	23.1	23.8	24.2	23.7	22.7	22.1	22.1	22.7	18.4	14.7
1970	29.6	32.3	34.8	33.0	-	-	-	-	-	-	-	-
	17.0	19.3	23.5	22.7	-	-	-	-	-	-	-	-

TABLE 3. MONTHLY AVERAGE RAINFALL AT SAKAERAT FORESTRY CAMP (in mm)

Year	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1967	-	-	-	-	-	-	-	-	-	-	2.3	-
1968	-	0.1	1.3	4.5	13.2	2.6	1.7	1.7	4.6	3.4	0.3	-
1969	0.7	-	5.3	3.8	4.2	6.9	4.6	6.0	14.3	4.4	1.6	-
1970	0.3	0.5	4.0	4.1	-	-	-	-	-	-	-	-

## VEGETATION

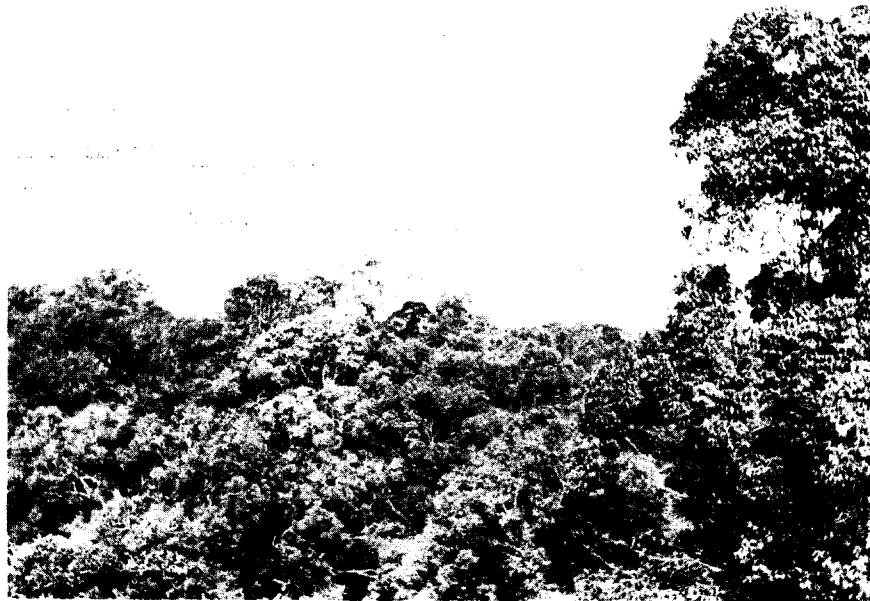
The vegetation and ground covers of Sakaerat can be classified into 4 vegetal types: 1) dry-evergreen forest, 2) mixed deciduous forest, 3) dry deciduous dipterocarp forest, and 4) grassland.

1) Dry-evergreen forest. This type of vegetation occupies the area in the south and west of the station and forms gallery stands along streams passing through the mixed deciduous forest in the east (Figure 2) where the soil is deep and retaining the moisture content all the year round.

The dry-evergreen forest is composed by dense stands of trees, shrubs, and undergrowth with a continuous crown canopy (Figure 8a & b). The forest is 3-storied, the upper storey is 21-40 m high, and constituted by takhian hin (Hopea ferrea), khiam khanong (Shorea sericeiflora), kabok (Irvingia malayana), kabak (Anisoptera costata), nang dam (Dialium cochinchinense), sa-to (Parkia streptocarpa), pu chao (Terminalia triptericoides), tabaek plueak bang (Lagerstroemia superreana), nonsi (Peltophorum dasyrachis), wa (Syzygium cumini), maklam (Adenanthera pavonina), makha mong (Azelia xylocarpa) and sai (Ficus altissima). The second storey is 15-20 m high, and formed by the following species: kabae klak (Eudnocarpus ilicifolius), phlong (Memecylon ovatum), khi-ai (Walsura robusta), katlin (Walsura trichostemon), dongdam (Diospyros oblonga), tathip khi nok (Canthium brunescens), samphae (Chaetocarpus castanocarpus), kho hia (Xerospermum muricatum), mimen (Dehaasia caesia) and kadong daeng (Linociera microstigma). The lower storey is 4-14 m, composed by following species, sanan (Olea salicifolia), mak fak dong (Apodytes dimidiata), ma fai (Baccaurea sapida), maklek maknoi (Vitex pierrei), khang khao (Aglaia pirifera), phlap-phla (Grewia paniculata), kao (Murraya paniculata), chomphu pa (Eugenia siamensis), thao san (Prismatomeris fragrans), and sathit (Phoebe sp.). Climbers are frequent namely, khon ma daeng (Ancistrocladus tectorius), kho ngu hao (Toddalia asiatica), khui (Willughbeia edulis), nam-han (Acacia comosa), nam phungde (Azina sarmentosa), khrua plok (Ventilago harmandiana), dang-i-thok (Erycibe noei), chong ra-a (Securidaca appendiculata), rotsukhon (Tetracera scandens), tueng khrua (Strychnos axillaris), thao chang (Myxopyrum smilacifolium), kadai ling (Beuhnia horsfieldii),



(a)



(b)

Figure 8. Showing the continuous crown canopy of the dry-evergreen forest.

and kaduk taek (Hymenopyramis brachiata).

The undergrowth is consisted of shrubs belonging to the genera Ardisia, Canthium, Clausena, Ervatania, Euonymus, Glycosmis, Goniothalamus, Ixora, Lasianthus, Prismatomeris, Rinorea, and Saprosma together with seedlings and sapling of trees; within this stratum aroids (Aglaiomena, Arisaema and Amorphophallus) and zingiberads (Alpinia, Amomum, Boesenbergia, Globba, Kaempferia, and Zingiber) are frequent together with other herbaceous species belonging to following genera: Acroceras, Carex, Chasalia, Corymberchis, Cyanotis, Elatostemma, Elephantopus, Geophila, Habenaria, Hedyotis, Malaxis, Ophiorrhiza, Pratia, and Tropidia.

Epiphytes are sparsely distributed and composed of following orchids, Aerides falcatum, Aerides nitratum, Chiloschista luniferus, Cymbidium pubescens, Dendrobium aggregatum, Dendrobium pierardii, Grammatophyllum speciosum, Oberonia iridifolia, Phalaenopsis decumbens, Podochilus lucescens, Pteroceras clausum, Robiquetia paniculata, Pomatocalpa spicatum, Sarcanthus subulatus, Sarcanthus tenuissus, Staurochilus fasciatus, Thrixspermum hystrix, and Trichoglottis cirrhifera together with some ferns, e.g. hang nok wa (Asplenium nidus), nak kharat (Drynoglossum piloselloides), and chaipha sida (Platynerium wallichii). Also hua roi ru (Hydnophytum formicarum), the ant-inhabited plant, and nang sawan (Fragrea obovata), an epiphytic shrub are found scatteringly on trees.

2) Mixed deciduous forest. This vegetal type occupies narrow strips between the dry-evergreen and the dry deciduous dipterocarps forests, forming a transitional zone (Figure 9). The forest is 2-storied with broken crown canopy. The upper tree-storey is 21-30 m high and composed of som kop (Hymenodictyon excelsum), tabaek khon (Terminalia pierrei), salao bai yai (Lagerstroemia loudonii), phan sat (Erythrophloeum succirubrum), giu pa (Bombax insigne), samet thung (Lophopetalum wallichii), and pu chao (Terminalia tripteroides); the second storey is 10-20 m high, and consisting of plao luang (Croton oblongifolius), daeng samae (Schoutenia hypoleuca), ta khram (Garuga pinnata), mok luang (Holarrhena antidysenterica), kradon (Careya arborea), oi chang (Lansea coromandelica), teng nam (Bridelia pierrei), makok lueam (Canarium subulatum) and ko non (Lithocarpus spicatus).



3) Dry deciduous dipterocarp forest. This type of vegetation occupies rolling hills of exposed nature, where sandstone boulders are predominant; the soil is similar to that subtended the mixed deciduous forest, but the laterite is more prominent, due to the leaching of the organic matter and the exposure to the sun and rain.

The forest is 3-storied with broken crown canopy. The upper storey is 21-35 m high; dominant species in this stratum are teng (Shorea obtusa) (Figure 10), rang (Pentacme suavis), krat (Dipterocarpus intricatus) (Figure 11), phluang (Dipterocarpus tuberculatus), makha tae (Sindora maritima), daeng (Xylia kerrii) and pradu (Pterocarpus parvifolius); other associated species are mamuang khi ya (Mangifera duperreana), phayom (Shorea talura), kabok (Irvingia malayana), ket daeng (Dalbergia dongnaiensis), khang (Albizia odoratissima), kwao (Adina cordifolia) and chanuan (Dalbergia nigrescens). The second storey is 11-20 m high consisting of ko phae (Quercus kerrii), khamok luang (Gardenia sootepensis), khamok noi (Gardenia obtusifolia), nam thaeng (Randia tomentosa), tap tao (Diospyros ehreticoides), liang nan (Berrya nollis), san (Dillenia obovata), mamuang hua maeng wan (Buchanania reticulata), makham pon (Phyllanthus emblica), tun kwao (Mitragyna brunonis) and tao (Cratoxylon formosum).

The under storey is 4-10 m high, and composed by small trees such as manao (Antidesma ghaesembilla), phlong dam (Memecylon edule), phak wan (Meliantha suavis), nom sao (Anacloosa clarkii), muat lot (Aporosa villosa), and tanok kot (Ochna integerrima). The undergrowth is formed up by low shrubs, such as: prong pa (Cycas siamensis) (Figure 12), khi tun (Helicteres vinosa), ya khat (Sida acuta), nom maeo pa (Ellipeiopsis cherrevensis), chamot (Hibiscus surattensis); the followings are straggling shrubs and climbers: lep yieo (Zizyphus oenoplia), ta khrong (Zizyphus cambodiana), nam chan (Mezoneurum hymenocarpum), tinmang kon (Lygodium flexuosum), saitan (Aganosma marginata), noi nang (Streptocaulon juvenis), phuang buri (Alsomitra angustipetala), thua paep chang (Afgekia sericea), kathok rok (Passiflora foetida), and khwai suak (Olax scandens); herbaceous species are hao pradu (Eriosema chinensis); phak kachet bok (Cassia mimosoides), katang bai (Leea sp.), buk (Amorphophallus sp.), prohoh (Kaempferia pandurata), Cymbidium siamense, Eulophia siamensis, Eulophia graminea, and Eulophia macrobulbon.



Figure 9. A transitional zone found between the dry-evergreen and the dry deciduous dipterocarp forests is characterized by many mixed deciduous trees.



Figure 10. Seedlings of teng (*Shorea obtusa*) are spectacular on the ground floor of the dry deciduous dipterocarp forest in the rainy season.



Figure 11. Yang krat (Dipterocarpus intricatus), a predominant tree species in the dry deciduous dipterocarp forest.

Figure 12. Cycas siamensis, a small rosette shrub, scattered in the dry deciduous dipterocarp forest, can withstand the annual ground fire through producing the big cylindrical trunk sometimes up to 150 cm high.



Epiphytes are comparatively richer than the dry-evergreen forest and enumerating as follows: Hoya kerrii, Dischidia minor, Dischidia imbricata, Dischidia rafflesiana, Aerides crassifolium, Cymbidium simulans, Dendrobium secundum, D. indivisum, D. delacourii, D. draconis, D. pulchellum, D. aggregatum, Ephemerantha fimbriata, Eria bractescens, E. albido-tomentosa, E. pumila, Rhynchostylis gigantea, Rh. coelestis, Sarcanthus recurvatus, S. flagelliformis, Vanda brunnea, V. lilacina, Drynaria quercifolia, D. rigida, and Pyrrhosia adnascens.

4) Grassland. This type of vegetation is the effect of man. Normally villagers will cut down the dry-evergreen forest to grow crops such as rice, castor oil plant, corn, papaya, banana, egg plant, red pepper and gourd. After one or two crops the sites were left to fallow for 3-4 years, while new sites were being cleared. These old clearings developed into grasslands, which are scattered all over the area, due to the annual fire hazard. Tall grasses such as ya khaem (Neyraudia reynaudiana) (Figure 13), ya phong (Saccharum spontaneum), ya kha (Imperata cylindrica) established after the phasing of ya sap suea (Eupatorium odoratum). Traces of the dry-evergreen forest are shown by evergreen species such as khruca ngu hao (Toddalia asiatica), khan thong phaya bat (Suregada multiflora), tabaek plueak bang (Lagerstroemia superreana), kabao klak (Hydnocarpus ilicifolius), khui (Willughbeia edulis), mimen (Dehaasia caesia), and mahuat (Lepisanthes rubiginosus), etc., which are mostly coppices, lian (Melia azedarach), and nonsi (Peltophorum dasyrachis) can be discerned as pioneer species.

#### ACANTHACEAE

A family of herbs, shrubs and climbers, stems often swollen near nodes. Leaves simple, opposite, sometimes with rough surfaces. Flowers often showy, irregular, in the axil of bracts borne in spikes or in the axil of leaves in clusters. Calyx 4-5-lobed. Corolla generally funnel-shaped, unequally 4-5-lobed, usually 2-lipped. Stamens 4 or 2, sometimes with staminodes, inserted on corolla tube, usually superposed, discs usually conspicuous and nectar bearing. Ovary 2-celled, superior, style filiform, 2-fid. Capsule loculicidally dehiscent, with few to numerous seeds attached to retinaculum.

So far only 4 genera and 6 species found at Sakaerat.



Figure 15. Grassland came into being after forest destruction, mainly occupied by the two common tall grasses, ya khaem (Neyraudia reynaudiana) (a & b); and ya pheng (Saccharum spontaneum) (c & d).

Key to the genera

1. Climbers. Leaves often cordate or hastate at base, palm-nerved. Bracteoles usually cohering and enclosing floral bud. Calyx obscure or 10-15-lobed. Capsule globose, beaked; retinacula absent

1. Thunbergia

1. Shrubs or herbs. Leaves acute or cuneate at base, penninerved. Bracteoles not as above. Calyx tubular or partite. Capsule without beak; retinacula present

2. Flowers white, 1-4 together in terminal cymes. Bracts 1-4, in opposite pairs, longer than calyx. Corolla linear tubular, mouth deeply unequally 2-lipped. Stamens 2; anthers superposed. Seeds 4, glandular, papillose

2. Peristrophe

2. Flowers pale blue or violet, in axillary clusters. Bracts not in opposite pairs. Corolla funnel-shaped, mouth sub-equally 5-lobed. Stamens 4, perfect or not, anthers equal. Seeds 2-4, hairy

3. Shrubs sometimes with spines. Bracts and bracteoles sepal like. Flowers facing upwards, blue, in loose clusters. Sepals 4, outer pair larger. Corolla showy, elongate. Stamens 2 perfect, 2 rudimentary. Capsule sub-terete; seeds ovoid

3. Barleria

3. Shrubs without spines. Bracts small or absent, bracteoles linear. Flowers facing all directions, in compact clusters. Calyx small, obscurely 2-lipped. Stamens all perfect, superposed. Capsule linear oblong, narrowed towards base; seeds orbicular

4. Dyschoriste

1. THUNBERGIA LINN. F.

Leaves usually hairy. Flowers solitary or in pairs, fragrant; pedicels long; bracteoles oblong, curved with entire margins, tomentose; corolla white, spreading

T. fragrans

Leaves glabrous. Flowers in racemes, odourless; pedicels short; bracteoles elliptic lanceolate with dentate margins, puberulous; corolla yellow or orange, reflexed

T. hoesesii

Thunbergia fragrans Roxb., Clarke in Hook. f., Fl. Br. Ind. 4: 390. 1885.

Slender climber. Leaves ovate or oblong, acute, with obtuse tips, rounded or sub-cordate bases and dentate margins; surfaces densely pubescent to glabrate; petioles 1.2-2 cm. Corolla white, lobes obovate, emarginate, spreading. Capsule green, shining, 0.7 x 0.7 cm, beak 1.2 cm; seeds 4, ovoid, dorsally compressed, rugose, sessile.

D i s t r i b u t i o n.—India, China, Thailand, Laos, Vietnam, Cambodia, Malaya, Philippines, Australia.

V e r n a c u l a r.—Nam nae khao (หนานนาเฆว) (Northern).

Thunbergia hossesii C.B. Clark in Engl. Jahrb. 40: 64. 1907.

Slender climber. Leaves broadly ovate, hastate or angled with acute to acuminate tips, rounded cordate or hastate bases, margins with large spacing teeth; petioles 2.5-5 cm. Racemes short, 9 cm long. Corolla yellow or orange.

D i s t r i b u t i o n.—Endemic to Thailand.

E c o l o g y.—Both climbers are common in dry-evergreen forests, the former is usually creeping on open ground, while latter is found climbing on trees and shrubs along streams and on hill slopes. Flowers and fruits: August-January.

V e r n a c u l a r.—Nom mae daeng (หนอมแมดอง) (Chiang Mai).

## 2. PERISTROPHE NEES

Peristrophe tinctoria Nees, Clarke in Hook. f., Fl. Br. Ind. 4: 556. 1885.

Small, dusky puberulous shrub. Leaves ovate-elliptic or lanceolate, shortly acuminate, pubescent; petioles 1-1.8 cm. Flower heads ea. 3 cm long; bracts elliptic acute, copiously reticulate veined, hairy. Sepals lanceolate, hairy. Corolla with lower lip broad elliptic, 3-lobed at tip; anthers linear, one superposed half of it's length. Capsule ellipsoid, green, 1 cm long.

D i s t r i b u t i o n.—India, Vietnam, Thailand.

E c o l o g y.—Common in dry-evergreen forests, usually in shady spots. Flowers and fruits in November.

### 3. BARLERIA LINN.

Barleria strigosa Willd., Clarke in Hook. f., Fl. Br. Ind. 4: 489. 1885; Ridl., Fl. Mal. Pen. 2: 587. 1923.

Small shrub, branches covered with red brown stiff hairs. Leaves elliptic ovate, acute at apex, with scattered red brown stiff hairs especially on lower surfaces; petioles 0.2-0.5 cm. Flower head 5-6.5 cm across, very dense glomerate; bracteoles elliptic acute, copiously veined, hairy, margins ciliate-denticulate. Anterior pair of sepals broadly bifid at apex. Corolla funnel-shaped, lobes ovate, blue. Capsule ovoid oblong, 2 cm; seeds silky (Figure 14).

D i s t r i b u t i o n.—India, Thailand, Laos, Cambodia, South Vietnam.

E c o l o g y.—Scattered in dry-evergreen forests, usually common in cultivated areas. Flowers and fruits in August.

V e r n a c u l a r.—Sang korani (สังกรณี) (Krungthep); thoeng-di (เทิงดี) (Kanchanaburi/Karen); ya ngon kai (หญ้าหนองไถ่), ya hua nak (หญ้าหัวนาค) (Northern); khi fai nek khum (ชีไพนอกขุน) (Prachinburi); chuk rohini (จุกโรหิณี) (Chon Buri).

### 4. DYSCHORISTE NEES

Dyschoriste depressa Nees, Clarke in Hook. f., Fl. Br. Ind. 4: 410. 1885;

Calophanes nagchana Nees, Clarke in Hook. f., l.c. 410.

Prostrate, branched herbs, slightly hoary. Leaves obovate or elliptic spatulate or ovate with rounded obtuse tips, bases attenuate and decurrent into short petioles, scabrid. Flowers 8-10 in each cluster, sub-sessile. Calyx lobes longer than tube. Corolla lobes obtuse. Filaments connate near base. Capsule green linear oblong, retinacula strongly curved; seeds compressed, densely elastic hairy when wet.

D i s t r i b u t i o n.—India, Thailand, Laos, Vietnam.

E c o l o g y.—Fairly common in dry dipterocarp forests. Flowers and fruits in November.





Figure 14. Barleria strigosa Willd.



Figure 15. Buchanania lucida Bl.

## AMARANTHACEAE

Herbs rarely shrubs. Leaves opposite or alternate, simple, entire or denticulate or serrulate. Flowers bisexual or unisexual or partly deformed and neutral, in terminal clusters, heads, racemes or spikes or panicles, in axil of bracts. Tepals 3-5, usually free; bracts, bracteoles and tepals scarious or with scarious margins. Stamens 3-5, opposite tepals, filaments free or connate below or almost entirely united in a cup or tube, with or without interposed subulate false staminodes. Ovary superior, 1-celled, ovules 1 or more, basal; styles 1-3. Fruit an utricle, berry or crustaceous, usually membranous; seeds 1 to numerous, often lenticular, smooth or verruculose.

Only 1 specie, Cyathula prostrata (Linn.) Bl. found at Sakaerat.

### CYATHULA LOUR.

C. prostrata (Linn.) Bl. in Hook. f., Fl. Br. Ind. 4: 723. 1885; Ridl., Fl. Mal. Pen. 3: 7. 1924.

Very slender, scaberulous herb with erect branches and rooting base, stems reddish, 4-angular, thick above nodes. Leaves opposite, elliptic-rhomboid-oblong with triangular apex and contracted base, surfaces with stiff hairs; petioles very short, slender. Spikes narrowly ovoid, 2.5-21 cm long, perfect flowers usually surrounded by imperfect ones which are reduced to tepals with rigid hooked awns. Flowers yellow. Tepals 5, scarious, 1-3-nerved, mucronate. Stamens 5, connate below with 2-fid staminodes. Ovary obovoid. Utricle ovoid with aerolate top, glabrous; seeds ovoid, shining brown.

D i s t r i b u t i o n.—Africa to China and Australia.

E c o l o g y.—Scattered in dry-evergreen forest, quite common in shaded localities, forest borders, orchards and compounds, often gregarious. Flowers in November.

U s e.—Medicinal, for cough, dysentery, cholera and as vermifuge.

## ANACARDIACEAE

A family of trees, shrubs and woody climbers, usually with acrid turpentine smelling resinous juices in their barks, often in leaves and fruits. Leaves crowded at tips of branches, alternate, simple or compound. Flowers small, regular, 4-5 merous, bisexual or polygamous, in panicles or thyrses. Sepals 4-5 lobed, rarely spathaceous or calyptriform, sometimes accrescent. Petals 4-5, free rarely accrescent. Stamens 4-10, rarely numerous, sometimes only 1 fertile, rest reduced to staminodes or absent, inserted under or on variable discs. Carpels 1-5, free or connate (absent or rudimentary in male flowers), ovules solitary; styles 1-5, free or connate. Fruit usually a drupe with resinous mesocarp; wings seldom present.

Only 4 genera and 5 species found at Sakaerat.

### Key to the genera

1. Leaves simple
  2. Petioles flat and winged. Flowers bisexual; carpels 5, only 1 fertile; stamens 10, all fertile; petals with median vein. Drupes lenticular, topped with style base; stone bony 1. Buchanania
  2. Petioles usually cylindrical, pulvinate or swollen at base. Flowers usually polygamous; carpels 1; stamens 1-5 fertile, with or without staminodes; petals with 3-5 basally connate nerves. Drupes usually large and fleshy; stone compressed, grooved or fibrous 2. Mangifera
1. Leaves compound, imparipinnate
  3. Trees monoecious, glabrous, aromatic. Pinnae usually with crowded nerves and intramarginal nerve. Drupes ellipsoid or oblongoid, fleshy with woody endocarp. Panicles conspicuous. Pistile 5, free 3. Spondias
  3. Trees dioecious, leaves and inflorescences with deciduous stellate hairs. Pinnae with spacious nerves. Drupes bean-shaped crowned by persistent styles, thinly fleshy. Panicles usually inconspicuous, clustered at tips of bare twigs. Pistil 1 4. Lannea

1. BUCHANANIA ROXB.

Leaves glabrous, tertiary nerves spacious, elevate, ascending. Petioles dilated, flat. Panicles glabrous with long pedicelled flowers; anthers sagittate. Drupes with sharp edge B. lucida

Leaves usually hairy below, resin-dotted, tertiary nerves compact. Petioles not dilated, sub-terete and suberized. Panicles rusty hairy with short-pedicelled flowers; anthers-elongate ovoid. Drupes without edge, usually reddish hairy B. reticulata

B. lucida Bl. in Hook. f., Fl. Br. Ind. 2: 23. 1876; Eidl., Fl. Mal. Pen. 1: 528. 1922.

Trees 13 m high with smooth blackish barks, blaze white. Leaves elliptic to oblanceolate or obovate with obtuse or acute tips, bases decurrent into petioles. Panicles subterminal, laxly branched. Flowers yellowish white; calyces glabrous. Drupes green, drying reddish black (Figure 15).

D i s t r i b u t i o n.—Burma, Thailand, Malaya.

E c o l o g y.—Very rare in dry deciduous forests. Fruits in May.

V e r n a c u l a r.—Krit (กรีก) (Banong); muang fa (ม่วงฟ้า), manuang khi kratai (มะม่วงขี้กระต่าย) (Peninsular); ni siat (หนี่เสียด) (Trang); manuang khwai (มะม่วงควาย) (Surat Thani); wa lukhin (วาลูกหิน) (Sengkha).

U s e.—Tannin obtained from bark; pounded leaves used as poultice.

B. reticulata Hance in Lec., Fl. Gén. Indoch. 2: 11. 1908; Tard.-Blot, Fl. Camb., Laos, Vietn. 2: 78. 1962.

Small to middle-sized trees, with rough, fissured, grey barks, blaze red. Leaves oblong to elliptic oblong, blunt with obtuse or emarginate tips, bases obtuse or blunt. Panicles at tips of branches. Flowers greenish white; calyces hairy; ovaries rusty tomentose. Drupes reddish green with deciduous reddish hairs.

D i s t r i b u t i o n.—Thailand, Cambodia, South Vietnam.

E c o l o g y.—Uncommon in dry deciduous forests.

V e r n a c u l a r.--Ma muang (มะม่วง), malanwan (มะลิวัน), rak (รัก) (Phrae, Prachin Buri); rak khi mu (รักขี้หนู) (Chiang Mai); nam klieng (น้ำเค็ม) (Uttaradit); hua maeng wan (หัวแมงวัน) (Phitsanulok); mamuang hua maeng wan (มะม่วงหัวแมงวัน) (Phrae, Chainat, Chaiyaphum, Nakhon Ratchasima, Loei, Sakon Nakhon, Phetchaburi); mamuang no (มะม่วงนอ) (Chon Buri); mamuang khop pho (มะม่วงขุบพอ) (Phetchaburi); (มะม่วงนอ), phaeng phuai (แพ่งพuai) (Prachuap Khiri Khan).

## 2. MANGIFERA LINN.

M. duperreana Pierre, Fl. For. Coch. 1: t 362. 1897; Tard.-Blot, Fl. Camb., Laos, Vietn. 2: 85. 1962.

Trees 19 m high, 140 cm girth, with rough grey bark, blaze red; branchlets stout, shining. Leaves elliptic lanceolate to oblanceolate or oblong, tips obtuse or shortly acute, bases cuneate; petioles smooth, swollen and hollow at base. Panicles terminal, peduncles grey-brown tomentose with dense clusters of subsessile flowers. Flowers cream or pale green, bisexual. Petals elliptic with 3 glandular nerves. Stamens 10, 5 fertile with 5 spur-like staminodes; discs papillose. Drapes ellipsoid, small, stout, green, edible (Figure 16).

D i s t r i b u t i o n.—Thailand, South Vietnam.

E c o l o g y.—Scattered on ridge of hill in dry deciduous dipterocarp forests. Flowers in January.

V e r n a c u l a r.—Mamuang khi ya (มะม่วงขี้ยา) (Chiang Mai); mamuang (มะม่วง) (Nakhon Ratchasima); mamuang pa (มะม่วงป่า) (Chanthaburi, Surat Thani, Prachin Buri, Nakhon Ratchasima); mamuang kalon (มะม่วงกะล่อน) (Chon Buri); mamuang khan (มะม่วงขัน) (Chumphon, Trat).

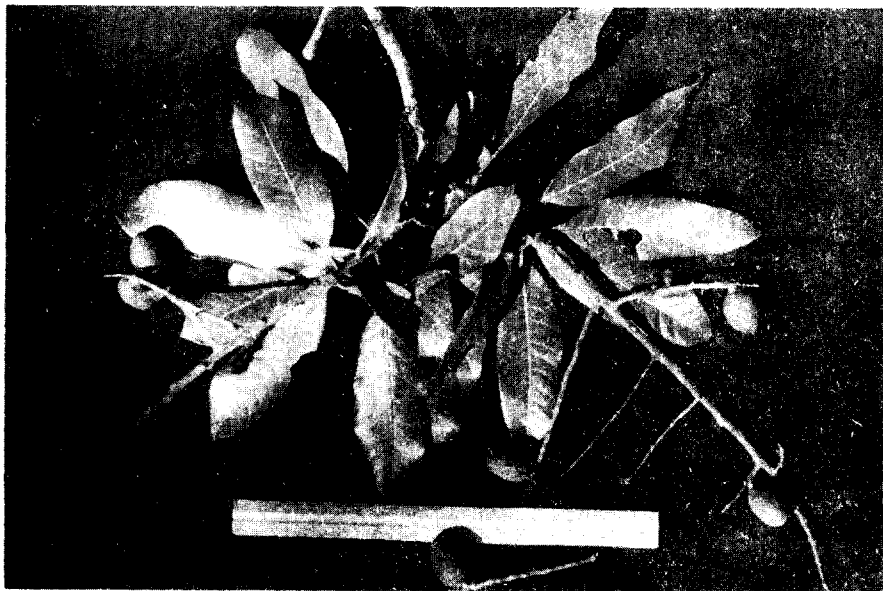
## 3. SPONDIAS LINN.

S. pinnata (Linn.) Kurz, Pegu Report A 42. 1875; Tard.-Blot, Fl. Camb., Laos, Vietn. 2: 133. 1926.

Small to medium-sized deciduous trees, aromatic with crushed leaves smelling of mangoes. Barks grey, older branches with numerous lenticels. Leaves dull green, becoming pink before falling. Leaflets in 4-6 opposite to subopposite pairs, oblong lanceolate or elliptic, tips acuminate,



(a)



(b)

Figure 16. Mangifera duperreana Pierre  
(a) bark, (b) leaves and fruits.

bases oblique, rounded, nerves parallel, straight; petiolules narrowly winged. Panicles stiff, racemose, peduncles stout, lenticulate, bearing fasciculated compressed cymes. Flowers star-shaped, bisexual, subsessile, white with yellow discs. Drupes green ripening yellow to orange-brown, warty; pulp soft, sour with bitter flavour, very fibrous between 5 ridges, stone semi-woody.

D i s t r i b u t i o n.—India, Burma, China, Thailand, South Vietnam, Malaya.

E c o l o g y.—Scattered in the dry-evergreen forest.

V e r n a c u l a r.—Kok kuk (กอกกุก) (Chiang Rai); kok mong (กอกมอญ) (Chiang Rai); kuk (กุก) (Chiang Mai); makok pa (เมะกอกปา) (Nakhon Ratchasima); phai (ไผ) (Kanchanaburi/Karen); kok (กอก) (North-eastern, Peninsular); makok (เมะกอก) (Trang); bai makok (ไผเมะกอก) (Ratchaburi); Hog Plum.

U s e.—Cultivated for their edible fruits. Bark, leaves, roots and fruits medicinal.

#### 4. LANNEA A. RICHARD

L. coromandelica (Houtt.) Merr. in Journ. Arn. Arb. 19: 353. 1938; Backer & Bakh. f., Fl. Java 2: 152. 1965; Odina wodier Roxb., Hort. Beng. 29: 1814; Hook. f., Fl. Br. Ind. 2: 29. 1876; Kurz, Fl. Br. Burm. 1: 321. 1877.

Deciduous trees, bark brownish, younger parts stellate rusty tomentose. Leaves reddish; petioles terete. Pinnæ in 3-4 pairs, oblong ovate, tips caudate acuminate, bases oblique, asymmetric; chartaceous, usually hairy below, tertiary nerves sunken below. Panicles drooping, males large, females small, spiciform. Flowers scented, 4-5-merous. Stamens small in females. Drupes oblique, reniform, green-tinted with red-purple; stone hard.

D i s t r i b u t i o n.—India, Burma, Thailand, Cambodia, South Vietnam, Malay Peninsula.

E c o l o g y.—Scattered between dry-evergreen and dry deciduous forests.

V e r n a c u l a r.—*Oi chang* (อ้ายช้าง) (General); *kuk* (กุก) (Northern); *wit* (วิทย์) (Chiang Mai); *seng lu khai* (เสงลู Khai) (Chiang Mai/Karen); *pi chaeng* (ปิช้าง), *tho ki-si* (โทกีไซ) (Mae Hong Son/Karen); *kok kan* (กอกกัน) (North-eastern); *chang non* (ช้างนอน) (Trat); *cha kok* (ช้างกอก) (Surat Thani); *me-yu-wai* (เมอญวราย) (Kanchanaburi/Karen); *tak ran* (ตักらん) (South-eastern).

U s e.—Mucilaginous gum used in calico printing. Barks and leaves medicinal. White wood used for carvings etc. and as firewood.

#### ANCISTROCLADACEAE

The family is monogeneric, Ancistrocladus being the only genus.

#### ANCISTROCLADUS WALL.

Scandent shrubs with sympodial branches bearing a cluster of erect leaves at their tips together with unilateral or alternate tendril like woody hooks. Leaves subsessile, simple, surfaces minutely pitted, hairy, each hair secreting waxy substances. Inflorescences few to several times dichotomously branched or spike like, often with hooks. Flowers small; pedicels articulated; bracts with thick base. Calyx-tube short, adnate to ovary, lobes 5, unequal, imbricate, accrescent. Petals 5, contorted. Stamens 10, rarely 5, episepalous, filaments subulate. Ovary semi-inferior, 1 celled, 1 ovuled, tip protruding and elongating bearing 3 erect articulated styles. Nut indehiscent, crowned by enlarged calyx; seeds orbicular.

A. tectorious (Lour.) Merr., van Steenis, Fl. Mal. Ser. 1, Vol. 4: 9, Fig. 1. 1948.

Woody climber with sessile, lanceolate or oblanceolate to obovate-oblong leaves, tapering at bases, tips obtuse, coriaceous, nerves fine, feathery, intramarginal nerve looped, usually with outer one. Inflorescences terminal, branching thrice with divaricate branches bearing clusters of flowers at their tips. Flowers reddish. Calyx lobes ovate, with glands. Petals ovate. Stamens unequal. Nuts brown, wings slightly decurrent on the obconical smooth tube. Wings spatulate-cuneate, veined, usually 2 or 3 larger (Figure 17).





(a)



(b)

Figure 17. Showing characteristic of vegetation under the crown canopy of the dry-evergreen forest; the big tree in (a) is one of the common tree species, ta baek plueak bang (Lagerstroemia duperreana), and the common woody climber with obovate-oblong leaves in (b) is khon ma daeng (Ancistrocladus tectorius).

D i s t r i b u t i o n.—Burma, Thailand, Laos, Vietnam, Cambodia, Malay Peninsula.

E c o l o g y.—Very common in dry-evergreen forests.

V e r n a c u l a r.—Khen ma daeng (เขนมาแดง) (Makhoen Batchesima);  
lin kwang (ลินกวัง) (Lampang).

#### APIACEAE

A family of trees, shrubs, and woody climbers with resinous or scurly aromatic tissues. Leaves simple, alternate, commonly oblong, entire, pointed and drooping, with short stalks, exstipulate. Flowers solitary or in clusters often opposite the leaves, hanging or facing down, commonly opening while still as young buds. Sepals 3, generally small. Petals 6 in two rows, the inner often smaller or differently shaped, rather thick and fleshy. Stamens numerous, minute, very short, crowded below the ovary in a rosette. Carpels numerous each with a very short style. Fruits round, oblong or pod-like, typically in a bunch, each fruit 1-many-seeded, with fleshy or pulpy rind and generally indehiscent; seeds with hard shining testa and ruminated albumen.

At the present only 9 genera and 10 species found at Sakaerat.

#### Key to the genera

1. Trees or erect shrubs
2. Trees
  3. Petals all flat, more or less spreading from the base
    4. Flowers solitary or 1-2, axillary; petals as broad as long, inner ones shorter 1. Cananga
    4. Flowers many in clusters, cauline; petals twice as long as broad, all equal 2. Polyalthia
  3. Petals not spreading, if so only the outer, the inner more or less joining along the upper margins to form a dome
5. Petals not spreading
  6. Peduncles slender, petals subequal, as broad as long 3. Melodorum

6. Peduncles short, stout; petals unequal, outer long, inner short,  
all twice as long as broad 4. Goniotalamus
5. Outer petals spreading, inner joining along upper margins to form  
a dome, lower margins attenuate into claws 5. Mitrephora
2. Erect shrubs
7. Petals all equal 6. Ellipeiopsis
7. Petals unequal, outer short, inner long 7. Phaeanthus
1. Woody climbers or sprawling shrubs
8. Woody climbers
9. Branches hooked; flowers on hooked peduncles 8. Artabotrys
9. Not as above
10. Petals flat, as broad as long; all parts with soft brown hairs 9. Uvaria
10. Petals not spreading, longer than broad
11. Flowers solitary, axillary or terminal; peduncles slender, petals  
all equal, twice as long as broad; fruit moniliform on short  
stalk 10. Desmos
11. Flower in 2-5-flowered cyme, opposite to the leaves or terminal;  
petals as broad as long; fruits oblique on slender stalk 11. Cyathostemma
8. Sprawling shrubs; twigs with white lenticels; leaves thin covered  
with soft hairs. Flowers solitary, inner petals with 2 basal glands 12. Anonanthus

1. CANANGA HOOK.F. et THOMS.

Cananga latifolia (Hook. f. et Th.) Finet et Gagnep., Bull. Soc. Bot. Fr. Mem. 4:84. 1906; Canangium latifolium Ridl., Fl. Mal. Pen. 1: 44. 1922; Craib, Fl. Siam. Enum. 1: 36. 1925.

Deciduous tree, 20 m high, 150 cm girth; bark grey, flaky, blaze yellowish; younger parts greyish tomentose. Leaves membranous, broadly ovate-oblong, rounded or almost cordate at the base, apex obtuse or mucronate, shortly pubescent above, greyish tomentose beneath; lateral nerves 9-11 pairs, straight, ascending, prominent on both sides; reticulations prominent on lower surface; petioles tomentose. Flowers fragrant, 1-2, borne on short, leafy, axillary branches, about 3.5 cm across; peduncles 1.5-2.5 cm long, tomentose with a bract. Sepals

oblong-ovate, acute, connate at base, reflexed, tomentose. Petals yellowish green, spreading, 5 cm long and 1.4-1.7 cm broad, oblong-lanceolate, several-veined, tomentose, blades narrowed at junction into claws. Eipe carpels glabrous, slightly oblique, oblong, 1.2-1.5 cm long; seeds 2-4 in 2 rows.

D i s t r i b u t i o n.—Burma, Laos, Thailand, Cambodia, Malaysia.

E c o l o g y.—Scattered by stream on slopes in the dry-evergreen forest. Flowering in April - May.

V e r n a c u l a r.—Sakae saeng (สะแกแสง) (General); foeng (เฟิง), kaen saeng (แกแสง) (Uttaradit); nao (นอ) (North); ngun, saban nga (งุนสะพานงา) (Chiang Mai); han hok (ห่านฮอก), som klip (สมกลิป) (Nakhon Ratchasima); rap (แรบ) (Surat Thani).

## 2. POLYALTHIA BLUME

### Key to the species

Fruits large, numerous, in a large bunch. Leaves 20-33 cm long; petioles, midribs and veins pubescent, later glabrous

#### 1. Polyalthia viridis

Fruits small, numerous in a small bunch. Leaves 5-13 cm long. Branchlets and undersurfaces of the leaves sparsely pubescent

#### 2. Polyalthia suberosa

1. Polyalthia viridis Craib, Kew Bull. Misc. Inf.: 4. 1914 et ibid.: 226. 1922.

Medium-sized tree, 15 m high, 70 cm girth. Bark smooth, dark, blaze yellowish. Leaves oblong or elliptic-oblong, 20-33 by 6-8 cm, mature leaves glabrous. Flowers arranged in bunches on twigs; peduncle slender. Petals all equal, arranged in 6-rayed star. Carpels glabrous, oblong-elliptic, 2.2-2.8 cm long, 20-40 in a large bunch, red when ripe.

D i s t r i b u t i o n.—Burma, Laos, Thailand, Cambodia.

E c o l o g y.—Scattered by stream in the dry-evergreen forest, and scattered in mixed deciduous forest. Flowering in March - April. Fruiting in April - July.

V e r n a c u l a r.—Yang-on (ยางโอน) (Phitsanulok, Phichit); yang ueng (ยางอึ้ง) (Sukhothai); sam tac (สามเตา) (Lampang); yang pai (ยางพาย) (Chiang Mai).

2. Polyalthia suberosa (Roxb.) Thw., Enum.: 398. 1864; Hook. f. et Th., Fl. Br. Ind. 1:65. 1875; Kurz, Fl. Br. Burm. 1: 38. 1877; Gatteria suberosa Dunal, Monong. Anon.: 128. 1871.

Small tree, 10 m high; young twigs rusty-pubescent, later glabrous. Leaves oblong or elliptic-oblong, glabrous above, slightly pubescent beneath; main nerves 7-10 pairs, faint on both surfaces, 6-12 by 2-4.5 cm; petioles 1-3 mm long. Flowers arranged in bunches. Ripe carpels glabrous, spherical, 6 mm in diam.; stalks slender, 0.9-1.2 cm long.

D i s t r i b u t i o n.—India, Ceylon, South China, Burma, Laos, Thailand, Philippines.

E c o l o g y.—Scattered in mixed deciduous and dry-evergreen forests. Fruiting in August - September.

V e r n a c u l a r.—Kanchai (กำจาย) (Nakhon Sawan); klueng klon (กิ่งกลอง), krathum klong (กระทุมกลอง), thong khlong (ทองกลอง), chang klong (ช้างกลอง) (Ratchaburi); mong cham (มงจาย) (Ang Thong); chong khlong (ชองกลอง) (Kanchanaburi); khrai nam (ไครน้ำ) (Uttaradit); na, cham (นะจาย), kanchap (กำจาย) (North); nam noi (น้ำน้อย) (Loei); nam nong (น้ำนอง), ching klon (ชิงกลอง) (Peninsular).

### 3. MELODORUM DUNAL ex HOOK. F. & THOMS.

Melodorum fruticosum Lour., Fl. Cochinch: 351. 1790; M. clavipes Hance, Journ. Bot. 15: 328. 1877; Sphaerocoryne clavipes Craib, Kew Bull. Misc. Inf.: 168. 1922 et Fl. Siam. Enum 1: 47. 1925; Popowia mesnyi Craib, Kew Bull. Misc. Inf.: 5. 1914. Polyalthia sianensis Boerl., Icon. Bogor.: 124. 1899.

Small tree reaching 10 m high; bark scaly, dark brown. Leaves elliptic-oblong, wholly glabrous, glaucous beneath, 7-10 by 2-3.5 cm. Flowers solitary, axillary or terminal; peduncles slender, 2-3 cm long, thickened below calyx. Sepals broadly triangular. Petals coriaceous nearly orbicular, acute with broad base. Ripe carpels ovoid, glabrous,

about 8 mm long and 7 mm in diam., many in a small bunch; stalks slender, glabrous 2-3 cm long (Figure 18).

*D i s t r i b u t i o n.*—India, Burma, Thailand.

*E c o l o g y.*—Frequent in the dry-evergreen forest. Flowering in January and June. Fruiting in February - March and July - August.

*V e r n a c u l a r.*—lam duan (ลำควน) (Central); hom nuan (หอมนวล) (North).



Figure 18. Melodorum fruticosum Lour.

#### 4. GONIOTHALAMUS HOOK. F. et THOMS.

Goniothalamus marcanii Craib, Kew Bull. Misc. Inf.: 167. 1922 et Fl. Siam. Enum. 1: 51. 1925.

Small tree, 8 m high; young twigs shortly rusty-tomentose, finally flabrous. Leaves thinly coriaceous, oblong, apex shortly and bluntly acuminate, glabrous above, slightly rusty-pubescent beneath; reticulations very faint or invisible, 10-16 by 4-6.5 cm. Flowers generally 1-2, axillary; peduncles short. Sepals ovate, acute, rusty pubescent outside, glabrous inside. Petals greenish-yellow, coriaceous. Ripe carpels obovoid in sessile clusters.

D i s t r i b u t i o n.—Thailand, Malaysia.

E c c o l o g y.—Scattered in the dry-evergreen forest. Flowering in March - April.

V e r n a c u l a r.—Khao lam (เขาลำ) (Nong Khai).

#### 5. MITREPHORA HOOK. F. et THOMS.

Mitrephora thorelii Pierre, Fl. For. Coch. t. 37. 1881; Lec., Fl. Gen. I-C. 1: 91. 1907.

Tree 15-20 m high, 60-80 cm girth; young twigs shortly rusty-tomentose, later glabrous. Leaves oblong or elliptic-oblong, apex shortly acuminate, glabrous above except midribs, sparsely rusty-pubescent beneath; midribs and lateral veins prominent on the under surface, nerves 9-15 pairs, 10-20 by 4-7.5 cm; petioles rusty-pubescent, 6 mm long. Sepals ovate. Petals outer spreading, inner upper margins joining to form a dome, lower margins tapered into claws. Ripe carpels ovoid or subglobose.

D i s t r i b u t i o n.—Indo-China, Thailand.

E c c o l o g y.—Scattered in the dry-evergreen forest.

V e r n a c u l a r.—Nom haet (นมหาด), nom khwai dong (นมหาดดง), po sam tao (ป่าสามเตา) (Northern).

#### 6. ELLIPEIOPSIS R.E. FRIES

Ellipeiopsis cherrevensis (Pierre) R.E. Fries; Ellipeia cherrevensis Pierre ex Finet et Gagnep., Bull. Soc. Bot. Fr., Mem. 4: 76. 1906.

Erect shrub, 40-70 cm high. Leaves broadly ovate-elliptic, base cordate, apex shortly acute, sparsely pubescent above, rusty-tomentose beneath; lateral nerves 9-11 pairs, prominent on undersurface, 3-13 by 4.5-9 cm. Flowers solitary, opposite the leaves; peduncles rusty-tomentose, 0.5-1.6 cm long. Ripe carpels ovoid, 8 mm long, 5 mm in diam., yellow.

D i s t r i b u t i o n.—Laos, Thailand, Cambodia.

E c c o l o g y.—Very common in dry deciduous dipterocarp and mixed deciduous forests.

V e r n a c u l a r.—Nom maeo (นนนง), nom maeo pa (นนนงป) (Chiang Mai); phi khac (พืค), phi phuan noi (พืคพนน) (Nakhon Phanom).

### 7. PHAEANTHUS HOOK. F. et THOMS.

Phaeanthus cf. malabaricus Bedd., King, Ann. Roy. Bot. Gard. Calc. 4: 154. 1893.

Erect shrub, 1 m high; young parts rusty-tomentose, later glabrous. Leaves elliptic-oblong, shortly and rather abruptly acuminate, base rounded or shallowly cordate, both surfaces glabrous except the midrib on the lower; lateral nerves 7-9 pairs, faint, 10-13 by 3-4 cm; petioles rusty-pubescent, 3 mm long. Flowers solitary, extra-axillary or axillary. Sepals orbicular ovate, acute, rusty tomentose, spreading. Petals inner red, thick and fleshy, ovate, acute, more than twice as large as the outer. Ovaries numerous.

D i s t r i b u t i o n.—South India, Burma, Thailand.

E c o l o g y.—Frequent in the dry-evergreen forest.

### 8. ARTABOTRYS R. BR.

Artabotrys siamensis Miq., Ann. Mus. Bot. Lugd. Bat. 2: 42. 1865-66; Kurz, Fl. Br. Burm. 1: 31. 1877.

Evergreen scandent shrub; young parts tawny pubescent, later glabrous. Leaves coriaceous, obversely oblong to oblong and obovate-oblong, rather acute at the base, apex acute, glabrous above, shortly tawny pubescent beneath; reticulate veins distinct on both sides, 8-16 by 3.5-6 cm. Flowers solitary on hooked puberulous peduncles. Sepals puberulous triangular. Petals reddish green, narrowly elliptical, narrowed above the broad base, with softly and shortly tomentose, 1.5-2 cm long. Ripe carpels ellipsoid, short-stalked.

D i s t r i b u t i o n.—Burma, Thailand, Indonesia.

E c o l o g y.—Frequent in the dry-evergreen forest. Flowering in April.

V e r n a c u l a r.—Kadang-nga pa (คคังงป), kadang-ngua (คคังง) (Ratchaburi); karawek (คคคค) (Central); nom ngua (คคง), kadang-nga thao (คคังงคค) (Peninsular).



9. UVARIA LINN.

Key to the species

Flowers solitary. Calyx entirely covering petals in flower bud up to the time of opening 1. Uvaria grandiflora

Flowers 3-4 in short cymes. Calyx not entirely covering petals in flower bud, tips of petals visible 2. Uvaria rufa

1. Uvaria grandiflora Roxb. Fl. Ind. 2: 665. 1824; Sinclair, Gard. Bull. Sing. 14(2): 202. 1955; U. purpurea Bl., Hook. f. et Th., Fl. Br. Ind. 1: 47. 1872.

Climbing shrub; young twigs stellately tomentose. Leaves shining above, glabrous except the midrib, stellately pubescent beneath, oblong-lanceolate, shortly acuminate, base rounded, 12-20 by 4.5-7 cm; petioles tomentose. Flowers solitary, opposite the leaves with green pubescent leaf-like bracts. Sepals broadly triangular, shortly tomentose outside, glabrous inside. Petals glabrous with several indistinct veins. Carpels many, minutely tomentose, yellow when ripe.

D i s t r i b u t i o n.—India, Burma, Thailand, Indo-China, Malaysia, Indonesia, Philippines.

E c o l o g y.—Frequent in the dry-evergreen forest. Flowering in June.

V e r n a c u l a r.—Kluai musang (กล้วยหมั่ง) (Peninsular).

2. Uvaria rufa Bl., Lec., Fl. Gén. I-C. 1: 51. 1907; Backer & Bakh. f., Fl. Java 1: 104. 1963; U. astrosticta Miq., King, Mat. Fl. Mal. Pen. 1. 4: 272. 1892 et Ann. Roy. Bot. Gard. Calc. 4: 30. Pl. 27A. 1893; U. ridleyi King, Mat. Fl. Mal. Pen. 1. 4: 268. 1892 et, Ann. Roy. Bot. Gard. Calc. 4: 23 Pl. 24B. 1895.

Woody climber, young twigs rusty stellate-tomentose, finally glabrous. Leaves elliptic to oblong, acuminate, base rounded or slightly cordate, upper surface sparsely covered with brownish hairs, densely on lower surfaces; lateral nerves 10-13 pairs, distinct on both surfaces; petioles 5-6 mm long, tomentose. Inflorescence a cyme of 3-4 flowers. Sepals nearly orbicular, obtuse. Petals dull reddish-purple, broadly

ovate; inner slightly narrower, with very short claw, the outer not clawed. Ripe carpels 4-10, ovoid-ellipsoid, 2-3 cm long; stalks stout, 1-4 cm long.

D i s t r i b u t i o n.—India, Thailand, Indo-China, Malaysia, Indonesia, Philippines.

E c o l o g y.—Scattered in the dry-evergreen forest. Flowering in March - April.

V e r n a c u l a r.—Nom khwai (นนทขวาย) (General); nom maeo (นนแมว) (Central); bunga yai (bungaใหญ่) (Northern); phi phuan (พืพวน) (Udon Thani).

#### 10. DESMOS LOUR.

Desmos chinensis Lour., Fl. Cochinch.: 352. 1793; Ridl., Fl. Mal. Pen. 1: 46. 1922.

Scandent shrub with straggling branches; young twigs with brownish hairs, later glabrous. Leaves oblong-ob lanceolate, base rounded, apex acute or acuminate, glabrous above, glaucous beneath. Flowers solitary, axillary or terminal, at first green becoming yellow; peduncles slender, 3-5 cm long. Petals narrow lanceolate, glabrous or silky. Pistils oblong, hairy. Ripe carpels 3-4 cm long, numerous in a bunch.

D i s t r i b u t i o n.—India, South China, Thailand, Indo-China, Malaysia, Indonesia.

E c o l o g y.—Scattered in the dry-evergreen forest. Flowering in June - July.

V e r n a c u l a r.—Sai yut (สายหยุด), sao yut (สาวหยุด) (Central); sa lao (สาวเลา) (Prachuap Khiri Khan); khuea khao kaep (เคื่อเขาแคบ) (Loei).

#### 11. CYATHOSTEMMA GRIFF.

Cyathostemma micranthum (A. DC.) J. Sincl., Gard. Bull. Sing. 14. 2: 225. 1955; Uvaria micrantha Hook. f. et Th., Fl. Br. Ind. 1: 51. 1872; King, Ann. Roy. Bot. Gard. Calc. 4: 26. Pl. 18. 1893; Craib, Fl. Siam. Enum. 1. 1: 30. 1925. Popowia nitida King, Ann. Roy. Bot. Gard. Calc. 4: 118. Pl. 165B. 1893.

Woody climber; young branches brown tomentose, later glabrous. Leaves oblong-lanceolate, acuminate or acute, base rounded, midrib slightly hairy on both surfaces when young; lateral nerves faint on both surfaces; 5-10 by 2-3 cm. Inflorescence 2-5-flowered cymes, opposite the leaves or terminal; flower buds globose. Sepals pubescent outside, glabrous inside. Petals greenish-yellow, tomentose, broadly ovate. Ripe carpels, 14-19, oblique about 0.7-1 cm in diam., stalks slender, glabrous about 2 cm long; yellow.

D i s t r i b u t i o n.—India, Burma, Thailand, Indo-China, Malaysia.

E c o l o g y.—Very common in the dry-evergreen forest. Fruiting in August.

## 12. ANOMIANTHUS ZOLL.

Anomianthus dulcis (Dunal) Sinclair, Gard. Bull. Sing. 14. 1: 40. 1953.  
A. heterocarpus Zoll., Linnæa 29: 324. 1857-58; Finet et Gagnep, Fl. Gen. I-C 1: 46. 1907.

Sprawling shrub; young branches brown tomentose, afterwards glabrous, dark coloured with white lenticels. Leaves elliptic or lanceolate-ovate, apex acute, base slightly cordate, sparsely pubescent above, soft white hairy beneath; lateral nerves 11-14 pairs, prominent below; 9-14 by 3-5.5 cm; petioles about 3 mm long, tomentose. Flowers solitary. Sepals triangular. Petals orange-yellow, inner ones with 2 basal glands. Ripe carpels 0.8-1.2 cm long, numerous, oblique; stalk slender, sparsely pubescent, 0.8-1.5 cm long, red.

D i s t r i b u t i o n.—Thailand, Indo-China, Indonesia.

E c o l o g y.—Uncommon in the dry-evergreen forest. Fruiting in June - July, red when ripe.

V e r n a c u l a r.—Nom maeo (นมนมว) (Sukhothai); nom wua (นมวัว), khuea nom wua (เคื่อนนมวัว), nom ngua (นมจัว), na nom ngua (นมจัว) (Northern); top hu (ตมหู), tintang (ตีนตาง) (Ubon Ratchathani); tintang noi (ตีนตางน้อย) (Nakhon Phanom).

## APOCYNACEAE

Family of climbers, shrubs and trees with milky latex. Leaves simple, opposite or whorled, usually exstipulate. Flowers in axillary or terminal cymes; bracts small. Calyx tube short, lobes 5, imbricate, often glandular. Corolla rotate or funnel-shaped with long or short tube, lobes 5, spreading, twisted, throat hairy or with corona scales. Stamens 5, epipetalous, filaments short, anthers linear oblong free or adhering to stigma, pollen granular; disc variable. Ovaries superior of 2 separate carpels; styles slender, split near base; stigmas knob-like usually at level with anthers. Fruits berries, drupes, usually a pair of follicles joined at base, often divergent. Seeds plumed or pulpy.

Seven genera found at Sakserat.

### Key to the genera

1. Shrubs with tendrilled branchlets. Leaves coriaceous. Fruit a berry, globose; seeds not plumed 1. Willughbeia
1. Shrubs or climbers without tendrils. Leaves usually membranous. Fruits follicular; seeds coated in red pulp, plumed or winged
  2. Follicles short, thick, fleshy; seeds coated in red pulp. Corolla lobes crisped at edge. Petiole base usually clasping the stem 2. Ervartamia
  2. Follicles elongate; seeds with tuft of hair. Corolla lobes not crisped at edge. Petiole base not clasping stem
    3. Anthers free from stigma, included, cells rounded at base. Leaves pointing upwards 3. Holarrhena
    3. Anthers conniving in a cone and adhered to stigma, cells spurred at base. Leaves not upright
      4. Anthers exerted. Corona scales at throat of corolla. Disc absent. Follicles with 2 longitudinal furrows, beaked. Erect shrubs or small trees 4. Wrightia
      4. Anthers not exerted. Corona absent. Disc lobed. Follicles smooth. Scandent shrubs or climbers
        5. Flowers small, usually on trichotomously branched cymes. Follicles 4.5-6.5 cm, attenuate at summit, parallel, stipitate 5. Xylinabaria

5. Flowers showy, in lax corymbose cymes. Follicles 30-65 cm usually divaricate, not stipitate
6. Flowers large; bracts and sepals leaf-like. Corolla bell- or funnel-shaped, lobes overlapping to right. Follicles woody; seeds beaked 6. Beaumontia
6. Flowers medium-sized. Sepals not leaf-like. Corolla rotate or salver-shaped, lobes nearly straight or twisted to left. Follicles not woody; seeds not beaked 7. Aganosma

#### 1. WILLUGHBEIA ROXB.

W. edulis Roxb., Hook. f., Fl. Br. Ind. 3: 623. 1882; Kurz, For. Fl. Br. Bur. 2: 165. 1887; W. martabanica Wall., Pl. As. Bar. 3: 45, t.272. 1832.

Large glabrous climbers; bark brown. Leaves elongate ovate to elliptic, tips obtuse acuminate, bases rounded. Flowers small, in short axillary cymes, fragrant, on short pedicels; bracts rounded. Calyx lobes rounded, thick, ciliated. Corolla salver-shaped, tube swollen in middle, lobes oblong, ciliated along veins. Stamens not exerted. Berry subglobose, yellow, with thick wrinkled rind; seeds numerous, ovoid, embedded in soft, fibrous acidic pulp.

D i s t r i b u t i o n.—East Pakistan (Chittagong), India (Assam), Burma, Thailand, Malay Peninsula.

E c o l o g y.—Common in dry-evergreen forest. Flowers and fruits in September.

V e r n a c u l a r.—Katang katiu (กะตังกะต้าว) (Central); phlopho (โพลโฟ) (Kanchanaburi/Karen); khui nang (ขุ่ยหนัง) (Rayong); khui chang (ขุ่ยชาง) (Kabin Buri); tangtu khrua (ตังกตุเคื้อ) (Lampang).

#### 2. ERVARTAMIA STAFF

E. cf. garcinifolia (Pierre ex Pitard) Kerr, Fl. Siam. Enum. 2: 444. 1939. Tabernaemontana garcinifolia Pierre ex Pitard in Lec., Fl. Gen. Indo-China. 7: 1144, 1933.

Shrub with pale bark. Leaves stipulate, elliptic lanceolate, tips acuminate caudate, bases cuneate, slightly decurrent on short slender petiole, glabrous, nerves arched and ascending. Inflorescences at tips

of branches, branches dichotomous usually 6-flowered at tips. Flowers large. Calyx bell-shaped with linear lanceolate lobes, small. Corolla salver-shaped, tube slender dilated near middle, lobes obovate, yellow. Stamens at throat, subsessile. Ovary globose very short, style long. Follicles short and thick resembling gaping red mouth of betel eater.

D i s t r i b u t i o n.—South Vietnam, Thailand.

E c o l o g y.—Uncommon in dry-evergreen forests.

V e r n a c u l a r.—Prik takat (พริกตะกาท) (Trat).

### 3. HOLARRHENA R. BR.

H. antidysenterica Wall., Hook. f., Fl. Br. Ind. 3: 644. 1882; Kurz, For. Fl. Br. Bur. 2: 182. 1877.

Small bushy deciduous tree, 8 m high; barks pale grey. Leaves elliptic or ovate oblong to oblanceolate, tips shortly obtuse acuminate, base obtuse; surfaces glabrous above, velvety pubescent below, nerves arched; petioles short. Flowers white with yellow centres, fragrant, in lax terminal subsessile many-flowered corymbose cymes; bracts small. Calyx lobes lanceolate, glandular at base. Corolla salver-shaped, tube slightly inflated at base. Anthers mucronate, subsessile. Follicles terete, slightly curved, terulose, dotted with white flecks; seeds numerous, brown, with tuft of silky brown hair (Figure 19).

D i s t r i b u t i o n.—India, Burma, Laos, Cambodia, Thailand.

E c o l o g y.—Trees rare in dry deciduous forests. Flowers and fruits in April.

V e r n a c u l a r.—Mok yai (โมกใหญ่) (nok luang (โมกหลวง) (Central); mukman luang (มุกมันหลวง) (Northern); nam nuea (นวมเหนือ) (Northern Shan); phokae (พอก) (Mae Hong Son/Karen); phuttha raksa (พุทธรักษา) (Phetchaburi).

U s e.—Bark commercially used; bark and seeds medicinal for dysentery and as tonic. White soft even grained wood used for carvings and household articles. Tree effective for reclaiming waste lands.

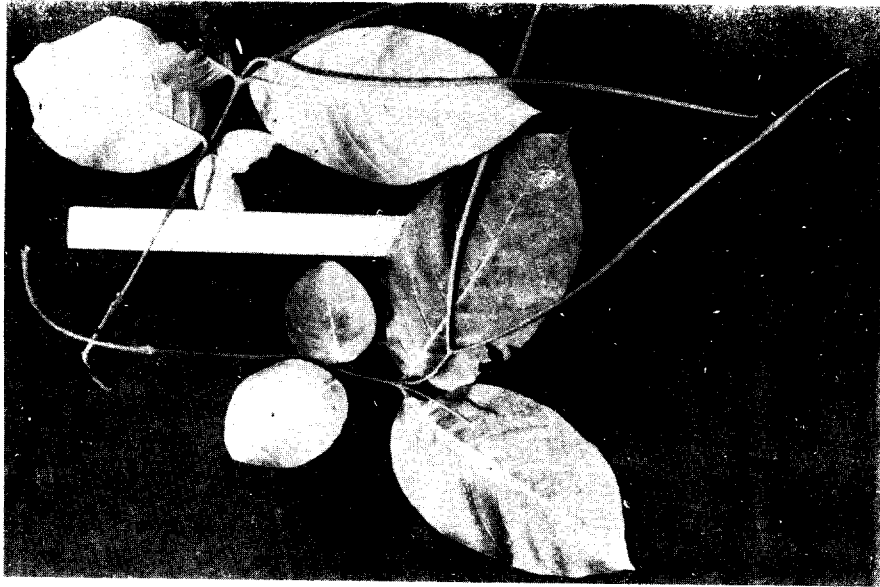


Figure 19. Holarrhena antidysenterica Wall.

#### 4. WRIGHTIA R. BR.

W. pubescens R. Br., Mem. Wern. Soc. 1: 73. 1809; Pichon, Nat. Syst. 14: 83. 1956; W. javanica A. DC., Prod.; Ridl., Fl. Mal. Pen. 2: 353. 1923.

Shrub 6 m high with rough bark, cord-like branches and broad nodes. Leaves elliptic or ovate-elliptic, tips abruptly acuminate, bases obtuse; surfaces pubescent above, tomentose below; petioles short. Flowers in terminal, many-flowered cymes. Calyx lobes ovate with scales. Corolla white, salver-shaped, tube short, lobes oblong, corona scales 10-lobed. Stamens at top of tube, anthers stiff. Follicles green, terete, rough, 30-36 cm long; seeds narrow, with tuft of hair at base.

D i s t r i b u t i o n.—India, Thailand, Malay Peninsula, Indonesia (Java), Philippines, Laos, South Vietnam, Cambodia, South China (Hainan).

E c o l o g y.—Not frequent in dry-evergreen forests.

V e r n a c u l a r.—Muk (มุก), mok (หมอก) (Central); makman (มุกมัน) (Surat Thani).

## 5. KYLINABARIA PIERRE

X. minutiflora Pierre, Bull. Soc. Lin. Par. 20. 1898; Pitard in Lec., Fl. Gen. I.-C. 4: 1204, f. 134, p. 1202. 1933.

Liana with pubescent younger parts. Leaves elliptic, tips cuspidate, bases rounded and subcordate; semi-coriaceous, nerves impressed above, arched at border; petioles short. Flowers in groups of 3-5 in terminal cymes. Calyx lobes ovate, obtuse. Corolla nearly bell-shaped, lobes lanceolate. Stamens near base of tube, filaments short, anthers oblong sagittate. Follicles green, oblong ovoid, acuminate with white flecks, stalked; seeds oblong with tuft of silky hair at apex.

D i s t r i b u t i o n.—Thailand, Laos, Cambodia.

E c o l o g y.—Scattered in dry-evergreen forest.

V e r n a c u l a r.—Thaomak Khao (หมากขาว) (Nakhon Ratchasima).

## 6. BEAUMONTIA WALL.

B. brevituba Oliv., Hook. Ic. Pl. t. 1582. 1887; Craib, Fl. Siam. En. 2: 475. 1939.

Large woody climber with milky juice; younger parts rusty pubescent. Leaves opposite, decussate, broadly elliptic to oblong, bases slightly oblique, broadly acute, abruptly shortly acuminate at the apex, glabrous on both surfaces, 10-20 5.8-12 cm. Flowers in terminal cymes, 4-11 flowered, large, white, showy, 5-merous; pedicels finely rusty pubescent. Calyx deeply divided, segments large, broadly elliptic, finely puberulous. Corolla funnel-shaped, tube short, limb widely campanulate, finely puberulous outside, 5.5-8 cm long, when expanded 9-13 cm broad. Stamens inserted at the top of the narrow basal part of the corolla; filaments arcuate, anthers adhering to the stigma, sagittate. Ovary 1, included by the annular disk, glabrous, 2-celled, numerous-ovuled. Follicles oblong, 30 x 5 cm; seeds compressed, narrowed towards the top, comose.

D i s t r i b u t i o n.—Laos, South China (Hainan), North Vietnam, Thailand.

E c o l o g y.—Not common on rocky ground in dry-evergreen forest.

V e r n a c u l a r.—Hiranyika (หิรัญยิกา).



7. AGANOSMA G. DON

A. marginata G. Don, Hook. f., Fl. Br. Ind. 3: 633. 1882.

Large scandent climber with twisted stems and stout warty branches; younger parts pubescent. Leaves linear oblong or elliptic to lanceolate-oblong, tips bluntly acuminate, rounded at base, glabrous above, puberulous especially on nerves below, lateral nerves elevate below, joined by a prominent looped intramarginal nerve far away from the margin. Flowers in terminal or axillary cymes. Calyx lobes acuminate. Corolla tube slender with villous bands, lobes twice as long. Follicles brown, terete, elongate up to 65 x 8 cm; seeds black, linear, with tuft of long hairs at blunt tip (Figure 20).

D i s t r i b u t i o n.--India (Assam), Thailand, Laos, Vietnam, Cambodia, South China (Hainan), Malay Peninsula.

E c o l o g y.--Uncommon in dry dipterocarp forests.

V e r n a c u l a r.--Madua din (มะเคื่อกิน), madua thao (มะเคื่อเดา) (Ratchaburi); sai tan (ไส้ตัน) (Nakhon Ratchasima); yanduai bit (ย่านเคื่อยบีด)



Figure 20. Aganosma marginata G. Don.

(Surat Thani); duadip (เค็ดคิม), duadin (เค็ดคิม) (Northern and Peninsula  
 duakhruea (เค็ดเคว็ด), duathao (เค็ดอูเถา), duamai (เค็ดไม), mokhruea  
 (โมกเคว็ด) (Northern); mai pit (ไมพิต) (Central).

#### ASCLEPIADACEAE

Terrestrial or epiphytic herbs or shrubs, usually climbing or twining, with milky latex, mostly unarmed. Leaves simple, opposite, rarely verticillate, thin or fleshy sometimes sac like; exstipulate or with minute stipules. Flowers often very waxy, in umbelliform or paniculiform cymes borne in between petioles of leaf pair. Calyx small, 5-lobed with basal glandular scales. Corolla rotate, bell- or urn-shaped, with short tube, lobes 5, valvate; corona staminodal or attached to corolla or to both, sometimes hairy. Stamens 5, joined with style to form angular or star-like mass in centre of flower, filaments connate or free; anthers appressed against stigma after cohering with it to form a dome covering ovary and styles, often with apical membrane and anther wings; cells 2, with pollen forming 1-2 masses in each cell. Ovary superior, 2, mostly free 1-celled; ovules numerous; styles 2, short; stigmas large, usually 5-angled. Follicles 2 or 1, divaricate; seeds numerous, compressed, often marginal, crowned with tuft of white hair at one end.

Four genera found at Sakaeat.

#### Key to the genera

1. Twining herbs or shrubs. Leaves opposite, flat, membranous, usually with trichomes.
2. Corolla urn- or bell-shaped, lobes 5-fid. Flowers small clustered in short corymbs. Follicles 5-6 cm long with few seeds. Leaves bluish below 1. Marsdenia
2. Corolla salver or funnel shaped, lobes 5-partite. Cymes lax with few small or large flowers. Follicles 7-15 cm long with numerous seeds. Leaves not bluish below.
3. Shrubs with tomentose hairs. Leaves obovate. Flowers small.  
 Corolla rotate, lobes overlapping to right; corona in single row,

anthers with apical membrane; pollinia in 2 masses in each cell

2. Streptocaulon

3. Herbs puberulous. Leaves narrow, lanceolate. Flowers large, solitary or in peduncled cymes. Corolla funnel-shaped, lobes not overlapping; corona double; anthers without apical membrane; pollinia solitary

3. Ceropegia

1. Fleshy epiphytic herbs with climbing stems

4. Leaves verticillate or opposite, either flat or sac like; flowers in short spikes

4. Dischidia

4. Leaves opposite, obovate, fleshy not sac-like; flowers in umbels

5. Hoya

1. MARSDENIA R. BR.

M. glabra Cost. in Lec., Fl. Gén. I.-C. 4: 96. 1912.

Slender climber with branched stem. Leaves elliptic with obtuse or acute tips, blunt or rounded bases, membranous, velvety, lower surfaces bluish, nerves obliquely arched, ascending and interlacing; petioles slender. Corymbs axillary on short stalks. Flowers white. Calyx lobes ovate rounded. Corolla urn-shaped, lobes broad, throat with silky hair; corona scales minute. Membranous tip of anthers over-arching stigma. Follicles green, shining, puberulous; seeds flat elliptic, with tuft of hair 2 cm long.

D i s t r i b u t i o n.—Laos, Thailand, South Vietnam.

E c o l o g y.—Scattered and common in dry-evergreen forests.

V e r n a c u l a r.—Thao phaksaew (เถาผักเสี้ยว) (Saraburi); thaowan dam (เถาวัลย์ดำ) (Prachuap Khiri Khan).

2. STREPTOCAULON W. & A.

S. juvenis (Lour.) Merr. in Trans. Am. Phil. Soc. n.s. 24. 2: 315. 1935.

Lacticiferous vines, rusty tomentose. Leaves broadly elliptic to elliptic-ovate, tips cuspidate, rounded or sub-cordate at base, membranous, scaberulous above, pubescent along midrib, densely pale brown pilose-tomentose below, nerves oblique, parallel. Follicles lanceolate, green, finely hairy, 7.5-10.5 cm long; seeds oblong, black with tuft of

hair 5 cm long (Figure 21).

*D i s t r i b u t i o n.*—Burma, Thailand, Laos, Vietnam, Cambodia, China.

*E c o l o g y.*—Common on ridges of hills in dipterocarp forests, scattered in dry dipterocarp forests.

*V e r n a c u l a r.*—Nuainang (หนอยนิ่ง), thao chuk rohini (เถาจุกโรหิณี) (Chumphon); thao prasong (เถาประสงค) (Prachin Buri); yang samut (หยงสมุทร), yang samut noi (หยงสมุทรน้อย) (Chiang Mai); thao tamyan rak hom (เถาตำยานรากหอม) (Central).

### 3. CEROPEGIA LINN.

*C. sootepensis* Craib in Kew Bull. Misc. Inf. 1911: 420 et Fl. Siam. Enum. 3: 50. 1951; Cost in Lec., Fl. Gén. I.-C. 4: 152.

Scandent slender creeper. Leaves narrowly linear-lanceolate, acuminate, chartaceous, puberulous above. Cymes few-flowered on short peduncles. Calyx small. Corolla lobes lanceolate with dilated tips; corona obtuse, notched. Follicles terete, slender, lanceolate, greenish red, 15 cm; seeds oblong; comma 2.5-3.5 cm.

*D i s t r i b u t i o n.*—Endemic to Thailand.

*E c o l o g y.*—Scattered on hill slopes in dry dipterocarp forests.

*V e r n a c u l a r.*—Wan sam phi nong (วานสามพี่น้อง) (Nakhon Ratchasima); mamui doi (มะมุยกอย), makhua chae din (มะเขือแจจกีน) (Chiang Mai).

### 4. DISCHIDIA BR.

*D. rafflesiana* Wall., Ridl. Fl. Mal. Pen. 2: 403. 1923; Hook. f., Fl. Br. Ind. 4: 51. 1885.

Epiphyte with milky juice, creeping and rooting on trees, often pendulous. Leaves clustered, coriaceous, sessile, yellowish with purple underside, of 2 types, flattened and orbicular, or pitcher-like, compressed, oblong, blunt, mouth downwards with roots from nodes inside. Racemes short, umbelliform, 6-8-flowered. Flowers yellowish or greenish red. Calyx lobes lanceolate, hairy. Corolla yellow, urn-shaped, fleshy,

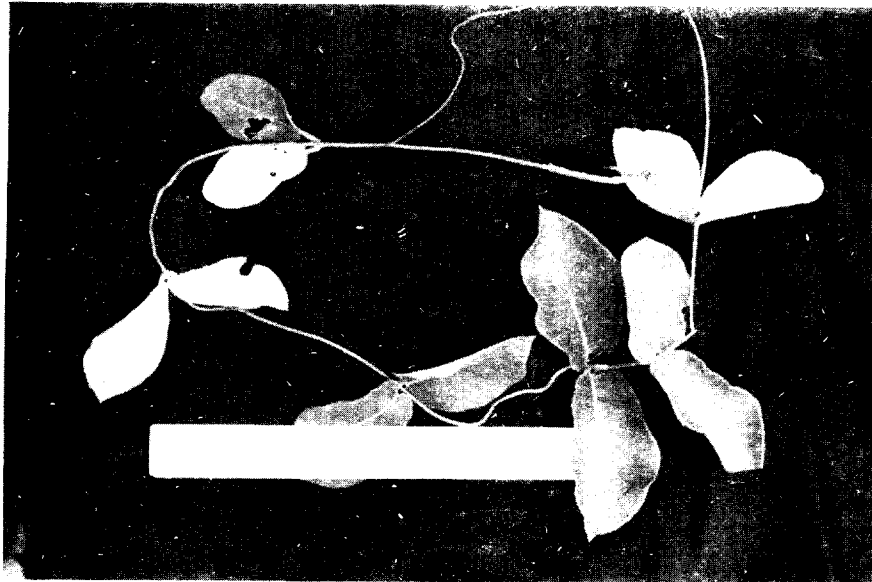


Figure 21. Streptocaulon juvenus (Lour.) Merr.



Figure 22. Hoya kerrii Craib.

lobes villous; corona 2-lobed. Follicles narrow, curved, tapering at ends, orange yellow with thin skin, 8-10 cm; seeds angled, winged, with tuft of hair 2.5 cm long.

D i s t r i b u t i o n.—Burma, Thailand, South Vietnam, Malay Peninsula, Java, Borneo, Australia.

E c o l o g y.—Common on trees in dry-evergreen forests.

V e r n a c u l a r.—Chuk karohini (จุกกะโรหิณี), kot phung pla (โคงพุงปลา) (Central); kluai mai (กล้วยไม้) (Northern); buap lom (บัวปลม) (Nakhon Ratchasima, Ubon Ratchathani); phung pla (พุงปลา) (Chanthaburi, Trat); thao phung pla (เตาพุงปลา) (Rayong); kluai musang (กล้วยมูสัง) (Phang Nga); churuhini (จุกหิณี) (Chumphon); nom tamrai (นมตำไร) (Chanthaburi).

#### 5. HOYA B. ER.

Hoya kerrii Craib, Kew Bull. Misc. Inf. 1911: 418; Bot. Mag. 146, t. 9322, 1933. Hoya obovata Dene. var. kerrii Cost. in Lec., Fl. Gén. I.-C. 4: 130, Fig. 18. 1912.

Epiphytic plant, creeping on tree trunk; all parts with milky latex. Leaves simple, opposite, fleshy, obovate, glabrous, margin curved downwards. Flowers waxy, white with pink centre, many in axillary umbels. Follicles a pair of slender capsules, longitudinally split; seeds small, numerous with tuft of silky hairs at the top (Figure 22).

D i s t r i b u t i o n.—Laos, Thailand, South Vietnam.

E c o l o g y.—Frequent in the dry deciduous dipterocarp forests, on trees and rocks.

V e r n a c u l a r.—Dang (ดาง) (Nakhon Phanom); tang (ตาง) (Ubon Ratchathani).

## CONNARACEAE

Trees, shrubs often scandent. Leaves alternate, exstipulate, imparipinnate, rarely unifoliolate. Flowers in axillary glomerules or fascicles or terminal panicles, bisexual, rarely unisexual, hypogynous. Sepals (4-) 5 usually free. Petals (4-) 5 free. Stamens free or coherent at the base, all fertile or some sterile. Carpels 1-5 distinct, 2 ovulate. Fruits dehiscent with 1 arillate seed.

Four genera found at Sakaerat.

### Key to the genera

- |  |                       |
|--|-----------------------|
| 1. Leaves unifoliolate. Seeds with endosperm     | 1. <u>Ellipanthus</u> |
| 1. Leaves many leaflets. Seeds without endosperm |                       |
| 2. Carpel 1 per flower                           | 2. <u>Connarus</u>    |
| 2. Carpels more than 1 per flower                |                       |
| 3. Leaflets emarginate at the apex               | 3. <u>Roureopsis</u>  |
| 3. Leaflets acuminate - caudate at the apex      | 4. <u>Rourea</u>      |

### 1. ELLIPANTHUS HOOK. F.

Ellipanthus tomentosus Kurz, J. Asiat. Soc. Beng. 41: 305. 1872; Craib, Fl. Siam. En. 1: 366. 1928. E. cinereus Pierre in Lec., Fl. Gén. I.-C. 2: 55, f. 7. 1908. E. subrufus Pierre in ibid. 2: 56. 1908.

Small tree. Leaves coriaceous, elliptic to lanceolate, 6-15 by 3-6 cm, rounded to narrowed at base, obtuse to acuminate at apex, tomentose beneath, especially on the nerves, petiole 0.5-1 cm long. Inflorescences glomerulate to racemose, few-flowered, densely pilose. Flowers mostly bisexual and 5-merous. Sepals ovate, blunt or acute, pilose outside, glabrous inside. Petals white to cream, twice as long as the sepals, pilose outside, glabrous inside. Petals white to cream, twice as long as the sepals, pilose outside, tomentose inside. Stamens and staminodes glabrous except at base. Fruits short stipitate (5-10 mm long), ventral suture smooth (Figure 23).

D i s t r i b u t i o n.—Lower Burma, Cambodia, Laos, South Vietnam, Malay Peninsular, Sumatra.

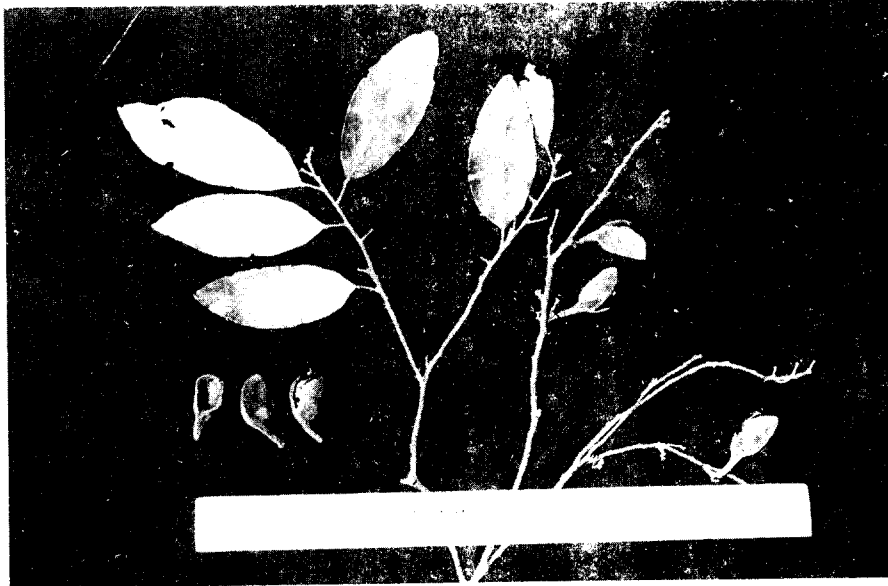


Figure 23. Ellipanthus tomentosus Kurz .

**E c o l o g y.**—Infrequent in mixed deciduous and dry deciduous dipterocarp forests. Flowers from February to March. Fruits from April to June.

**V e r n a c u l a r.**—Hamfan (พ่าพ่าน), má un khikai (ไม้ฮุ้นขี้ไก่), pradong luat (ประดองเลื้อย) (Northern); chan nok kot (จันทนกก), chang nao (ช้างนาอ), ta nok kot noi (ตานกกคนอย) (Eastern); karok daeng (กะโรกแดง) kham rok (คำรอก), ma tai thak lak (มะต้ายพ่าลาค) (South-eastern).

## 2. CONNARUS LINN.

Connarus semidecandrus Jack, Mal. Misc. 2(7): 39. 1822. C. griffithii Hook. f., Fl. Br. Ind. 2: 52. 1876. C. mekongensis Pierre, in Lec., Fl. Gén. I.-C. 2: 53. 1908. C. amplifolius Pierre, in ibid.

Liana or scandent shrub, sometimes a small tree. Leaves 3-7-foliate, glabrous or minutely pubescent; leaflets elliptic to lanceolate, 4-25 by 2-9 cm, cuneate to rounded at base, blunt to acuminate at apex. Panicles terminal and subterminal, broad, up to 35 cm long, ferruginous



or fulvous tomentose. Sepals ovate, or elliptic, tomentose outside, glabrous inside. Petals lanceolate to linear, 3-7 mm, blunt, glabrous outside except margins and apex, ± glandular punctate. Fruits 1.5-3.5 by 1-2 cm, stipe 5-15 mm; pericarp thin, glabrescent outside, pubescent inside.

D i s t r i b u t i o n.—Burma, Cambodia, Laos, South Vietnam, Malay Peninsula, Sumatra, W. Java, Micronesia, Melanesia.

E c o l o g y.—Scattered in dry-evergreen forest. Flowers from June-July.

V e r n a c u l a r.—Khang daeng (ขางแดง), khang khao (ขางขาว), khang nam khrang (ขางน้ำครึ่ง), khi ai khrua (ขี้ายเคี้ยว), thopthaep (ตอปปอ), thopthaep khrua (ตอปปอเคี้ยว) (Northern, North-eastern, Peninsular); champho (จำเพาะ) (Central); kalampho (กะลำเพาะ), mai lampho (ไมลำเพาะ), tongtin (ตองตั้น) (South-eastern); lapho (ลาโพ), mak song (หมากสง) (Peninsular).

U s e s.—Young shoots are probably eaten as a vegetable, as they are in neighbouring countries, Cambodia, Laos, Vietnam.

### 3. ROUREOPSIS PLANCH.

Roureopsis stenopetala (Griff.) Schellenb.; Kew Bull. 1927: 375; Craib, Fl. Siam. En. 1: 362. 1928. Rourea stenopetala Hook. f., Fl. Br. Ind. 2: 49. 1976.

Liana or scandent shrub. Leaves 11-21-foliolate, rachis pubescent, leaflets subsessile; the lateral ones oblique, cuneate at base, truncate - emarginate at apex; the terminal one elliptic, 1-2.5 by 0.5-1.5 cm, stiff chartaceous, glabrous except on the midrib. Racemes very short (up to 8 mm). Sepals ovate acute, 3 mm, villous at the tip. Petals very narrow, 8 mm. Stamens slightly connate at the base. Carpels sparsely pilose. Fruits 1.5 cm, glabrous.

D i s t r i b u t i o n.—Burma, Laos, Cambodia.

E c o l o g y.—Very common in dry-evergreen forest. Flowers in February - March. Fruits in May - June.

V e r n a c u l a r.—Makham khrua (มะขามเครือ) (Northern, Eastern);  
man kham (มันขาม), yan kham (ขามขาม) (Peninsular).

U s e s.—In local medicine the infusion of stem and leaves is  
used as a tonic.

#### 4. ROUREA AUBL.

Rourea minor (Gaertn.) Leenh. in Fl. Mal. 1. 5: 514. 1958; Santaloides  
rubellum Schellenb., Craib, Fl. Siam. En. 1: 361. 1926; S. siamensis  
Schellenb., Craib, ibid.

Liana or shrub. Leaves 3-11-foliolate, rachis glabrous, lateral  
petiolules 2-6 mm; leaflets suborbicular or ovate to lanceolate, 5-10 by  
1-3 cm, glabrous; base equilateral to oblique, acute to cordate; apex  
obtuse to acuminate-caudate. Inflorescences racemose, or paniculate in  
axillary or pseudo-terminal fascicles of 1-5, axes unequal in length up  
to 8 cm, glabrous. Sepals 2-3 mm, tomentose to glabrous. Petals 4-7 mm  
long. Carpels pubescent to glabrous. Fruits usually recurved, blunt to  
acute, 1-3 by 0.5-1 cm, dehiscent by a ventral slit.

D i s t r i b u t i o n.—Ceylon, S. & E. India, SE. Asia, Andaman  
and Nicobar Is., Malay Islands, NE. Queensland, New Caledonia, New  
Hebrides, Fiji, Samoa.

E c o l o g y.—Scattered in dry-evergreen forest. Flowers from  
April to July.

V e r n a c u l a r.—Khang daeng (ขางแดง)(Northern); thopthaep  
(ถอปถอป) (Peninsular).

#### DILLENACEAE

A family of trees or climbers. Leaves simple, spirally arranged,  
generally large, toothed, with close and many parallel veins; stipules  
absent. Flowers large, showy, solitary or in panicles. Sepals 4-5,  
imbricate, large, fleshy, persistent. Petals 4-5, yellow or white,  
large, imbricate, caducous. Stamens numerous, narrow, needle-like,  
crowded, free. Ovary superior of 1-11 more or less separate parts (car-  
pels), each with a distinct style. Fruit or follicles or indehiscent  
and baccate, with many seeds; seeds arillate, albumen fleshy, embryo

minute.

Only 2 genera and 3 species found at Sakaerat.

Key to the genera

Scabrid climber. Flowers small in panicles, scented 1. Tetracera  
Flower large solitary or 2-3 on short twigs 2. Dillenia

1. TETRACERA LINN.

Only 1 species found at Sakaerat.

Tetracera scandens (Linn.) Merr., Backer & Bakh. f. Fl. Java 1: 277.  
1963.

Scabrid climbers. Leaves elliptic-obovate to oblong, shallowly crenate-dentate or subentire, very rough on both surfaces, 9-19 cm by 3.5-8 cm; petiole 1-2 cm. Panicles many-flowered, covered with sparsely long soft hairs. Sepals 4-5, about 0.3 cm long. Petals 0.3-0.4 cm long. Stamens 0.3-0.5 cm long; filament white. Carpels 1-2. Follicles obliquely ovoid.

D i s t r i b u t i o n.—Thailand, Malaysia, Indonesia.

E c o l o g y.—Very common in the dry-evergreen forest.

V e r n a c u l a r.—Rotsukhon (โรตสุกหิน).

2. DILLENIA LINN.

Key to the species

Flowers solitary at the end of the twigs, fully foliage while blooming.

1. Dillenia ovata

Flowers solitary axillary or rarely 2-3 together on short twigs, appearing before or with new leaves

2. Dillenia obovata

1. Dillenia ovata Wall. ex Hook. f., & Th., Fl. Br. Ind. 1: 70. 1855;  
Backer & Bakh. f., Fl. Java 1: 279. 1963.

Evergreen bushy trees. Twigs, leaves and flower buds softly hairy. Leaves 14-25 by 8-13 cm, obovate, blunt or slightly tipped, glabrous or

pubescent on the nerves above, softly pubescent beneath, edge finely toothed. Flowers large, 10-13 cm wide, solitary on slender hairy stalk on the leafy twigs at or near the ends. Petals yellow. Carpels 9-11. Fruits indehiscent, 6-8 cm wide, rounded, dull yellow when ripe; seeds smooth, blackish brown (Figure 24).

D i s t r i b u t i o n.—India, Thailand, Cambodia, Malaysia, Indonesia.

E c o l o g y.—Uncommon on the plains in dry deciduous dipterocarp forest.

V e r n a c u l a r.—San dode (सानโดเด), ta nok krot (ตานกกรวด) (North-eastern); san thung (सानตุง), san kwang (सानกวาง) (Peninsular).

2. Dillenia obovata (Bl.) Hoogl., Backer & Bakh. f., Fl. Java 1: 279. 1963.

Small deciduous trees. Leaves obovate or obovate-oblong, 15-30 by 7-15 cm; petiole 2-3.5 cm long. Flowers solitary or sometimes 2-3 together on defoliate branches, usually coming up before mature leaves, about 11-15 cm wide. Petals yellow. Carpels 6-12, usually 9-11. Fruits indehiscent 4-6 cm wide, green when young (Figure 25).

D i s t r i b u t i o n.—Thailand, Indonesia.

E c o l o g y.—Common on the gentle slope of hills in dry deciduous dipterocarp forest.

V e r n a c u l a r.—San luang (सानหลวง), san yai (सानใหญ่), san (แสน).



(a)



(b)

Figure 24. *Dillenia ovata* Wall. ex Hook. f. & Th.  
(a) bark, (b) leaves and fruits.

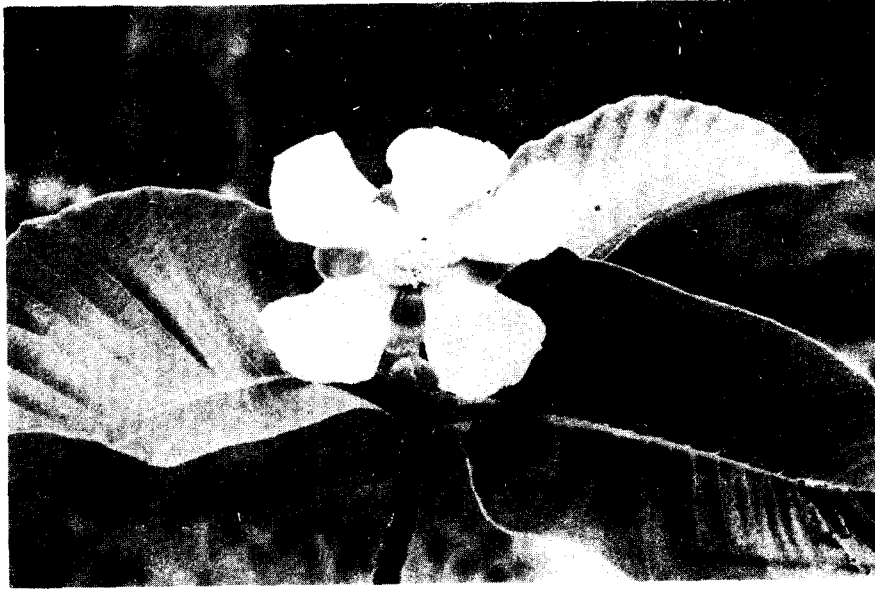


Figure 25. Dillenia obovata (Bl.) Hoogl.

#### EBENACEAE

A family with only one genus, DIOSPYROS is widespread in Asia.

#### DIOSPYROS LINN.

Dioecious trees. Leaves alternate, petiolate. Flowers axillary, cymose, fascicled or solitary. Calyx more or less deeply lobed, persistent, accrescent, lobes valvate or imbricate in bud. Corolla urceolate or tubular. Stamens 12-30, free or adnate to the base of the corolla; anthers basifixed, 2-celled, longitudinally dehiscent; rudimentary ovary present in male flower; staminodes usually present in female flowers. Ovary 3-10-celled; cells with 1-2 pendulous ovules; styles 1-5. Fruit berry with coriaceous pericarp, 3-4-6-8-seeded.

At the present only 4 species are found at Sakaerat, two in the dry deciduous dipterocarp forest and other two in the dry-evergreen forest.

Key to the species

1. Inflorescence sessile or subsessile
  2. Sepals and petals 3 lobes (in dry deciduous dipterocarp forest) D. castanea
  2. Sepals and petals 5 lobes (in dry-evergreen forest) D. oblonga
1. Inflorescence pedunculate
  3. Stamens not exceeding 16 in number; leaves at most 12 by 6 cm, submembranaceous (in dry-evergreen forest) D. montana var. cordifolia
  3. Stamens more than 18 in number; leaves up to 30 by 21 cm, coriaceous (in dry deciduous dipterocarp forest) D. ehretioides

Diospyros castanea (Craib) Fletcher, Kew Bull.: 382. 1937 et in Craib, Fl. Siam. Enum 2: 366. 1938. Maba castanea Craib, Kew Bull.: 432. 1915; Lecomte, Fl. Gén. I.-C. 3: 978. 1930. Diospyros bracteata (non Roxb.) Fletcher Kew Bull.: 382. 1937 et in Craib, Fl. ibid. 2: 382. 1937.

Medium-sized tree, young parts greyish pubescent, then glabrescent. Leaves ovate to ovate-oblong sometimes elliptic or sub-rhomboid, 5-13 by 5-8 cm, coriaceous, rounded or obtuse base, rounded or obtuse or acute apex, glabrescent on both side; transverse nerves few; petioles sub-cylindric or groove on the upperside, about 0.5 cm long, glabrescent. Inflorescence sessile. Male flowers about 1 by 0.5 cm. Sepals companulate, 3-lobed, densely pubescent on both sides. Petals sub-salver-shaped, 3-lobed, pubescent on both sides. Stamens 12, + glabrous. Rudimentary ovary with few hairs. Female flowers not seen. Fruits ellipsoid; 2.2 by 2 cm, adpressedly pubescent near base then glabrescent; fruiting calyx broadly companulate, 3-lobed.

D i s t r i b u t i o n.—Thailand (type).

E c o l o g y.—In dry deciduous and dry-evergreen forests, alt. 100-300 m.

V e r n a c u l a r.—Lang dam (หลังดำ) (Loei); tako phanom (ตะโกพนม) tap tao (ตั้มเตา) (Uttaradit); lang dam (หลังดำ), nang dam (หนังดำ) (Nakhon Ratchasima).

U s e s.—Fruits for dying nets and clothes. Wood for posts and poles.

Diospyros ehretioides Wall. ex G. Don, Syst. Gard. 4: 40. 1837; Hiern, Trans. Cambr. Phil. Soc. 12: 116. 1873; Kurz, Fl. Burm., 2: 234. 1877; Clarke in Hook. f., Fl. Br. Ind. 3: 559. 1882; Lecomte, Fl. Gén. I.-C. 3: 925. 1930; Fletcher in Craib, Fl. Siam. En., 2: 368. 1938. Diospyros putii Fletcher, Kew Bull.: 388. 1937 et in Craib, *ibid.* 377.

Tree, young parts pubescent then glabrescent. Leaves ovate to broadly ovate, 7-30 by 5-21 cm, coriaceous, obtuse or truncate or cordate base, obtuse or rounded apex, ± pubescent beneath, glabrescent above; midrib ± depressed, prominent beneath; lateral nerves 8-12 pairs, ascending; transverse nerves conspicuous on both sides; petioles 1-1.8 cm long, sub-terete, peduncles pubescent. Male flowers in cyme, 0.5-1 by ± 0.5 cm. Calyx broadly campanulate, 4-lobed, pubescent. Corolla campanulate, 4-lobed, tube twice as long as petals. Stamens 20-22-29 (usually 20), subequal, glabrous. Rudimentary ovary with few hairs. Female flowers usually solitary. Ovary 6-8 celled. Fruits globose, ± 2 cm diam. (Figure 26).

D i s t r i b u t i o n.—Burma (type), Cambodia, Thailand.

E c o l o g y.—In dry deciduous dipterocarp forest; alt. 100-500 m.

V e r n a c u l a r.—Mamang (มะม่วง) (Nakhon Ratchasima); mafai phi (มะไฟผี) (Chiang Rai); mako pa (มะโกป่า) (Phrae); tap tao (ทับเต่า) (Chumphon, Chaing Mai, Kanchanaburi); tap tao luang (ทับเต่าหลวง) (Phitsanulok); huan kwang (เหือนกวาง) (Khon Kaen, Nakhon Ratchasima).

U s e s.—Fruits for dying nets, clothes, etc., and locally used as medicine. Wood for posts and poles.

Diospyros montana Roxb. var. cordifolia (Roxb.) Hiern, Bakh., Bull. Jard. Bot. Btzg., 3. 15: 203. 1938.

Small-sized tree, young part softy pubescent, then grabrescent; bark dark grey to black, flaky; branchlets with spines. Leaves obovate-oblong, 3.5-12 by 2-5.5 cm, submembraneous, cordate base, acute to obtuse apex, pubescent on both sides; nerves 3-8 pairs, not or rarely anatomose, subdepressed, prominent beneath basal nerves 3-5; petioles terete, about 0.5 cm long. Male flowers in racemes 0.5-0.8 cm long. Calyx broadly campanulate, 4-lobed, pubescent, about 0.3 cm diam. Corolla urceolate, about 0.4 cm diam. Stamens 16, in pairs, glabrous.





(a)



(b)

Figure 26. Diospyros ehretioides Wall. ex G. Don  
(a) bark, (b) leaves and fruits.

Rudimentary ovary with long hairs. Female flowers solitary 0.7-1.2 cm long. Staminodes 8 or 10, glabrous. Ovary 8-celled. Fruits globose about 2.5 cm diam; fruiting calyx 4, reflexed.

D i s t r i b u t i o n.—India, Burma, Malaysia, Indonesia, Philippines, Thailand.

E c o l o g y.—In dry-evergreen and mixed deciduous forests.

V e r n a c u l a r.—Tan dam (ถ่านดำ)(Nakhon Ratchasima).

U s e s.—Fruit for dyeing nets clothes, etc. Wood for posts and poles.

Diospyros oblonga Wall. ex G. Don, Hist. Dichl. 4: 40. 1838, excl. syn.; Hiern, Trans. Camb. Phil. Soc. 12: 243. 1873; Clarke in Hook. f., Fl. Br. Ind. 3: 569. 1882; Bidl., Fl. Mal. Pen. 2: 291. 1923; Bakh., Gard. Bull. S.S. 7: 179. 1933 et Bull. Jard. Bot. Btzg. Ser. 3. 15: 251. 1938; Fletcher in Craib, Fl. Siam. En., 2: 375. 1937.

Tree, young parts dark brown pubescent, then glabrescent; bark dark grey to black, flaky or cracked. Leaves oblong, 15-24 by 5-10 cm, sub-coriaceous, obtuse to sub-rounded base, acute to acuminate apex, glabrous, densely lenticellate; midrib flattened or slightly grooved above, prominent beneath; lateral nerves 12-18 pairs, conspicuous above, prominent beneath; lateral nerves 12-18 pairs, conspicuous above, prominent beneath; net veins conspicuous on both side; petioles sub-terete, about 1 cm. Inflorescence subsessile, pubescent. Male flowers yellowish-white, 1-1.5 cm long. Calyx campanulate with 5 long, narrow sepals. Corolla salver-shaped, 5-lobed, silky tomentose on the outer part, lobes as long as tube. Stamen 10-14-16-18 in pairs, glabrous. Rudimentary ovary pubescent. Female flowers 0.6-1.2 cm long; calyx and corolla as in male flowers. Staminodes 5, glabrous. Ovary 10-celled. Fruit 1.5-2.5 cm diam., sub-globose, laterally compressed, pubescent then glabrescent; fruiting calyx with 4-5 enlarged, oblong, reflexed lobes, covered with blackish hairs.

D i s t r i b u t i o n.—Burma, Thailand, Malaysia (type), Philippines.

E c o l o g y.—In dry-evergreen forest.

V e r n a c u l a r.—Thaying (ถ่านดำ)(Nakhon Ratchasima).

U s e s.—Fruits for dyeing nets and clothes; wood for posts and poles.

## GNETACEAE

This is a monogeneric family, GNETUM being the only genus.

### GNETUM LINN.

Long lianes, shrubs or trees. Leaves opposite, usually coriaceous. Flowers unisexual, in whorls within cup-shaped bracts and surrounded by hairs on simple or branched spikes. Male flowers perianth club-shaped, tubular. Stamen 1, anther 1-celled. Female flowers without perianth. Ovule ovoid or globular, inner intergument produced into a tube. Drapes pink or red.

At the present only one species is found in dry-evergreen forest at Sakaerat.

Gnetum macrostachyum Hook. f., Fl. Br. Ind. 5: 642. 1888; Ridl., Fl. Mal. Pen. 5: 274. 1925; Suvatabandhu in J. Nat. Res. Council Thailand, 2. 1: 62. 1961.

Woody climber. Leaves oblong to oblong-lanceolate, coriaceous, brown when dry, 14-16 by 4-5 cm; cuspidate apex, acute to rounded or sometimes sub-oblique base. Male and female inflorescence simple. Fruits sessile, ellipsoid, surrounded basally by very striking long brown hairs.

D i s t r i b u t i o n.—Indo-China, Thailand, Malaysia.

E c o l o g y.—Mostly by stream in dry-evergreen forest, alt. 200-500 m. Flowering between January - February and fruiting between February - March.

V e r n a c u l a r.—Muei duk (เมือยคูก) (Pattani); muei (เมือย), muai (มวย) (Trat, Nakhon Ratchasima); muai luat (มวยเลือด) (Nong Khai).

U s e s.—Seeds edible when roasted over the fire.

## ICACINACEAE

A pantropical family of evergreen trees or shrubs, and a few climbers or lianes, mainly in lowland. The Icacinaceae are not easily recognized owing to the lack of significant vegetative characters. The petals have inflexed tips. All have drupes, containing a single pendulous seed.

Only 2 genera found at Sakaerat.

### Key to the genera

Flowers unisexual, dicecious. Leaves turning brownish on drying

1. Gonocaryum

Flowers bisexual. Leaves turning blackish on drying

2. Apodytes

### 1. GONOCARYUM MIEG.

Gonocaryum lobbianum (Miers) Kurz., J. Asiat. Soc. Beng. 39. 2: 72. 1870; Craib, Fl. Siam. En. 1: 274. 1926. Gonocaryum subrostratum Pierre, Fl. For. Cochinch.: t. 268 B. 1892. G. siamense Warb., Fedde, Rep. Spec. nov. Regni. veg. 16: 254. 1919.

Shrub or tree, 2-7 m, bark smooth, grey to brown. Leaves oblong to elliptic, sometimes obovate-elliptic, apex shortly obtusely and rather abruptly acuminate, base cuneate to rounded, coriaceous, 10-16 by 3-8 cm; petioles 1-1.5 cm, yellow or greenish-yellow when fresh. Inflorescence 0.3-1.5 cm, sparsely appressedly hairy. Petals greenish-white 5-6 by 2 mm in the male flower. Drupe oblong-ellipsoid, rarely subovoid-oblong, 3-5 by 2-3 cm, both ends roundish or more attenuate, apex shortly apiculate or sub-rostrate, green for a long time, finally bluish-purplish or blackish, ribs of the endocarp in the dry fruit merely showing as very shallow grooves or low ribs.

D i s t r i b u t i o n.—China, Hainan, Lower Burma, N. & S. Vietnam, Laos, Cambodia, Malay Peninsula, Borneo.

E c o l o g y.—Common in dry-evergreen forest.

V e r n a c u l a r.—Kan luang (กานเหลือง), kham kiao ton (คำเกี้ยวตัน), dan mi (ดันมี) (Northern); di mi (ดีมี), madi khwai (มะดีควาย) (Eastern); putu buwae (ปลูบว) (Peninsular).

## 2. APODYTES E. MEYER ex ARN.

Apodytes dimidiata E. Meyer ex Arn. in Hook., J. Bot. Lond. 3: 155. 1840. A. cambodiana Pierre, Fl. For Cochinch.: t. 267. fig. A. 1892; Craib, Fl. Siam. En. 1: 273. 1926.

Tree, 8-15 m, bark rough, dark grey to brown, branchlets with sparse, oblong lenticels. Leaves of a bitter and astringent taste, oblong - to ovate-elliptic, apex mostly shortly acutely acuminate, rarely obtuse, base often unequal, acute or unilaterally obtuse-rounded, thin coriaceous, 6-13 by 3-6 cm; petioles 1-2 cm. Corymbs many-flowered, 3-8 cm diam. on the 1-3 cm long peduncle. Petals oblong, white to yellowish, fragrant, 5-6 mm. Ovary narrowly ovoid, densely to laxly pubescent. Drupe obliquely ellipsoid, compressed, veined, first dark purple, at full maturity blackish and shiny, c. 5 by 9 mm, with a large lateral succulent scarlet appendage.

D i s t r i b u t i o n.—Tropical and subtropical Africa, Ceylon, S. India, Burma, N. & S. Vietnam, Laos, Cambodia, China (Yunnan), Hainan, Malaysia.

E c o l o g y.—Uncommon in dry-evergreen forest.

V e r n a c u l a r.—Mak fak dong (หมักผักดอง) (General).

## IRVINGIACEAE

The family is monogeneric, IRVINGIA being the only genus.

## IRVINGIA HOOK. F.

Trees, with conspicuous, annular-scarred branchlets, stipules forming a curved, narrow, conical cap, enclosing the terminal bud. Leaves simple, alternate, petiolate. Panicles terminal or axillary. Flowers (4-) 5-merous. Stamens twice as many as petals. Ovary glabrous, 2-celled.

At the present only one species is found in Thailand.

Irvingia malayana Oliv. ex Benn. in Fl. Br. Ind. 1: 522. 1875; Nootboom in Fl. Mal. ser. I, 6(2): 225 Figs. 23, 24. 1962.

Tree, with irregular buttresses; bark greyish-brown, smooth or sometimes scaly. Leaves coriaceous, elliptic-oblong to lanceolate, slightly acuminate apex, broad-cuneate to rounded base, 8-20 by 2.5-9 cm; reticulate veins distinct on both sides. Stipules curved, enclosing the bud, up to 3 cm long. Flowers greenish-white or yellowish, pubescent. Calyx 5, sepals free, reflexed. Corolla 5, petals reflexed, 3 times as large as sepals. Stamens 10, free. Ovary conical, glabrescent, 1 mm high. Drupe ellipsoid, fleshy turning blackish when ripe; seeds woody (Figure 27).

D i s t r i b u t i o n.—Thailand, Indo-China, Malaysia.

E c o l o g y.—In deciduous and dry-evergreen forests, alt. c. 150-300 m. Flowering before or with new leaves, during March - April. Fruiting during April - May.

V e r n a c u l a r.—Kabok (กะบัก) (General); namuen (นมูเ็น) (Northern).

U s e s.—Wood for flooring, but not much esteemed due to its high silica content. Seeds containing fat which are edible and used in making soaps, wax and candles.

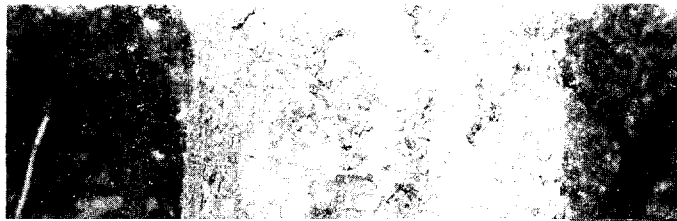
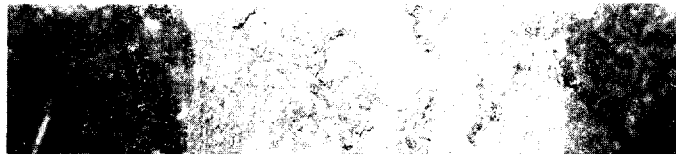
#### LAURACEAE

A family of trees or shrubs, mostly evergreen with aromatic tissues. Leaves simple, alternate, usually spiral, rarely opposite or sub-opposite, often crowded at the ends of branches, exstipulate. Flowers small, regular, greenish, white or yellow, arranged in racemes, panicles or in short clusters. Perianth 6 in 2 rows of 3. Stamens 6, 9 or 12 in 2-4 rows of 3 each, occasionally more; anther-cells 2 or 4, opening by valves. Ovary superior, free, 1-celled. Fruits small to large 1-seeded berry or drupe with pulpy rind, oblong or round and seated on, or more or less enclosed in, the persistent calyx; the rim of the fruiting calyx entire or with 6 lobes or teeth; seeds rather large.

Five genera and 7 species found at Sakaerat.



(a)



(b)



(c)

Figure 27. Irvingia malayana Oliv. ex Benn.  
(a) stem, (b) bark, (c) leaves and fruits.

Key to the genera

1. Flowers usually dioecious. Stamens all introrse 1. Litsea  
1. Flowers usually hermaphrodite. Stamens of 3 rows extrorse (or some  
extrorse and some introrse).  
2. Leaves opposite or sub-opposite. 2. Cinnamomum  
3. Leaves with 3 strong basal nerves. Fruits small, not more than  
1 cm long  
3. Leaves penninerved. Fruits big, 2-2.5 cm long 3. Beilschmiedia  
2. Leaves spirally arranged, rather crowded at the ends of the twigs  
4. Leaves obovate or elliptic-oblong, acute. Perianth deciduous  
4. Dehaasia  
4. Leaves lanceolate, acuminate. Perianth persistent enclosing the  
base of the fruit 5. Phoebe

1. LITSEA LAMK.

Leaves elliptic or elliptic-oblong, acute or rounded; petiole 2-3 cm  
long, glabrous or sparsely pubescent 1. Litsea sebifera

Leaves linear-lanceolate, acuminate; petiole short, 0.5-0.7 cm, densely  
tomentose 2. Litsea multiumbellata

1. Litsea sebifera Pers., Hook. f., Fl. Br. Ind. 5: 157. 1885; Kanj.,  
De & Das, Fl. Assam 4: 82. 1940.

Evergreen tree; bark greyish-brown, rough. Leaves elliptic or  
elliptic-oblong, acute or blunt, base narrowed, glabrescent above,  
pubescent beneath; petioles slender, 1.5-3.8 cm long, pubescent. Flowers  
in umbels, yellowish; peduncles pubescent. Fruits sub-globose, about  
0.7 cm across.

D i s t r i b u t i o n.—India, Burma, Thailand, Malaysia.

E c o l o g y.—Scattered in mixed deciduous and dry-evergreen  
forests. Flowering in June. Fruiting during July - August.

V e r n a c u l a r.—I men (อินเฒ่า) (Ratchaburi); mi men (หมี่เหม็น),  
mayoe (มะเเอ), yunyao (ยูนยอ) (Northern); thangbuan (ถังบัว) (Pattani);  
mue bo (ม่บอ) (Yala).



2. Litsea multiumbellata H. Lec., Fl. Gén. I.-C. 2: 113. 1914.

Small evergreen tree, bark greyish-white. Leaves crowded at the ends of the twigs, linear-lanceolate, 12-19 by 2.5-3.5 cm, acuminate; base cuneate, glabrescent above, brownish-yellow tomentose beneath; petioles short, 0.5-0.7 cm long, tomentose. Flowers in terminal umbels, densely covered with soft hairs. Fruits ovoid, about 0.9 cm long, seated on the persistent hairy perianth.

D i s t r i b u t i o n.—Laos, Cambodia, Thailand.

E c o l o g y.—Scattered in the dry-evergreen forest.

2. CINNAMOMUM BLUME

Key to the species

Leaves lanceolate-oblong

1. Cinnamomum iners

Leaves ovate

2. Cinnamomum cf. cinereum

1. Cinnamomum iners Bl., Hook. f., Fl. Br. Ind. 5: 130. 1855; Ridl., Fl. Mal. Pen. 3: 92. 1924.

Evergreen tree with dense, bushy, dull green, rounded or cylindrical crown; bark greyish-brown, rather smooth and even. All parts glabrous except for the finely hairy panicles. Bark and leaves smelling faintly of cinnamon. Leaves narrowly oblong, about 3 times as long as broad, acute, shining above. Panicles 13-25 cm long, with spreading branches and pedicels. Flowers white, unpleasant smell. Berry oblong, 0.9 cm long, base sunk in the perianth.

D i s t r i b u t i o n.—India, Burma, Thailand, Malaysia, Indonesia.

E c o l o g y.—Scattered by stream in dry-evergreen forest. Flowering in December - January.

V e r n a c u l a r.—Opchoei (อพบไชย), opchoei ton (อพบไชยตม), maha prap (มหาปราบ), chiat (ชัยค) (Central); fak dap (ฝักดาด) (Phitsanulok); kradang nga (กระดังงา) (Kanchanaburi); phaya prap (พญาปราบ) (Nakhon Ratchasima); hang kaeng (หางแกง) (Northern); kachae (กะแจะ), mong (โหมง), mong hom (โหมงทม) (Chon Buri).

2. Cinnanomum cf. cinereum Gamble, Kew Bull.: 220. 1910; Ridl., Fl. Mal. Pen. 3: 96. 1924.

Small evergreen tree. Leaves broader than those of C. iners, ovate, acute. Flowers and fruits not seen.

D i s t r i b u t i o n.—Thailand, Malaysia.

E c o l o g y.—Not frequent in the dry-evergreen forest.

V e r n a c u l a r.—Suramerit (สุรามะริต).

### 3. BEILSCHMIEDIA NEES.

Beilschmiedia sp.

Tree. Leaves opposite, elliptic, blunt or sub-acute, coriaceous, wholly glabrous. Flowers not seen. Fruits ovoid, 2.5 cm long, brownish black when dry, shining glabrous; perianth deciduous in fruits.

D i s t r i b u t i o n.—Thailand.

E c o l o g y.—Uncommon on the ridges of hills in dry-evergreen forest. Fruiting in March - May.

### 4. DEHAASIA BLUME

Dehaasia cf. caesia Blume., Backer & Bakh., Fl. Java 1: 131. 1963.

Evergreen tree. Leaves elliptic-oblong or obovate-oblong, acute, cuneate base; petioles slender, 2-3 cm long. Flowers small, white, peduncles, pedicels and perianth covered with thin short hairs.

D i s t r i b u t i o n.—Thailand, Indonesia.

E c o l o g y.—Very common on the ridges of hills in dry-evergreen forest. Flowering in February - March.

V e r n a c u l a r.—Hi men (หมี่หมื่น).

## 5. PHOEBE NEES

Phoebe lanceolata Nees., Hook. f., Fl. Br. Ind. 5: 141. 1885; Kanj., De & Das, Fl. Assam 4: 71. 1940.

Small tree, barks greyish, smooth; inside light brown. Leaves lanceolate, or elliptic-lanceolate, long acuminate, glabrous (or sparsely pubescent beneath on midribs); base cuneate; petioles slender, 1.2-2.5 cm long. Flowers in lax, long-peduncled panicles. Perianth cup-shaped. Berry ovoid or ellipsoid.

D i s t r i b u t i o n.—India, Burma, Thailand.

E c o l o g y.—Scattered on the ridges of hills in dry-evergreen forest. Flowering in June - July.

V e r n a c u l a r.—Tok suep (ตูกสูบ), pi tong (ปีตอง) (Chiang Mai); sirai khang khok (สีไทรกลางคอก), thop (ทอป) (Pattani).

## MOLLUGINACEAE (FICOIDEAE)

A family of annual or perennial shrubs, undershrubs or herbs. Leaves simple, opposite or subopposite or alternate or verticillate, slightly fleshy. Flowers small, regular, borne in cymes or false racemes. Tepals 4-5, free or slightly connate at base, imbricate, scarious or herbaceous. Stamens 5-10 or numerous, alternate with tepals, free or connate at base or in groups, external ones sometimes staminodal. Ovary superior, 2-5-celled, ovules 1-numerous. Capsule dehiscent loculicidally or transversally, usually surrounded by persistent perianth.

Only 1 genus found at Sakaerat.

## MOLLUGO LINN.

M. pentaphylla Linn., Ridl., Fl. Mal. Pen. 1: 867, f. 72, 868. 1922;

M. stricta Linn., Clarke in Hook. f., Fl. Br. Ind. 2: 663. 1876.

Slender, dichotomously branched, glabrous herb, often tinged with red-brown. Leaves in whorls of 3-5, unequal, linear-lanceolate, narrowed to base, acute at apex, reddish; subsessile. Cymes terminal or axillary with lax, racemose, slender branches. Flowers greenish on slender pedicels. Tepals 5, ovate-oblong, obtuse, margins white.

Stamens 3-5, filaments short. Ovary globose with white style. Capsule globose, sheathed by tepals; seeds numerous, reniform, tubercled, brown.

D i s t r i b u t i o n.—India to Japan, New Caledonia.

E c o l o g y.—Common on waste ground and sandy spots, found scattered on hill slopes in evergreen forests.

V, e r n a c u l a r.—Ya nok khao (ยาข่อย) (Chai Nat); ya khai hao (ยาไทร) (Northern); soi nok khao (สอยข่อย) (Chon Buri).

#### HYRISTICACEAE

Evergreen trees, often with aromatic tissues. Leaves, seeds, and resinous or aromatic tissues similar to the Annonaceae but with watery pink or red sap in the bark and twigs. Leaves simple, alternate, generally long oblong, pointed, with numerous lateral veins, exstipulate. Flowers generally very small, without petal, regular, usually dioecious, in small clusters, axillary or on bare branches. Calyx cup-shaped, opening with 2 or 3 lobes, often brown scurfy. Male flowers, stamens monadelphous. Female flowers, staminodes none or rare. Ovary superior, free, sessile, 1-celled, 1-ovuled. Fruits more or less fleshy, splitting on one side only, or splitting completely into two out-curling halves; seeds hard, large, enclosed in a fleshy, or membranous, entire, often aromatic aril; testa usually thick; the hard endosperm divided up by brown lines.

Only the genus KNEMA with 2 species found at Sakaerat.

#### KNEMA LOUR.

##### Key to the species

Leaves lanceolate to elliptic-lanceolate, glabrous above, glaucous and slightly pubescent beneath when young, later glabrous, 11-16 cm long.

1. Knema globularia

Leaves oblong or oblanceolate, glabrous above, stellate-pubescent beneath, 25-35 cm long

2. Knema laurina

1. Knema globularia (Lamk.) Warb., Monog. Myrist.: 601. 1897. Myristica globularia Lamk., Mem. Ac., Paris: 162. 1788. K. missionis (King) Warb., Ridl., Fl. Mal. Pen. 3: 71. 1924; Corner, Ways. Trs. Mal. 1: 477, text figs. 159 and 161. 1952.

Tree 10-18 m high; bark dark greyish, slightly flaky; sap red, copious; young branches rusty-tomentose, later glabrous and dark brown. Leaves lanceolate to elliptic-lanceolate, dark green, shining, glabrous above, glaucous and slightly pubescent beneath when young, later glabrous, apex acute, base acute; lateral nerves 14-17 pairs, raised on both surfaces; 11-16 by 3-4.5 cm; petioles 0.9-1.2 cm long. Flowers rusty tomentose outside, in axillary clusters. Male flowers trigonous in bud, 3-4 mm long. Female flowers stout, 5 mm long. Fruits subglobose, pinkish-orange, rusty pubescent, later nearly glabrous, 1.5-2 cm long; aril red; seeds sub-globose.

D i s t r i b u t i o n.—India, Burma, Thailand, Indo-China, Malaysia.

E c o l o g y.—Scattered along streams in the dry-evergreen forest. Flowering in December.

V e r n a c u l a r.—Muat khon (เหมือดคน), saming khamram (ส้มกำแพง) (Phichit); kabao luat (กะเบาเลือด) (Phitsanulok); han (หัน), hanlat (หันลัด) (Peninsular).

2. Knema laurina (Bl.) Warb., Monog. Myrist.: 606, t. 24, figs. 1-3. 1897; Ridl., Fl. Mal. Pen. 3: 72. 1924. Myristica laurina Bl., Hook. f., Fl. Br. Ind. 5: 112. 1886. Myristica cantleyi Hook. f., Fl. Br. Ind. 5: 110. 1886.

Tree 4-15 m high with rather slender branches; bark blackish-brown, nearly smooth; cut 3-5 mm thick with red sap. Leaves coriaceous, oblong or oblanceolate, apex acute, base rounded, dark green, shining and glabrous above, glaucous and stellate-pubescent beneath; lateral nerves 18-30 pairs, interarching near the margins; reticulation faint above, distinct beneath; 25-35 by 6-8 cm; petioles stout, rough with stellate hairs. Flowers axillary. Male flowers on rusty stellate-tomentose, 0.6-1.2 cm long peduncles. Female flowers sessile. Fruits ovoid or ellipsoid 2-2.7 cm long, densely covered with coarse tomentose; aril

thin, crimson; seeds ellipsoid.

*D i s t r i b u t i o n.*—Burma, Thailand, Indo-China, Malaysia, Indonesia.

*E c o l o g y.*—Uncommon in the dry-evergreen forest. Flowering in July - August.

*V e r n a c u l a r.*—Luat ma (လွတ်မာ) (General).

#### GCHNACEAE

Medium- to small-sized woody plants. Leaves simple, alternate, stipulate. Flowers actinomorphic, conspicuously coloured. Calyx pantamerous, imbricate, persistent. Corolla contorted, choripetalous, caducous. Stamens 5, 10, or many, free. Carpels superior, free or united, with a common style.

Only 1 genus found at Sakaerat.

#### GCHNA LINN.

Ochna integerrima (Lour.) Merr., Trans. Am. Phil. Soc. 2. 24: 265. 1935.

Ochna wallichii Planch. in Hook., Lond. J. Bot. 5: 550. 1846.

Deciduous undershrub, shrub, or tree up to 8 m. Leaves obovate-oblong or (obovate-) lanceolate, rarely obovate or linear-lanceolate, 6-20 by 2-7 cm, acuminate, sometimes acute or obtuse at apex, acute or sometimes obtuse at base, finely denticulate. Inflorescences many-flowered, pedicels 2-4 cm. Torus 0.5-1 mm high, 1.5-2.5 mm diam. Sepals 5, ovate to ovate-oblong, 10-16 by 4-9 mm. Petals 5-6 (-10), obovate, 15-25 by 8-15 mm, tapering at base or sub-unguiculate. Stamens 30-60, filaments 2.5-7 mm, unequal, the outermost longest. Carpels 6-10 (-15), 0.7-1.1 by 0.5-0.7 mm; style 10-15 by c. 0.5 mm, up to 20 mm in fruit; stigmas sometimes on up to 1 mm long branches. Drupes up to 11 by 8 mm (Figure 28).

*D i s t r i b u t i o n.*—NE. India, Burma, the Andaman and Nicobar Islands, Malay Peninsula, Laos, Cambodia, Vietnam, Hainan.

*E c o l o g y.*—Scattered in dry deciduous dipterocarp forest. Tall specimens are found near streams, undershrubs in vegetations where



Figure 28. Oehma integriflora (Lour.) Merr.

burning is frequent. Flowering occurs shortly before or during the development of new leaves.

V e r n a c u l a r .—fan luang (ฝานหลวง) (Northern), ngaeng (แงง) (North-eastern), chang nao (ช่างนาอ) (Eastern, North-eastern), ta nok kret (ตานอกกรก) (Eastern), Pradong daeng (ประโดงแดง), kamlang chang san (กำลั้งช้างสาร) (Central), chang nom (ช่างโนม) (South-eastern), chang hom (ช่างโหม), fin (ฝิน) (South-western), krachae (กระแจะ) (Peninsular).

## RHAMNACEAE

Small trees or shrubs, erect or climbing. Leaves simple, alternate or opposite, pinnate- or palmate-nerved; stipules spinous. Flowers small, regular, bisexual or polygamous, borne in axillary sessile cymes, clusters, sometimes spikes or panicles. Calyx 4-5 lobed, lobes erect or recurved, often keeled within. Petals 4-5, rarely absent, inserted at throat of calyx tube, minute, often clawed, hooded. Stamens 4-5, rarely absent, inserted within and opposite petals which embrace them, filaments short, subulate, anthers oblong; disc conspicuous, thin or fleshy, sometimes with excrescence before each sepal. Ovary superior or inferior, mostly immersed in disc, usually 2-3-celled, with an ovule in each cell; styles 1-3, entire or cleft. Fruits various, drupes, nuts or capsules, sometimes winged.

Two genera and 5 species found at Sakacrat.

### Key to the genera

- Ovary superior. Fruit a drupe. Shrubs or trees or climbers with recurved stipular thorns. Leaves asymmetrical, palmately 3-5 nerved. Disc without processes 1. Zizyphus
- Ovary inferior. Fruit a 3-winged capsule. Shrubs climbing by tendrils. Leaves symmetrical, penninerved. Disc with linear processes 2. Gouania

### 1. ZIZYPHUS JUSS.

### Key to the species

1. Flowers in large panicles; all parts rusty tomentose. Leaves 3-5-nerved, large, up to 12 x 8 cm. Calyx lobes not keeled. Petals absent 1. Z. rugosa
1. Flowers in small clusters, subsessile. Leaves 3-nerved, small, less than 7 x 5 cm. Calyx lobes keeled. Petals present.
2. Leaves usually glabrescent. Ovary 3-celled. Drupe 3-celled, stone horny. Disc villous, fleshy 2. Z. cambodiana
2. Leaves very hairy below. Ovary 2-celled. Drupe 1-2-celled, stone tubercled. Disc glabrous, lobed.



3. Leaves sub-orbicular, tips rounded, lower surfaces white or brownish with white or tawny tomentum; spines slender. Fruits large, orange to brown. Erect trees 3. Z. jujuba

3. Leaves ovate to ovate-lanceolate, tips sub-caudate, lower surfaces greenish, finely pubescent to glabrate; spines paired, unequal, straight or curved. Fruits small, black. Climbing shrubs

4. Z. oenoplia

1. Z. rugosa Lamk., Lawson in Hook. f., Fl. Br. Ind. 1: 636. 1875.

Small deciduous tree with straggling branches, younger parts rusty tomentose; barks grey to blackish, deeply cracked. Leaves sub-orbicular, ovate or elliptic, tips sub-acute, bases rounded or sub-cordate, oblique, margins minutely serrate, puberulous above, densely grey to rusty tomentose below; prickles few, solitary, small. Flowers in axillary or sub-terminal panicles. Calyx lobes ovate orbicular; disc 5-angular, hairy. Drupe reddish, pyriform, 1.5 x 1.5 cm, 1-celled, 1-seeded with crustaceous stone (Figure 29).

D i s t r i b u t i o n.—India, Ceylon, Burma, Thailand.

E c o l o g y.—Frequent in dry deciduous dipterocarp and mixed deciduous forest.

V e r n a c u l a r.—Oi chang (น้อยช้าง) (Kanchanaburi); ma khwat (มะควัด), nam khwat (หนามควัด), mak ma (หมากมา) (Northern).

U s e s.—Fruits edible. Wood used for fuel.

2. Z. cambodiana Pierre, Fl. For. Coch. t. 315; Pitard in Lec., Fl. Fl. Gém Indo-China 8: 922. 1912.

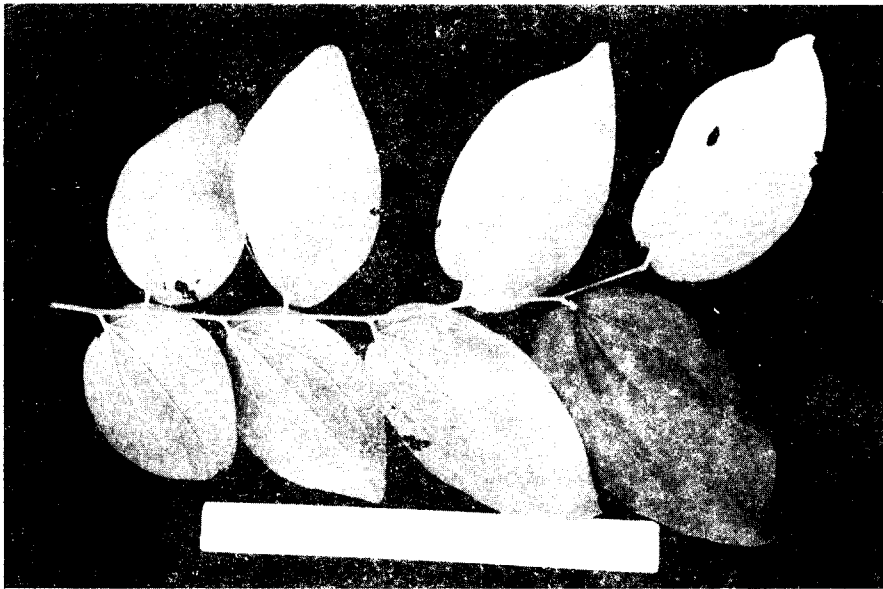
Erect trees, branches twisted, almost climbing; bark black, wrinkled. Leaves elliptic to ovate-elliptic, tips obtuse, margins denticulate; coriaceous, puberulent. Flowers clustered in pubescent cymes. Sepals hairy, deltoid. Petals obcordate. Drupe brown sub-globose with sub-crustaceous stone.

D i s t r i b u t i o n.—Thailand, Laos, Cambodia, South Vietnam.

E c o l o g y.—Frequent in mixed deciduous forest.



(a)



(b)

Figure 29. *Zizyphus rugosa* Lamk.  
(a) bark, (b) leaves.

V e r n a c u l a r.—Ta khrong (ตะครอง), mak kathan chang (หมากกะทันช้าง) (Central); nam khom (หนามคอม) (Phitsanulok); mama (มะมา), mak ma (หมากมา), matan dong (มะต้นดง) (Northern); angkrong (อังก์กรง) (Surin/Khmer); nam khom (หนามคอม) (Ubon Ratchathani).

3. Z. jujuba Lamk., Lawson in Hook. f., Fl. Br. Ind. 1: 632. 1875;

Z. mauritiana Lamk.

Small evergreen trees with spreading drooping crown; bark greyish, deeply fissured, thick. Leaves variable, usually ovate elliptic to sub-orbicular, margins crenate-serrate; prickles in pairs or solitary. Flowers fragrant in subsessile clusters; pedicels long. Calyx lobes ovate. Petals obovate, unguiculate, reflexed. Drupes green ripening yellow, orange or brown, globose, oblong or ellipsoid, with fleshy aromatic, sub-acidic edible pulp.

D i s t r i b u t i o n.—Tropical Asia to Australia.

E c o l o g y.—In secondary vegetation.

V e r n a c u l a r.—Phutsa (พุทซา) (General); matan (มะต้น) (Northern); makwat doi (มะกวัดคอกบ) (Chiang Mai); mathong (มะทอง) (Kanchanaburi, Karen); mangthang (มังถัง) (Mae Hong Son/Karen); Indian jujube or Chinese date.

U s e s.—Cultivated for fruits. Wood used for fuel and for minor uses. Root-bark contains tannin. Leaves used as fodder. Roots, bark & fruits medicinal. Trees mainly used for hedging.

4. Z. oenoplia Mill., Lawson in Hook. f., Fl. Br. Ind. 1: 634. 1875.

Sprawling, very thorny climbing shrubs, branchlets zigzag, younger parts hairy. Leaves ovate, acuminate, oblique, margins denticulate; upper surfaces puberulous, lower ones softly pale tomentose to puberulous, nerves sub-parallel, converging towards apex with numerous ascending transverse nerves; prickles usually paired with one pointed upwards. Flowers in sessile cymes; pedicels short. Calyx lobes broad, ovate, acuminate. Petals cucullate. Drupes obovoid-globose, ripening black, 5 x 5 mm.

D i s t r i b u t i o n.—Tropical Asia to Australia.

E c o l o g y.—Frequent in mixed deciduous and dry deciduous diptero-

carp forests.

V e r n a c u l a r.—Lep yieo (เล็บเหยี่ยว), let yieo (เล็กเหยี่ยว) (Central); nam lep yieo (หนามเล็บเหยี่ยว), matan kho (มะคันทอ), mak nam (หมากหนาม) (Northern); phutsa kho (พุทซาขอ) (Uttaradit); yap yiu (ยัพยิว), sang khon (สังคณ) (Peninsular).

U s e.—Chiefly for fencing.

#### GOUANIA LINN.

G. leptostachya DC., Lawson in Hook. f., Fl. Br. Ind. 1: 643. 1875.

Unarmed climbing shrub with circinate tendrils at ends of branchlets, pubescent. Leaves broadly ovate, tips acuminate, bases truncate or rounded and sub-cordate, margins serrulate especially towards apex, chartaceous, pubescent or puberulent above, densely wooly or pale tomentose below; nerves oblique, ascending and converging at tips, parallel, basal pair branched laterally; petioles channelled, flexuose; stipules with caducous apex. Flowers white, tomentose, in clusters usually on slender, axillary or terminal often leaf-bearing racemes. Calyx nearly funnel-shaped, tomentose, lobes keeled at apex within. Petals inserted below discs, ovate, clawed. Disc 5-angled with horny processes. Stamens infolded by petals. Ovary 3-celled; style 3-cleft. Capsule crowned by remains of calyx; seeds polished, laterally compressed.

D i s t r i b u t i o n.—India, Thailand, Laos, Vietnam, Cambodia, Malay Peninsula, Philippines.

E c o l o g y.—Frequent in mixed deciduous forest.

#### RHIZOPHORACEAE

Trees, sympodial branching. Leaves decussate, interpetiolar stipules conspicuous, caducous. Inflorescence axillary. Calyx persistent, free. Stamens usually twice the number of petals. Ovary inferior.

A widespread tropical family of evergreen trees best known for its dominance in the Mangrove forest, where several species are conspicuous by characteristic root formations, i.e. stilt - roots or knee - like

roots (pneumatophores). In the mangrove species the seed germinates in the fruit with the elongated hypocotyle of the embryo projecting while still on the tree. There are, however, also inland genera of normal habit.

Only 1 inland genus found at Sakaerat.

#### CARALLIA ROXB.

Carallia brachiata (Lour.) Merr., Philipp. J. Sci. 15: 249. 1919; Craib, Fl. Siam. En. 1: 597. 1931.

Tree up to 30 m. Leaves papyraceous to thin coriaceous, elliptic, obovate to oblanceolate, rarely sub-orbicular, 5-15 by 2-10 cm, entire, serrate, or denticulate, acute to shortly acuminate, base cuneate; petioles 1 cm; stipules 1-2.5 cm long. Inflorescences usually shining by secreted resin. Flowers shortly pedicellate or sessile. Calyx lobes deltoid. Petals suborbiculate, c. 1.5 mm in diam. Stamens c. 2 mm. Fruit globose, c. 7 mm in diam; seeds reniform.

D i s t r i b u t i o n.—Madagascar to tropical Asia, throughout Malesia, to Melanesia and N. Australia.

E c o l o g y.—In dry-evergreen forest, frequently along the stream.

V e r n a c u l a r.—Chiang phra nang ae (เชียงใหม่ทางเหนือ) (General), khiang phra (เชียงใหม่) (Trat, Prachuap Khiri Khan); kho haeng (คอแห้ง) (Peninsular).

U s e.—Wood for construction.

#### ROSACEAE

Trees, shrubs, or herbs. Flowers solitary, in fascicles, racemes, corymbs or panicles, mostly hermaphrodite, actinomorphic and pentamerous. Calyx tube free or adnate to ovary; lobes persistent or deciduous. Petals free, borne on the calyx tube. Stamens 5-many. Carpels 1-many, distinct or ± connate and adnate to the calyx tube (ovary superior, semi-inferior or inferior); styles free or connate, terminal, lateral or basal. Fruit a follicle, achene or drupelets, drupe, or pome.

Only 2 genera found at Sakaerat.

Key to the genera

Leaves serrate, with straight nerves ending in the teeth. Style terminal. Stamens about 20. Fruit a pome 1. Eriobotrya

Leaves entire. Style basal. Stamens 5-12. Fruit drupe-like 2. Parinari

1. ERIBOTRYA LINDEL.

Eriobotrya bengalensis (Roxb.) Hook. f., Fl. Br. Ind. 2: 371. 1878. Craib, Fl. Siam. En. 1: 579. 1931. Mespilus bengalensis Roxb., Fl. Ind. 2: 510. 1832.

Small tree, bark grey or darkish-grey; blaze yellowish with white lines, turning brown on exposure. Leaves variable, elliptic-oblong, elliptic or obovate, 10-22 by 3-7 cm, apex acuminate, acute or obtuse, coarsely serrate, glabrous and shining above; petioles 2-4 cm long. Panicles 8-12 cm, long and broad, tomentose to pubescent; pedicel 3-5 mm long, tomentose, glabrous in fruit. Calyx lobes obtuse or acute. Petals white. Ovary semi-inferior, woolly at the crown; styles 2-3. Fruit ovoid, up to 15 by 10 mm, usually 1-seeded.

D i s t r i b u t i o n.—E. Himalaya (Sikkim, Assam), Burma, Laos, Cambodia, S. Vietnam, Malay Peninsula, Sumatra, Borneo.

E c o l o g y.—Common in dry-evergreen forest. Flowers from November to February.

V e r n a c u l a r.—Kritsana (กฤษณา) (Northern); pa-ong thet (ป่าองเทต) (South-western); sisiat nam (สีเสียดน้ำ) (Eastern); takrao nam (ตะกร้าน้ำ) (South-eastern).

2. PARINARI AUER.

Parinari anamense Hance, J. Bot., Lond. 15: 333. 1877; Craib, Fl. Siam. En. 1: 563. 1931. Parinarium anamense Hance, Roy. For. Dep., Siam. Pl. Names: 370. 1948. Parinarium albidum Craib, Kew Bull. 1912: 152.

Tree 6-15 m, bark deeply fissured. Leaves coriaceous, ovate or elliptic, 6-15 by 4-9 cm, base rounded or broadly cuneate, apex obtuse or broadly acuminate, glabrous above, white-brownish woolly beneath;

nerves 12-15 pairs, distinctly raised beneath; petioles 8-10 mm long, usually with 2 small glands below the middle. Flowers in terminal panicles, longer than the leaves; pedicel very short or indistinct. Calyx tube 2-2.5 mm long, lobes acute. Petals white, as long as the calyx lobes. Stamens unequal. Ovary densely pilose; style glabrous in upper part. Fruit subglobose or ellipsoid, 30-40 by 30 mm, covered by grey scabs; exocarp edible.

D i s t r i b u t i o n.—Laos, Cambodia, S. Vietnam.

E c o l o g y.—Common in dry deciduous dipterocarp forest. Flowers in March - April.

V e r n a c u l a r.—Maphok (มะพอก), mak rok (หมากรอก), pradong fai (ประดงไฟ), pradong luat (ประดงเลือด) (South-western); chat (จัต), makhlok (มะคอก), mamok (มะมอก), mamu (มะมีอ), makmu (หมักมีอ) (Northern); thalok (ทะลอก) (Northern, Eastern); phok (พอก) (North-eastern); talo (ตะเลาะ), talok (ทะลอก), loe (เหลาะ) (Eastern); kathon lok (กะทอนลอก) (South-eastern).

U s e s.—Seeds yield fixative oil used in the manufacture of lacquer wares.

#### SIMAROUBACEAE

Monoecious rarely dioecious shrubs or trees with bitter bark; twigs pithy. Leaves simple or compound not gland-dotted, stipules absent (except Picrasma). Flowers regular, often unisexual. Sepals 3-5, usually connate, valvate to slightly imbricate. Petals 3-5, free, imbricate or valvate. Stamens as many or twice as many as petals, inserted annularly at the base of the disk; anthers 2-celled, opening lengthwise; filaments free. Ovary 1-5-locular, usually more or less distinct carpels, generally 1 ovule in each. Fruits usually indehiscent.

At the present only 2 genera and 2 species are found at Sakaerat.

Key to the genera and species

Flowers 5-merous, stamens twice as many as petals. Leaves imparipinnate with winged rachis; stipules absent. Thorny sprawling shrub

1. Harrisonia perforata

Flowers 4-merous; stamens as many as petals. Leaves paripinnate, rachis not winged; stipules present. Thornless tree

2. Picrasma javanica

1. Harrisonia perforata (Blanco) Merr. in Philip. J. Sc. 7: 236. 1912; Craib, Fl. Siam. En. 1: 243. 1926; Nooteboom in Fl. Mal. ser. 1, 6(2): 208, fig. 9. 1962.

Thorny, sprawling shrub; young shoots pubescent then glabrescent. Leaves imparipinnately compound, rachis narrowly winged, usually ribbed above, more or less pubescent; leaflets, opposite, rhomboid to obliquely ovate; margin usually dentate 1-2 by 1-1.5 cm. Flowers, 5-merous, white, axillary or terminal. Fruits usually globose or sub-depressed, sometime lobed,  $\pm$  1.2 cm diam.

D i s t r i b u t i o n.—Thailand, Indo-China, Burma, India, Malaysia.

E c o l o g y.—In dry-evergreen forest and grassland, usually along stream. Flowering during March - April, and fruiting during April - May.

V e r n a c u l a r.—Khon<sub>v</sub> tha (คันทา), si fan<sub>v</sub> (สีพัน), si fan khon tha (สีพันคันทา) (Central); chi (จี), nam chi (หนามจี), si tao (สีเตาะ) (Northern); nam kataeng (หนามกะเทาะ) (Loei).

U s e s.—The shoots, barks, and roots are used locally against diarrhoea, dysentery and even cholera.

2. Picrasma javanica Bl., Bijdr. 5: 248. 1825; Benn. in Hook. f., Fl. Br. Ind. 1: 520. 1875; Kurz, Fl. Burm., 1: 201. 1877; Brandis, Ind. Tree: 127. 1921; Craib, Fl. Siam. En. 1: 667. 1946; Nooteboom in Fl. Mal. ser 1. 6(2): 214. 1962.

Medium-sized tree, 10-15 m high, all part very bitter; bark greyish-brown, smooth or shallowly fissured. Leaves paripinnately compound;



leaflets 1-3 pairs, entire or wrinkled margin, acuminate apex, cuneate base, 8-15 by 3.5-7.5 cm. Flowers 4-merous greenish-white in axillary, loose panicle. Drupes 1-4, white, usually ovoid to depressedly globose, ± 1 cm diam.

D i s t r i b u t i o n.—Thailand, Burma, Indo-China, India, Malaysia.

E c o l o g y.—In dry-evergreen or evergreen forests, alt. from sea level up to 1500 m. Flowering during February - May, and fruiting during April - June.

V e r n a c u l a r.—Di ngu ton (คิงตุน) (Phitsanulok); kem khom (กอมทอน) (Northern).

U s e s.—Bark used in local medicine against malaria. Wood is not durable.

#### THEACEAE

Trees or shrubs, mostly evergreen. Leaves simple, alternate; stipules 0. Flowers mostly solitary, rarely racemose or paniculate, regular, mostly bisexual; bracteoles 2 to numerous below the calyx. Sepals mostly 5, imbricate, free or connate. Petals mostly 5, imbricate, often slightly connate below. Stamens mostly many to numerous in several whorls, free or shortly connate. Ovary superior, rarely (semi-) inferior, 2-5-locular; styles 2-5, free or fused; ovules 2 or more in each locule, axile. Fruit a capsule or berry, rarely pome-like.

Only 1 genus found at Sakaerat.

#### CAMELLIA LINN.

Camellia oleifera Abel. var. confusa (Craib) Sealy, Rev. Gén. Camellia: 209, f. 210. 1958; Thea confusa Craib, Kew Bull. 1914: 5; Camellia confusa (Craib) C. Stuart, Meded. Proefstn. Thee, Buitenz. 40: 130, f. 14. 1916; Craib, Fl. Siam. En. 1: 131. 1925.

Shrub or small tree, up to 7 m high. Leaves coriaceous, narrowly oblong to elliptic, 6-11 by 2.5-6 cm, apex acuminate, base cuneate, margin serrulate; petiole 4-8 mm; bracteoles and sepals not clearly

differentiated, caducous, ovate to orbicular, 2-3 mm long. Petals white, oblong or obovate, 2-3 cm long, apex retuse or deeply emarginate. Outer stamens united at the base. Ovary 3-4 mm long, silky tomentose, style stout, 3-fid. Capsule 3-lobed, with 1 seed in each locule.

D i s t r i b u t i o n.—Assam, Burma, Indo-China, SW. China (Yunnan).

E c o l o g y.—Uncommon in dry-evergreen forest.

V e r n a c u l a r.—Miang i-an (เมี่ยงอีอาน) (Northern); muat nek (หม้อดเนก), Khan khok ton (ขันโกลกต) (North-eastern).

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