

Figure 8.1 Examples of bioactive natural products from the family Menispermaceae.

8.2 *ARCANGELINA FLAVA* (L.) MERR.

[From: Latin *flavus* = pure yellow.]

8.2.1 Botany

Arcangelina flava (L.) Merr. (*Arcangelisia lemniscata* [Miers] Becc.) is a large climber that grows in the rain forests of Thailand, Malaysia, Indonesia, and the Philippines. The stems are 4mm large at the apex, smooth, and glabrous. The petiole is 3.5–9cm long. The leaves are simple, exstipulate, and spiral. The blade is 7cm × 4cm – 7.5cm × 13cm, elliptic, acuminate at the apex, thick, and recurved. The inflorescences are axillary and have 6cm-long panicles. The flowers are white. The fruits are globose, 3.5cm × 2.3cm – 2.5cm × 1.5cm, fleshy, yellow drupes (Figure 8.2).

8.2.2 Ethnopharmacology

The plant is known as *mengkunyit bukit* in Indonesia where a decoction of stems is used as a drink to treat jaundice, indigestion, and painful bowels. The wood is used to heal pox sores. In the Philippines a decoction of roots (Buy now from <http://www.drugswell.com>) is used as a drink to reduce fever, to invigorate, to promote menses, and to abort; and a decoction of wood is used as an antiseptic for the skin. Cutting fresh stems of this climber reveals a bright yellowish-orange color which is accounted for by isoquinoline alkaloids, berberine, jatrorrhizine, dihydroberberine, and palmatine which abound in it (Figure 8.3). Berberine inhibits the growth of HepG2 cells by direct interaction with DNA in

which it intercalates.¹ This intercalating property of berberine and congeners explains the broad range of antibacterial and

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Figure 8.2 *Arcangelina flava* (L.) Merr. [From: Phytochemical Survey of the Federation of Malaya. KL No: 1615. July 21, 1959. Geographical localization: Ulu Langat, Selangor. Hill forest. Field collector: G. A. Umbai for A. H. Millard.]

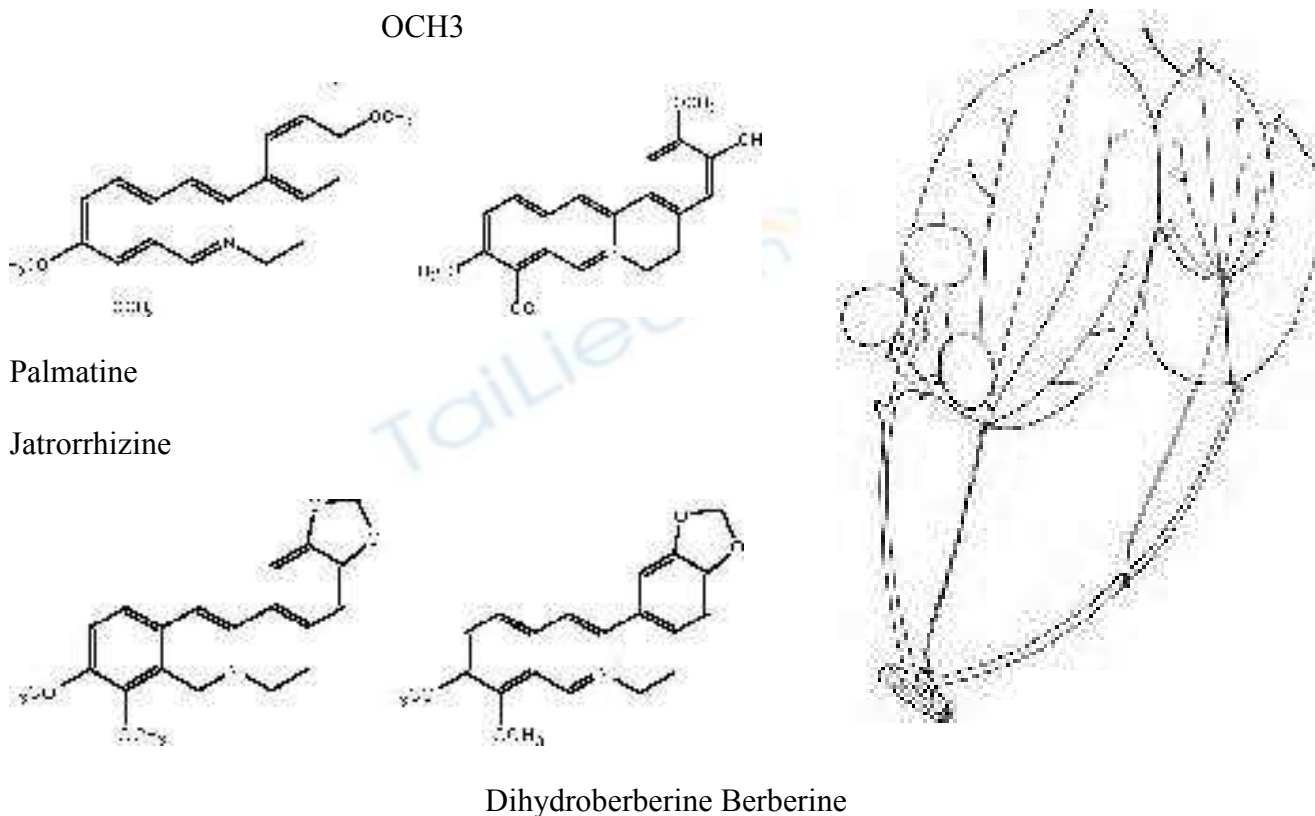


Figure 8.3 Isoquinolines of *Arcangelina flava* (L.) Merr.

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antiprotozoal effects elicited by the alkaloids and the medicinal properties mentioned above. Note also that berberine, extracted from *Arcangelisia flava* (L.) Merr., inhibits the enzymatic activity of *Plasmodium falciparum* telomerase dose-dependently at doses ranging from 30–300mM.² Palma-tine, berberine, jatrorrhizine, and dihydroberberine inhibit the growth of *Babesia gibsoni* cultured *in vitro* at very small doses.³

8.3 LIMACIA OBLONGA HOOK. F. & THOMS.

[From: Latin *oblonga* = oblong.]

8.3.1 Botany

***Limacia oblonga* Hook. f. & Thoms. is a climber that grows to a height of 3m in the rain forest of Malaysia. The leaves are simple, exstipulate, and spiral. The petiole is 3mm × 2mm. The blade is elliptic, 8.7cm × 4.4 cm – 11cm × 6cm – 14cm × 8cm – 15cm × 8cm – 19.5cm × 10cm and shows four to seven pairs of secondary nerves and scalariform tertiary nerves below. The inflorescence**

consists of axillary raceme. The flowers are greenish. The fruit is green and globose with 9mm berries (Figure 8.4).

8.3.2 Ethnopharmacology

The root plant is used externally by the Malays to heal sores. This property is probably mediated by berberine and congeners, which are known to occur in the plant.⁴

8.4 *STEPHANIA JAPONICA* (THUNB.) MIERS

[From: Greek *stephane* = wreath and Latin *japonica* = from Japan.]

8.4.1 Botany

Stephania japonica (Thunb.) Miers (*Stephania hernandifolia* Willd. Wap.) is a climber that is found in a geographical area ranging from India, South China, Taiwan, and Southeast Asia. The leaves are simple, exstipulate, and spiral. The petiole is 6.2cm long. The blade is broadly elliptic, 12cm × 2cm – 16cm × 11cm – 15cm × 8cm, acuminate at the apex, rounded at the base, and is attached to the petiole on its first half. The blade shows four pairs of secondary nerves, which are reddish. The flowers are minute and arranged in axillary cymes (Figure 8.5) .

8.4.2 Ethnopharmacology

In Japan and Taiwan decoction of the plant is used as a drink to treat malaria and to invigorate. In Indonesia, the roots (Buy now from <http://www.drugswell.com>) are used to assuage stomachaches, and a paste of the fruit is applied to

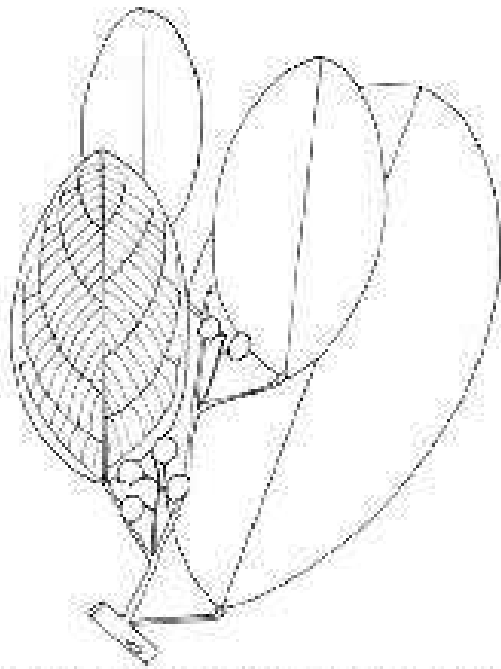


Figure 8.4 *Leucaena leucopyga*: Hook. f. & Thoms. Bot. Beechey's Exped. 4, Vol. 52:447 (Opp. of Plate 111) (opposite page 201) 20, 1843. Type collected by W. Beechey from Mexico (Veracruz); Jacques, Canada, 2003.

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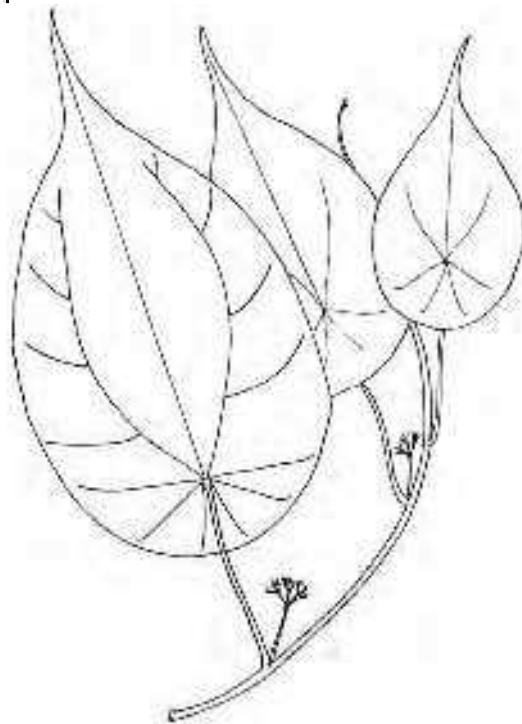


Figure 8.5 *Leucaena leucopyga* (Pursh) Merr. from Southeast Forest Experiment, Field collection: K. Anap.

No: S44854. Botanical identification: H. Kok, March 26, 1984. Geographical localization: Ulu Anap.

4th Division in secondary forest. Botanical identification: F. Jacques, October 2003.]

cancer of the breast. The antimalarial properties of the plant are very likely owed to the interesting array of isoquinolines, which abound in the plant, including homostephanoline, hasubanone, prometaphanine, epistephanine, cyclanoline, hasubanol, isotrilobine, and trilobine.⁵⁻¹³ Hall and Chang¹⁴ made the interesting observation that isotrilobine in reverse doxorubicin resistance in human breast cancer cells might hold some potential for chemotherapy. Note that weight loss

phytopharmaceuticals containing *Stephania tetrandra* S. Moore are banned from the European market because of their hazardous effect on the kidneys.

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CHAPTER 9

Medicinal Plants Classified in the Family Polygonaceae

9.1 GENERAL CONCEPT

The family Polygonaceae (A. L. de Jussieu, 1789 nom. conserv., the Buckwheat Family) consists of approximately 30 genera and 1000 species of bitter-tasting herbs, easily recognizable in the field by stems which are sourish, articulated, hollowed, and striated, and by their stipules that form some sort of membranous tubes at base of the leaves. The traditional system of medicine (Buy now from <http://www.drugswell.com>) in the Pacific Rim uses about 30 plant species of Polygonaceae mainly for gastrointestinal disturbances, to expel intestinal worms, to allay fever, to invigorate, to regulate menses, to reduce liver discomfort, to treat skin infection, and to soothe inflammation. Classic examples of medicinal Polygonaceae used in Western medicine (Buy now from <http://www.drugswell.com>) are *Rheum palmatum* L. var. *tanquticum* Maxim., and *Rheum officinale* H. Bn., which are laxatives; methoxystyandrone, a naphthoquinone; *Polygonum cuspidatum*, which has inhibited the enzymatic activity of HRV 3C-protease with an IC_{50} value of $4.6\mu M^1$; and two phenylpropanoid esters of sucrose: vanicoside B and lapathoside A, from the aerial part of *Polygonum lapathifolium*, which have inhibited the induction of Epstein-Barr virus early antigen (EBV-EA) by 12-*O*-tetradecanoylphorbol-13-acetate (TPA) and exhibited significant antitumor-promoting effects on mouse two-stage skin carcinogenesis.² Polygonaceae tend to elaborate resveratrol and congener, hence they have the potential as a source of chemotherapeutic agents ([Figure 9.1](#)).

9.2 POLYGONUM CHINENSE L.

[From: Greek *polus* = many and *gonos* = angled, and from Latin *chinense* = from China.]

9.2.1 Botany

Polygonum chinense L. is a perennial, rhizomatous herb that grows to a height of 1m in the wet valleys, mixed forests, thickets in valleys, and mountain grassy slopes of China, Taiwan, Himalaya, Japan, India, Malaysia, and the Philippines from sea level to 3000m. The stems are ligneous at the base, 3mm in diameter, red, striate, glabrous or hispid, and sour-tasting. Leaves: simple and alternate. The ochrea is tubular, 1.5–2.5cm long, membranous, glabrous, veined, and oblique at the apex. The petiole is 7mm long and auriculate at the base. The blade is ovate, elliptic, or lanceolate. The blade is $8cm \times 3.5cm - 6cm \times 2cm$, and shows nine pairs of secondary nerves.

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OH

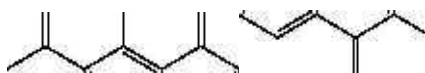


HO



Resveratrol

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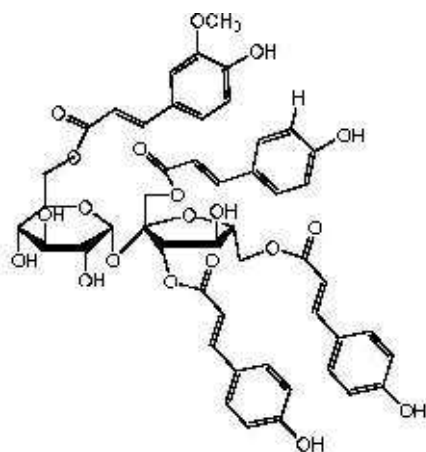
Methoxystyandrone

Vanicoside B

The base of the blade is truncate or broadly cordate. The margin is entire, and the apex of the blade is shortly acuminate. The inflorescences are long and thin axillary clusters of very small flowers. The flowers are white or pinkish, and comprise a perianth made of five ovate lobes which are accrescent in fruits. The androecium consists of eight stamens with blue anthers. The gynaecium includes three styles, which are connate at the base. The fruits are broadly ovate, trigonous, and black achenes are included in the perianth (Figure 9.2).

9.2.2 Ethnopharmacology

Mountain knotweed, Chinese knotweed, or hill buckwheat are used medicinally in China where it is known as *huo tan mu*, *ch'ih ti li*, and *shan ch'iao mai* (Chinese). In China, the roots (Buy now from <http://www.drugswell.com>) of *Polygonum chinense* L. are used to treat fluxes, to remove intestinal worms, and to counteract scorpion poisoning. The pharmacological property of this herb is unexplored. Note the presence of 25-R-spirost-4-ene-3,12-dione, stigmast-4-ene-3,6-dione, stigmastane-3,6-dione, hecogenin, and aurantiamide, which are antiinflammatory and antiallergic.³



Vanicoside B

Figure 9.1 Examples of bioactive natural products from the family Polygonaceae. Copyright © 2006 Taylor & Francis Group, LLC

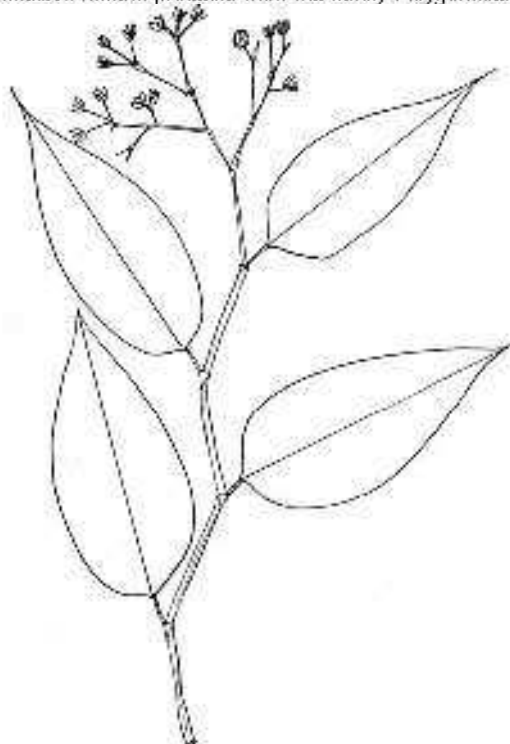


Figure 9.2 *Polygonum chinense* L. From: Flora of Malaya Peninsula. Geographical localization in Peninsular Malaysia. 1937. doi:10.1000/1.1000

9.3 *POLYGONUM MINUS* HUDS.

[From: Greek *polus* = many and *gonos* = angled, and from Latin *minus* = small.]

9.3.1 Botany

Polygonum minus Huds. is an annual herb which grows in roadsides, swamps, and ditches of Asia and the Pacific Islands. The stems are stoloniferous and decumbent. The ochrea show few short cilia. The leaves are lanceolate, membranous, 4cm × 9mm – 2cm × 5mm, and show a few secondary nerves. The flowers are white in spikes, which are 1–5cm long, linear-cylindrical, loosely but almost continuously flowered, and 3–5mm thick ([Figure 9.3](#)).

9.3.2 Ethnopharmacology

The plant is known as smartweed and in Sarawak is called *kasum* (Selakoh), *besanit* (Punan), and *rumput amak* (Iban) where it is used for sprains and body aches. They pound it with rice powder and make a paste which is rubbed or applied on the affected area. The plant is taken after childbirth and is also used as a remedy for indigestion. The pharmacological property of the plant

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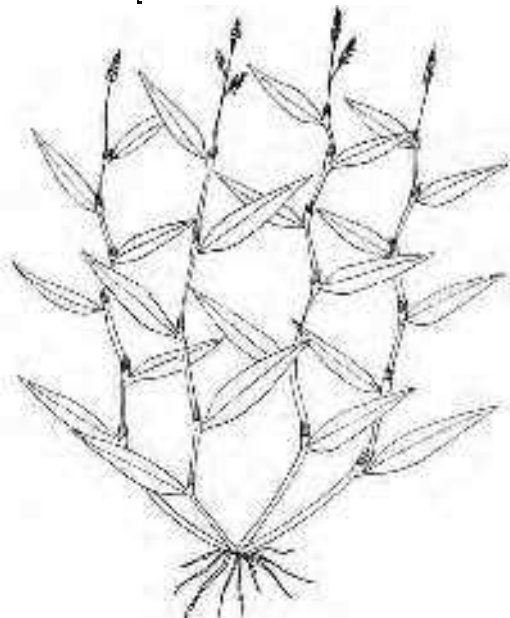


Figure 9.3 *Polygonum tomentosum* Willd. from plants of Indonesia. Pa. Timor, Iatanan, 1 km west of Kuning

Kuning in natural areas of Keban Raya, beyond the edge of Altingia Forest. Alt.: 1400m, 8°18' S, 115°9' E. Canopy, 15–20m tall. Common herbaceous.]

is unknown. 6,7-Methylenedioxy-5,3',4',5'-tetramethoxyflavone and 6,7-4',5' dimethylenedioxy-3,5,3'-trimethoxyflavone are known to occur in the plant.⁴

9.4 POLYGONUM TOMENTOSUM WILLD.

[From: Greek *polus* = many and *gonos* = angled, and from Latin *tomentosum* = densely covered with matted wool or short hair.]

9.4.1 Botany

Polygonum tomentosum Willd. (*Persicaria attenuata* subsp. *pulchra* [Bl.], K. L. Wilson *Polygonum pulchra* [Bl.], and *Polygonum tomentosum* Willd. non Schrank), is a perennial, rhizomatous floating creeper that grows in swamps and marshy areas in China, Taiwan, India, Indonesia, Malaysia, Burma, the Philippines, Sri Lanka, and Thailand. The rhizome is fibrous and the stems are erect to 1m tall, robust, pilose or glabrescent, and show fine reticulate roots (Buy now from <http://www.drugswell.com>) at nodes and dry red copper. The petiole is 1–2cm; the blade is 10–15cm × 1.5–3cm and broadly lanceolate. The inflorescence consists of terminal panicle spikes, which are 4.5cm long. The perianth is green. The corolla is white, maturing orange. Seven or eight stamens are yellow and included. It has two free styles and the stigmas are capitate. Achenes are included in a persistent perianth, and are black, shiny, orbicular, biconvex, and 3–4mm in diameter.

9.4.2 Ethnopharmacology

In Burma, a decoction of roots (Buy now from <http://www.drugswell.com>) is used to mitigate stomachaches in children. In Malaysia, the leaves are used to invigorate and to clean the blood. The Chinese call it *li liao*. The pharmacological potential of this herb is unexplored.

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CHAPTER 10

Medicinal Plants Classified in the Family Myrsinaceae

10.1 GENERAL CONCEPT

The family Myrsinaceae consists of 30 genera and approximately 1000 species of tropical plants of which 40 species are medicinal in the Asia-Pacific, notably for the treatment of uterine disorders, inflamed throat, and as an analgesic. Myrsinaceae are recognized in the field by the presence of glands beneath the blade. The flowers are small, perfect, somewhat fleshy, and 5-merous. The leaves are simple, fleshy, elliptical with a peculiar green, and crenate. The fruits are often red berries, which are glossy.

A classic example of Myrsi

naceae with pharmaceutical interest is *Embelia ribes* Burm. f., the seeds of which have been providing a treatment for intestinal worms (*Embelia*, *British OH Pharmaceutical Codex*, 1934) on account of benzoquinone: embelin (Figure 10.1). An interesting

Embelin

feature of Myrsinaceae family and *Ardisia* species is their ability to produce an unusual series of benzoquinones which have displayed a surprising number of pharmacological activities.¹ For instance, *Ardisia crispa* A. DC. produces 2-methoxy-6-tridecyl-^{HO}

OO

1, 4-benzoquinone, which blocks platelet aggregation, B16-F10 melanoma cell adhesion to the Ardisiaquinone A extracellular matrix, and B16-**Figure 10.1** Examples of bioactive benzoquinones characteristic of

the family Myrsinaceae.

F10 melanoma cell invasion; and inhibits pulmonary metastasis and tumor growth by blocking the integrin receptor.² Ardisiaquinones D, E, and F from *Ardisia sieboldii* inhibit the enzymatic activity of 5-lipo-oxygenase.^{3,4}

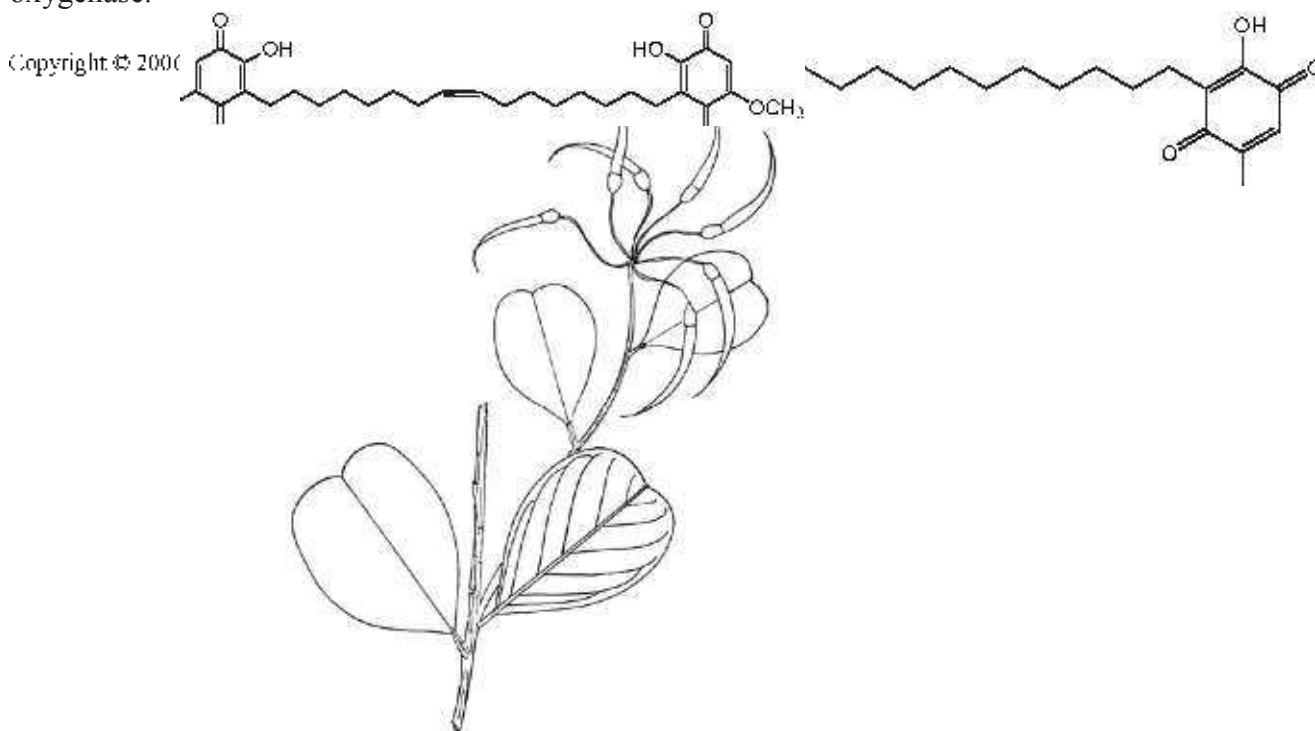


Figure 10.2 *Aegiceras corniculatum* Blco. [From: Flora of the Philippines. Bureau of Sciences, Agusan Sub province, Mindanao. Field collector: A. Mallonga, April–July 1921. Forestry Bureau 20643.]

10.2 AEGICERAS CORNICULATUM BLCO.

[From: Greek *aigos* = goat and *keras* = horn, and from Latin *corniculatum* = bearing little horns.]

10.2.1 Botany

Aegicera corniculatum Blco. (*Aegiceras majus* Gaertn.) is a tree that grows to a height of 4m in the mangroves of the tropical belt including Southeast Asia and the Pacific Islands. The stems are 3mm in diameter. The leaves are glossy above, simple, and cordate. The petiole is yellowish-orange and 8mm long. The blade is 6.5cm × 4.9cm – 5.2cm × 3.3cm, thick and the secondary nerves are inconspicuous in four to eight pairs. The fruits are horn-like, woody, and 4cm × 7mm attached to a 2.5cm-long pedicel (Figure 10.2).

10.2.2 Ethnopharmacology

In Vietnam, the plant is used to make a gargle. The plant is known to contain a series of oleanane triterpenes including 16 α -hydroxy-13, 28-epoxyoleanan-3-one 1, protoprimumagenin, aegicerin, as well as 2-methoxy-3-nonylresorcinol, 5-*O*-ethylembelin, 2-*O*-acetyl-5-*O*-methylembelin, 3,7-dihydroxy-2,5-diundecylnaphthoquinone, 2,7-dihydroxy-8-methoxy-3,6-diundecyldibenzofuran-1,4-dione, 2,8-dihydroxy-7-methoxy-3,9-diundecyldibenzofuran-1,4-dione, and 10-hydroxy-4-*O*-methyl-2,11-diundecylgomphilactone, 5-*O*-methylembelin, 3-undecylresorcinol, and 2-dehydroxy-5-*O*-methylembelin, embelinone, and flavonoid glycosides.⁵ Ardisiaquinones G, H, and I from *Ardisia teysmannia*

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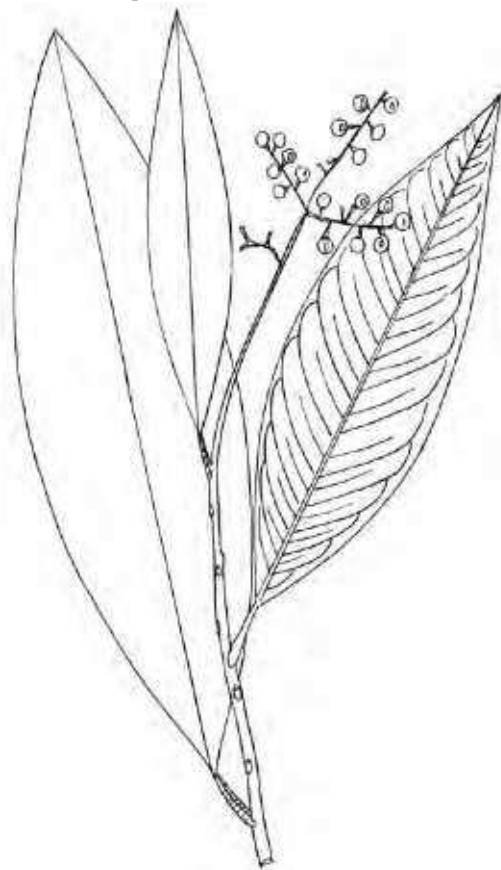


Figure 10.3 *Ardisia corolata* Roxb. [From: Distributed from the Botanic Gardens Singapore, Singapore Field

No: 30192. Geographical localization: U. Bendong and B. Kajang, Nipah River, Kemaman. Alt.: 500ft. Nov. 3, 1935. Field collector and botanical identification: E. J. H. Corner.]

inhibit *in vitro* the first step of bacterial peptidoglycan synthesis with IC_{50} of $50\mu\text{M}$, $26\mu\text{M}$, and $16\mu\text{M}$, respectively.⁶ 5-*O*-ethylembelin is cytotoxic *in vitro* against HL-60, Bel (7402), U937, and Hela cell lines.⁷ It will be interesting to learn whether or not more intensive future research on this plant discloses any molecules of therapeutic interest. It probably does.

10.3 ARDISIA COROLATA ROXB.

[From: Greek *ardis* = sharp.]

10.3.1 Botany

Ardisia corolata Roxb. (*Ardisia stylosa* Miq.) is a tree that grows to a height of 8m in lowland and hill forests in India, Malaysia, Thailand, and Indonesia. The stems are smooth, compressed, and ridged. The leaves are simple, exstipulate, and elliptic. The petiole is 1.3m long and channeled above. The blade is $16\text{cm} \times 4.5\text{cm} - 23\text{cm} \times 5.7\text{cm} - 11.5\text{cm} \times 2.4\text{cm}$, and shows 20 to 30 pairs of secondary nerves. The inflorescences are terminal pyramidal panicles up to 30cm long. The flowers are small, 5-merous and up to 3–5mm long, and are pink, white, or purple. The fruits are globose, deep red, and 6–6.5mm in diameter (Figure 10.3).

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10.3.2 Ethnopharmacology

In Malaysia and Indonesia, the plant is known as *tinjau belukar*. The roots (Buy now from <http://www.drugswell.com>) are used as a postpartum remedy. The fruits of the plant are known to contain ardisiphenols A–C, which scavenge 1,1-diphenyl-2-picrylhydrazyl (DPPH) free radicals and exhibit cytotoxicity against the murine breast cancer cell line, FM3A.⁸

10.4 *ARDISIA ELLIPTICA* THUNB.

[From: Greek *ardis* = sharp and from Latin *elliptica* = elliptic.]

10.4.1 Botany

Ardisia elliptica Thunb. (*Ardisia littoralis* Andr.) is a tree that grows to a height of 8m in lowland and hill forests in Southeast Asia and Hawaii. The stems are 3mm in diameter and finely fissured. The leaves are simple, exstipule-

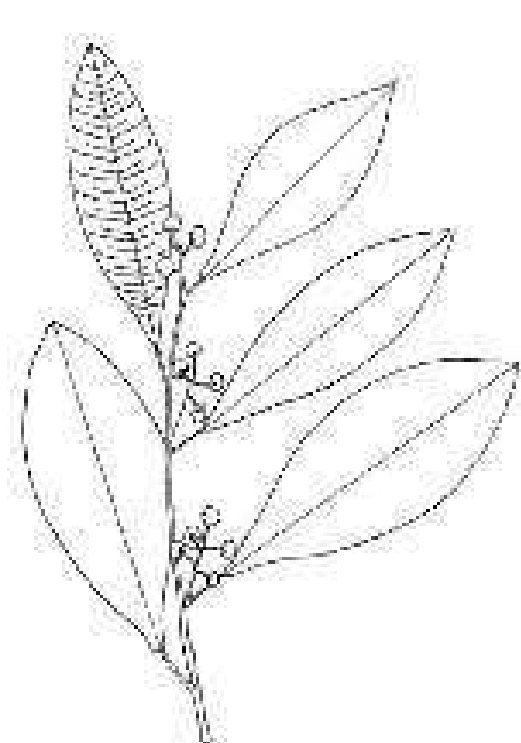


Figure 10.4 *Ardisia elliptica* Thunb. [From: Flora of Johor, Comm. Ex. Herb. Hort. Bot. Sing. Geographical localization: Jason Bay, Sidi. Johor, Date: June 16, 1972. Field collector: S. Ahmad. No. 22. Botanical inflorescences are axillary panicles up to 2.9cm identification: B. C. Stone, July 31, 1980.]

Figure 10.4 *Ardisia elliptica* Thunb. [From: Flora of late, and elliptic. The blade is 8cm × 3.5cm – Johor, Comm. Ex. Herb. Hort. Bot. Sing.

11cm × 4.4cm – 10cm × 3cm, 9.5cm × 3cm,

Geographical localization: Jason Bay,

and shows 15 pairs of secondary nerves. The

Sedih, Johor. Date: June 16, 1972. Field collector: S. Ahmad. No: 22. Botanical inflorescences are axillary panicles up to 2.9cm identification: B. C. Stone, July 31, 1980.]

long. The flowers are small, 5-merous, and pinkish. The fruits are globose, deep red, and the berries are 5mm in diameter (Figure 10.4).

10.4.2 Ethnopharmacology

Shoe Button *Ardisia* is used in Malaysia where a decoction of leaves is said to assuage retrosternal pains. The pharmacological potential of this plant is unexplored as of yet.

10.5 *ARDISIA FULIGINOSA* BL.

[From: Greek *ardis* = sharp.]

10.5.1 Botany

Ardisia fuliginosa Bl. is a treelet up to 3m in height that grows in Borneo. The leaves are simple, exstipulate, and elliptic. The blade is velvety below, and measures 16cm × 6.5cm – 15cm × 6cm, and shows 15 pairs of secondary nerves. The inflorescences are axillary panicles. The flowers are small, 5-merous, and pinkish. The fruits are globose, glossy, orange berries that are 8mm × 5mm. The fruit pedicel is 8mm long (Figure 10.5).

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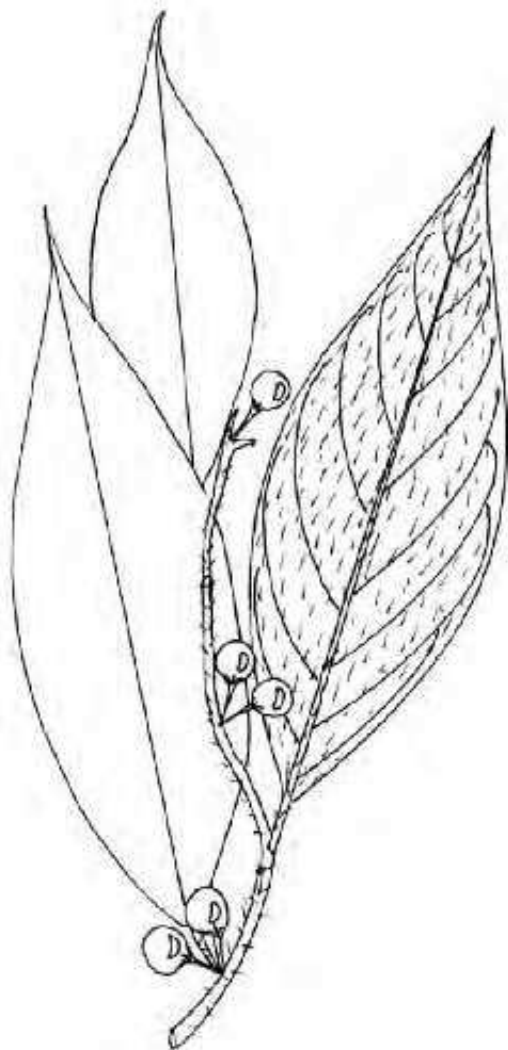


Figure 10.5 *Ardisia fuliginosa* Bl. [From: Fx. Herb. Leiden, Herbarium Bogoriense. Flora of Borneo. Plants collected by J. F. Wogelia and W. J. J. D. de Wilde during the Indonesian-Dutch Dukit Raya Expedition, 1902/1903. No. Moqoa: 7401. Dec. 23, 1902. Geographical localization: Logging area ca. 8 Km east of Central Base Camp, Alt.: 100m ca. 30 Km west of Baiding.]

10.5.2 Ethnopharmacology

Indonesians apply the sap squeezed from the stem to itchy parts of the skin. There is no evidence available on the pharmacological value of this plant. The plant is known in Borneo as *merjemah* (Sarawak).

10.6 *ARDISIA HUMILIS* VAHL.

[From: Greek *ardis* = sharp, and from Latin *humilis* = low-growing.]

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10.6.1 Botany

Ardisia humilis Vahl. (*Ardisia hainanensis* Mez., *Ardisia pyrgina* Saint Lager, *Ardisia pyrgus* Roemer & Schultes, and *Tinus humilis* [Vahl.] Kuntze.) is a shrub that grows to a height of 2–5m tall in mixed forests, hillsides, and open fields; from sea level to 1100m in China, the Philippines, and Vietnam. The stems are glabrous, 5–7mm in diameter. The leaves are simple and exstipulate. The petiole is channeled above and 1cm long. The blade is obovate, elliptic, 4.9cm × 10.5cm × 2.2cm, leathery, glabrous, and inconspicuously pellucid punctuate. The apex of the blade is broadly acute to obtuse and the blade shows 12 pairs of secondary nerves. The inflorescences are terminal and axillary panicles are 4.2–20cm long. The flowers are fleshy, pink, or purplish red, 5–6mm on a 6–10mm-long pedicel. The fruits are dull red or purplish black, globose, 6mm in diameter and densely punctuate (Figure 10.6).

10.6.2 Ethnopharmacology

In Burma, the plant is used to treat menstrual disorders. Pharmacological properties are unexplored. It is called *Ai zi jin niu* in Chinese, *ati popa'a* in French Polynesia, and *merjemeh laut* in Malay.

Figure 10.6 *Ardisia humilis* Vahl. [From: Sarawak Forest Department. Field collector: M. Asri. No: S52665. Geographical localization: Semunsan Wildlife Sanctuary,

10.7 *ARDISIA LANCEOLATA* ROXB.

beach forest.]

[From: Greek *ardis* = sharp, and from Latin *lanceolata* = lance-shaped.]

10.7.1 Botany

Ardisia lanceolata is a tree that grows to a height of 8m in Malaysia, Singapore, Sumatra, Java, Borneo, and Celebes. The bark is grayish brown. The trunks are stout. The leaves are simple and exstipulate. The petiole is 1.5cm long. The blade is elliptical-oblong: 21cm × 7cm – 23cm × 8cm, 12.5cm × 4.5cm, chartaceous, rusty tomentose when young, and conspicuously pellucid punctuate. The apex of the blade is acute to obtuse and the blade shows 12–17 pairs of secondary nerves. The inflorescences are axillary panicles, which are short and minutely hairy. The pedicels are 8mm long. The flowers are purplish-pink, and the anthers are dark and glandular dotted. The gynaecium to the ovary is 5mm long. The flower buds are 7mm × 8mm. The fruits are dull red or purplish- black, globose, and 6mm in diameter (Figure 10.7).

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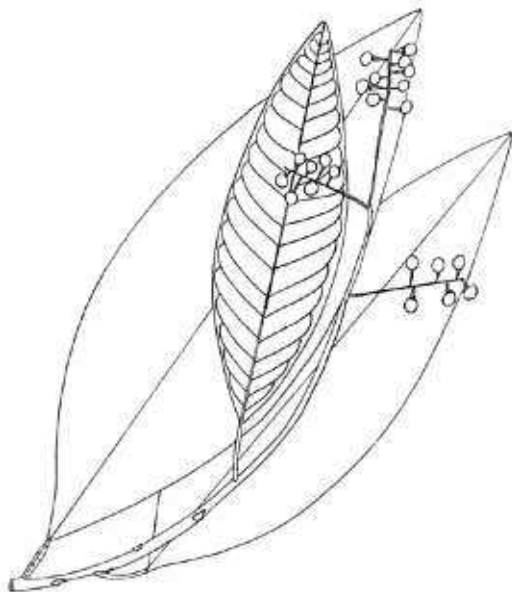


Figure 10.7 *Ardisia lanceolata* Roxb. [From: Distributed by The Botanic Gardens Singapore, Singapore Field No: 21311. Geographical localization: 5.5 miles from Kota Tinggi, Mawai Road from Johor, Feb. 2, 1935. Botanical identification: M. R. Henderson. Field collector: E. J. Corner. In swampy field.]

10.7.2 Ethnopharmacology

In Malaysia, the plant is used as a postpartum protective remedy. The pharmacological potential of this plant is unknown.

10.8 *ARDISIA ODONTOPHYLLA* WALL.

[From: Greek *ardis* = sharp, *odonto* = tooth, and *phullon* = leaf.]

10.8.1 Botany

Ardisia odontophylla Wall. is a shrub that is approximately 1m tall that grows in the rain forest of Malaysia. The stems are velvety. The leaves are simple, spiral, and exstipulate. The blade is obovate, velvety below, toothed, and shows 14–20 pairs of secondary nerves. The apex of the blade is acuminate to apiculate. The inflorescences are axillary panicles, which are up to 15cm long and hairy. The fruits are red ([Figure 10.8](#)).

10.8.2 Ethnopharmacology

A decoction of leaves is used to assuage stomachaches. The pharmacological potential of this plant is unexplored.

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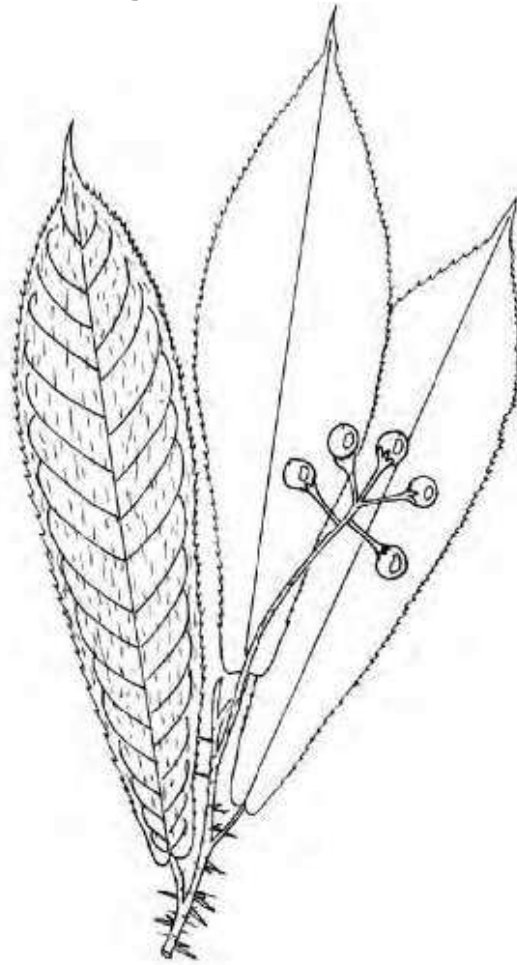


Figure 10.8 *Ardisia odontophylla* Wall. [From: Flora of Malaya. Comm. Ex Herb Hort. Bot. Sing. Geographical localization: Jeku River, Pahang. Alt.: 200–300ft. Feb. 21, 1968. No: MS 1380. Botanical identification: B. C. Stone, April 1962.]

10.9 *ARDISIA OXYPHYLLA* WALL.

[From: Greek *ardis* = sharp.]

10.9.1 Botany

Ardisia oxyphylla Wall. is a treelet that grows in lowland and hill forests in Northeast India, Malaysia, Burma, Thailand, and Borneo. The bark is grayish-brown. The leaves are simple and exstipulate. The petiole is channeled and 2cm × 2mm. The blade is elliptic-oblong, 20mm × 5.5mm, villous, and the margin is ciliate-pectinate. The apex of the blade is acuminate. The inflorescences are terminal panicles, which are up to 8cm long. The flowers are magenta with a densely tomentose ovary. The fruits are dull red or globose, and measure 5mm × 2mm (Figure 10.9) .

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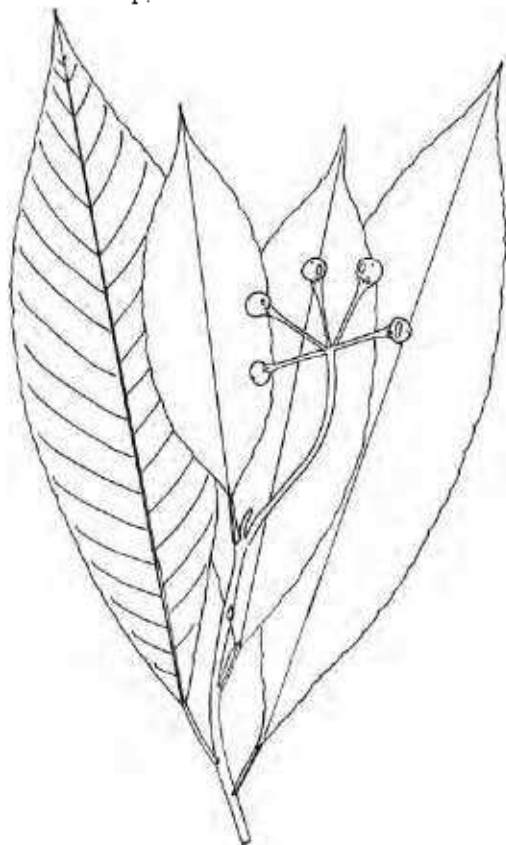


Figure 10.9 *Ardisia oxyphylla* Wall. [From: Flora of Malay Peninsula, Forest department. Geographical localiza-

tion: Lalang River Reserve Kajang. March 28, 1930. No: 24078. Field collector: C. F. Symington.

Botanical identification: B. C. Stone, 1952.]

10.9.2 Ethnopharmacology

Medicinal uses and pharmacological properties: in Malaysia, a paste of leaves is used to heal feet ulcers and cracks. The pharmacological potential of this plant is unexplored. One might set the hypothesis that some benzoquinones with antilipoxygenase activity are responsible for the traditional use of the plant.

10.10 *ARDISIA PYRAMIDALIS* (CAV.) PERS.

[From: Greek *ardis* = sharp.]

10.10.1 Botany

Ardisia pyramidalis (Cav.) Pers. is a treelet that is 7.5m in height with a girth of 7cm. The bark is whitish. The inner bark is yellow. The leaves are simple and exstipulate. The petiole is long and stout. The blade is elliptic-lanceolate, 16cm × 4cm – 26cm × 7 cm, 30cm × 6 cm, and denticulate at the margin. The blade shows 21 pairs of secondary nerves below. The inflorescences are terminal panicles of yellow flowers. The fruits are red and glossy ([Figure 10.10](#)).

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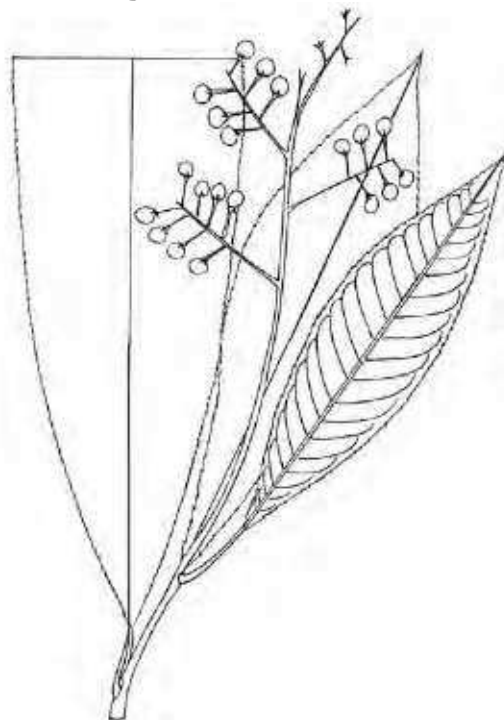


Figure 10.10 *Ardisia pyramidalis* (Cav.) Pers. [From: Flora of the Philippines. Philippine National Herbarium.

No: 34223. Geographical localization: Mount Makiling, Laguna Province, Luzon. March 2, 1955.

Field collector: M. Ebro.]

10.10.2 Ethnopharmacology

The plant is known as *gadong-gadon* in the Philippines where a decoction of roots (Buy now from <http://www.drugswell.com>) is used as a drink to treat infection of the genitals, and to assuage toothaches. The leaves are used externally to mitigate headaches. The pharmacological potential of this plant is unexplored.

10.11 *ARDISIA RIDLEYI* KING & GAMBLE

[From: Greek *ardis* = sharp and after Ridley, British botanist of 19th century.]

10.11.1 Botany

Ardisia ridleyi King & Gamble is a treelet that grows wild in the rain forests of Thailand, Malaysia, and Sumatra. The stems are 2mm in diameter. The leaves are simple and exstipulate. The petiole is 9mm × 1mm. The blade is 8cm × 2.3cm – 14cm × 5.2cm, lanceolate, acuminate at the apex, and crenate at the margin. The inflorescences are terminal panicles, which are slender. The fruits are red and 8mm in diameter (Figure 10.11).

10.11.2 Ethnopharmacology

Malays call this plant *lutot hyam* and use it as a postpartum protective remedy. The pharmacological potential of this plant is unexplored.

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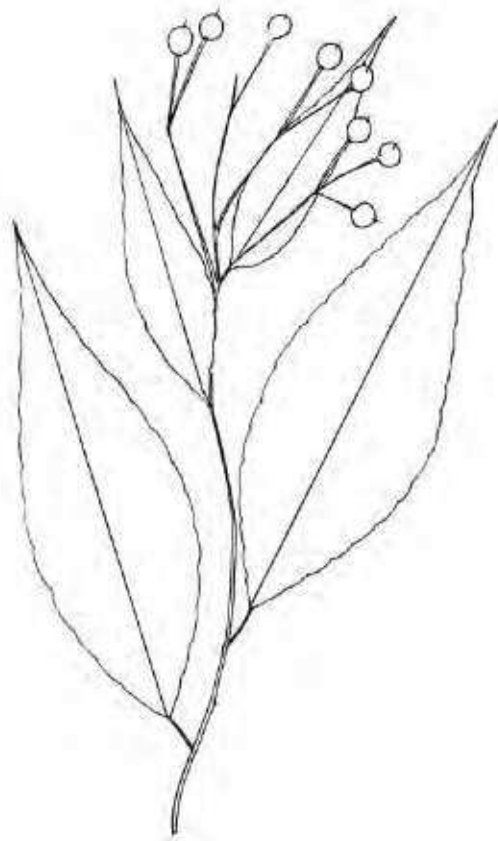


Figure 10.11 *Ardisia nolleyi* King & Gamble. [From: Flora of Malay Peninsula. Forest Department. Field collector:

A. B. Yeob. Geographical localization: Maxwell Hill, Taiping. Alt.: 3200ft. Feb. 6, 1917. Botanical identification: H. N. Ridley.]

10.12 *ARDISIA SQUAMULOSA* PRESL.

[From: Greek *ardis* = sharp and from Latin *squamulosa* = squamulose.]

10.12.1 Botany

Ardisia squamulosa Presl. (*Ardisia boissieri* A. DC.) is a shrub that grows to a treelet height of 2.5m in the Philippines. The stem is 4mm in diameter and lenticelled. The leaves are simple and exstipulate. The petiole is pinkish. The blade is elliptic, glossy above, and 11.5cm × 6cm – 2 cm. The inflorescences are terminal panicles, which are 4.3cm long. The flowers are a pale, waxy pink. The stamens are grey with a yellow edge. The fruits are red, glossy globose, and 3mm in diameter (Figure 10.12).

10.12.2 Ethnopharmacology

In the Philippines, a paste of leaves is applied to a wound to promote healing. Chiang et al.⁹ made the interesting observation that a water extract of *Ardisia squamulosa* inhibits the replication of adenovirus *in vitro*. Are bergerin and congeners involved here?

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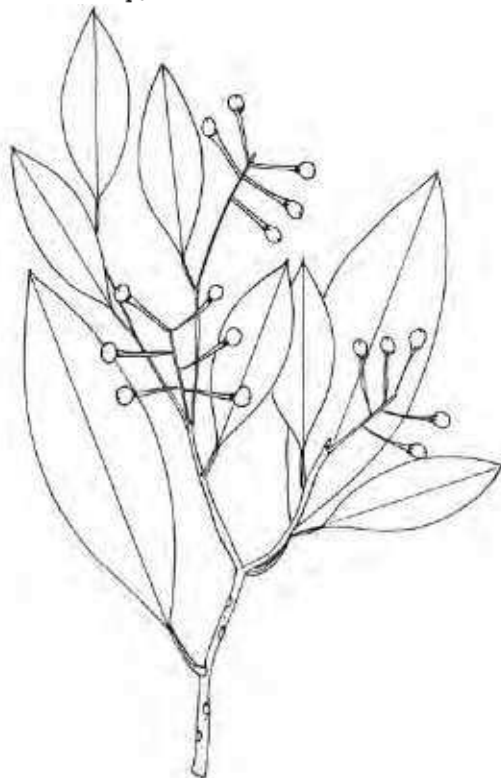


Figure 10.12 *Ardisia squarrolosa* Presl. [From: Philippines Plant Inventory, USAID, PPI No: 6/27. Field collector: B. C. Stone et al. Geographical localization: Sibuyan Island, Province Romblon; Geographical localization: Magdiwang, Barrio Hawasan, found along the Aung River, May 27, 1992.]

10.13 MAESA CUMINGII MEZ.

[From: Arabic *maas* = *Maesa lanceolata* Forrsk.]

10.13.1 Botany

Maesa cumingii Mez. is a shrub that grows wild in the Philippines. The stems are 2mm in diameter. The leaves are simple and exstipulate. The petiole is 1.2cm × 1mm. The blade is broadly elliptic, 2.5cm × 1cm – 4.5cm × 2.2cm, acute at the apex and shows 3–5 pairs of secondary nerves, inflorescences, axillary, and is 1.5cm long. A pair of bracteoles subtends the base of the calyx (Figure 10.13).

10.13.2 Ethnopharmacology

In the Philippines, the plant is known as *katiput* and provides a poison used for fishing. The ichthyotoxic property is most likely owed to saponins that are known to abound in the genus. Triterpenoid saponins, maesabalides I–VI, from *Maesa balansae*, destroy *Leishmania* sp. Maesabalide III and IV destroy intracellular amastigotes with IC₅₀ values of about 7 to 14mg/mL. A single subcutaneous dose at 0.2–0.4 mg/Kg has protected BALB/C mice against liver amastigote.¹⁰

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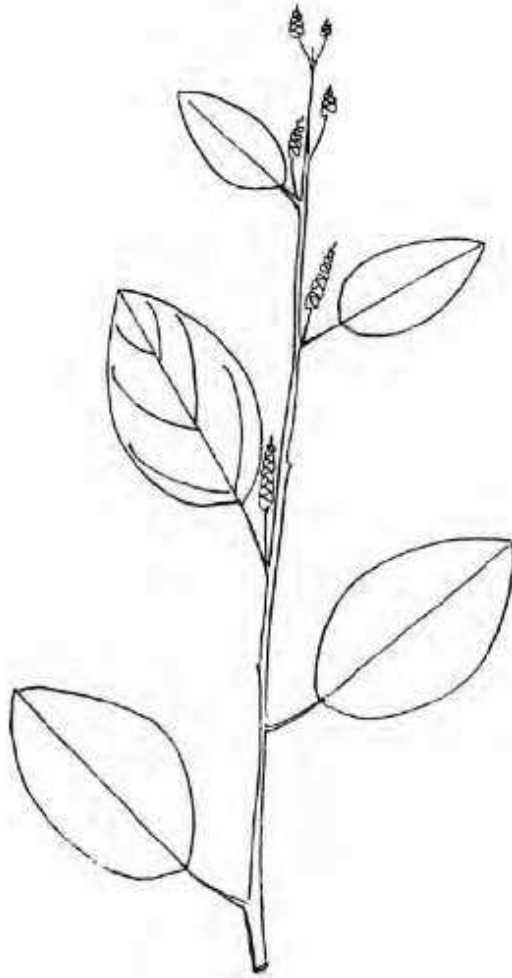


Figure 10.13 *Maesa cumingii* Mez. [From: Herbarium Bureau of Sciences, Manila, Philippines. Flora of the Philippines Islands. Plant of Luzon. Collected and presented by A. Lohr. Geographical localization: Morotaban, Rizal Province. January 1914. No. 13760.]

10.14 *MAESA DENTICULLATA* MEZ.

[From: Arabic *maas* = *Maesa lanceolata* Forrsk. and from Latin *denticullata* = denticulate.]

10.14.1 Botany

Maesa denticullata Mez. is a shrub that grows wild in the Philippines. The stems are 2mm in diameter. The leaves are simple and exstipulate. The petiole is 2.5cm × 1mm. The blade is broadly elliptic, minutely serrate, 15cm × 7cm, acuminate at the apex and shows 3–5 pairs of secondary nerves. The inflorescences are axillary and 3.5cm long. A pair of bracteoles subtends the base of the calyx (Figure 10.14).

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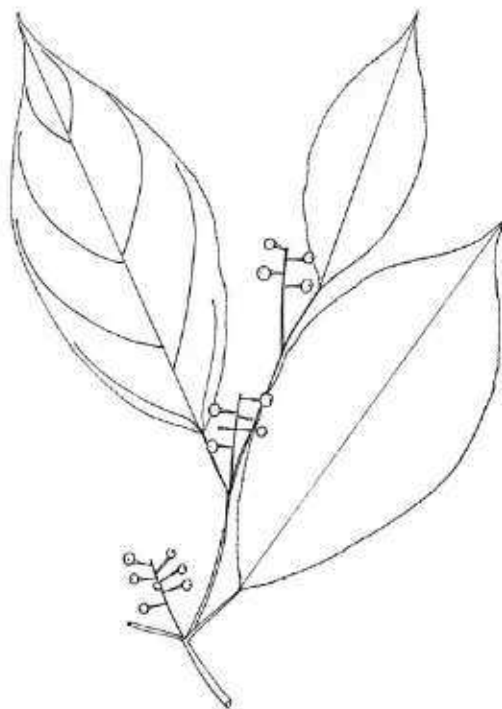


Figure 10.14 *Maesa denticulata* Mez. [From: Philippines Plants Inventory, USAID. Field collectors: E. J.

Reynoso et al. PPI No: 14486. Geographical localization: Northern Luzon, July 29, 1994. Ifugao Province, Brgy Pula, Mount Hagada, Banawie, 16°52.1' N, 121°24'.7 E. In a submountain forest.]

10.14.2 Ethnopharmacology

In the Philippines the plant is used as fish poison. The pharmacological properties of this plant are unexplored as of yet. Is it antifungal?

10.15 *MAESA LAXA* MEZ.

[From: Arabic *maas* = *Maesa lanceolata* Forrsk., and from Latin *laxa* = lax.]

10.15.1 Botany

Maesa laxa Mez. is a shrub that grows in the Philippines. The stems are lenticelled. The leaves are simple and exstipulate. The petiole is slender and 3.2cm × 2mm. The blade is broadly elliptical, 6.5–12.5cm, acute at the apex and shows five pairs of secondary nerves. The margin is laxly toothed. The inflorescences are 10cm long racemes with 6mm pedicels. A pair of bracteoles subtends the base of the calyx. The fruits are 6mm in diameter berries (Figure 10.15).

10.15.2 Ethnopharmacology

Filipinos call the plant *tubing-aso* and use it to catch fish, in which it displays an ichthyotoxic tendency.

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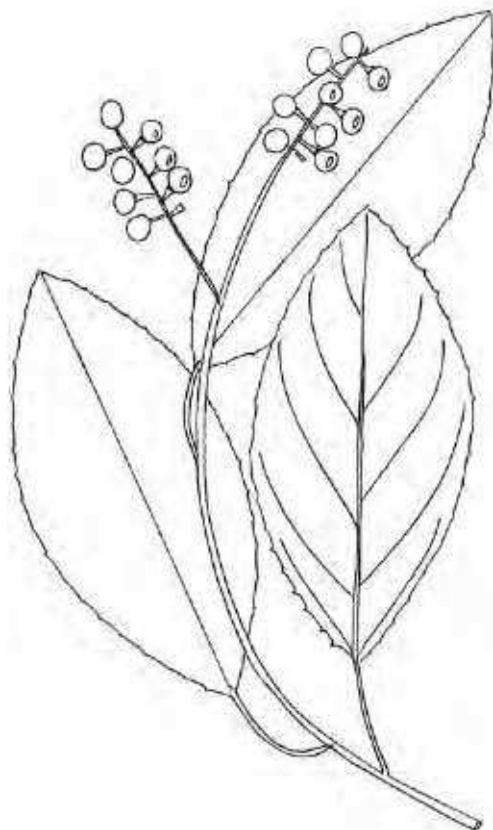


Figure 10.15 *Maesa laxa* Mez. [From: Flora of the Philippines Herbarium, Bureau of Sciences, No. 41553. Geographical localization: Cabalain, Leyte. Field collector: M. Ramos, December 1926.]

10.16 MAESA PERLARIUS (LOUR.) MERR.

[From: Arabic *maas* = *Maesa lanceolata* Forrsk.]

10.16.1 Botany

Maesa perlarius (Lour.) Merr. (*Dartus perlarius* Lour., *Maesa sinensis* A. DC., and *Maesa tonkinensis* Mez.) is a shrub that grows to a height of 3m in China, Taiwan, Thailand, and Vietnam. The stems are hirtellous and glandular granulose. The leaves are simple and exstipulate. The petiole is 10mm long and channeled. The blade is elliptical to broadly ovate, 7–11cm × 3–5cm, densely hirtellous when young. The base of the blade is acute, the margin is coarsely serrated, the apex is acute or acuminate; and the blade shows 7–9 pairs of secondary nerves. The inflorescences are axillary, paniculate, or rarely racemose, 2–4cm long, hirtellous, and glandular granulose. A pair of bracteoles are at the base of the calyx. The flowers are minute. The fruits are globose and 3mm in diameter (Figure 10.16).

10.16.2 Ethnopharmacology

In China, the plant known as *ii yu dan* is made into a paste of leaves which is applied to broken bones. In Cambodia, Laos, and Vietnam, the roots (Buy now from <http://www.drugswell.com>) are used to promote digestion and urination, and the leaves are used to treat measles. An infusion of leaves is used as a drink as a postpartum protective remedy. The pharmacological potential is unknown.

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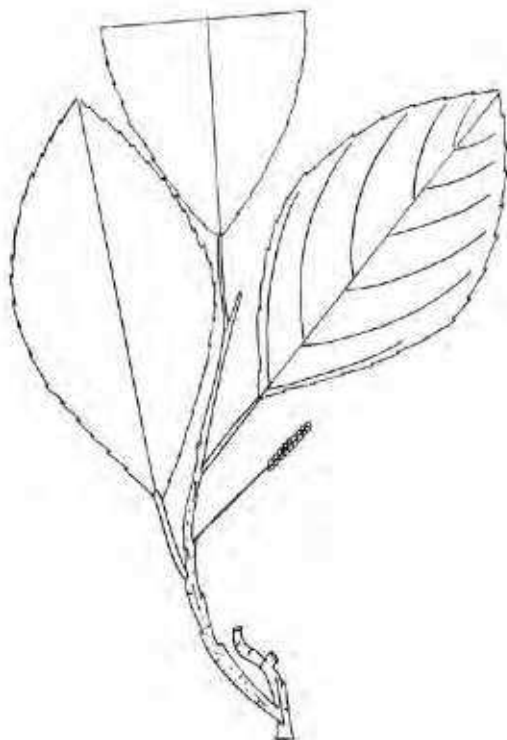


Figure 10.16 *Maesa pentanervis* (Lour.) Merr. [From: Philippines Plant Inventory. Flora of the Philippines. FSN/USAID. Field collectors: F. J. Reynoso et al. PPI No: 7021. Geographical localization: Northern Luzon, Province: Ilugato, Mount Bungkung, Brgy Dalikari, Banaue. Found along the ridge in a secondary forest.]

10.17 *MAESA RAMENTACEA* (ROXB.) A. DC.

[From: Arabic *maas* = *Maesa lanceolata* Forrsk. and from Latin *racemosa* = racemose].

10.17.1 Botany

Maesa ramentacea (Roxb.) A. DC. (*Baeobotrys ramentacea* Roxb.) is a shrub that grows to a height of 5m on mountain slopes, and in stream banks and shady places along jungle paths up to 1700m altitude in Bangladesh, Cambodia, India, Indonesia, Laos, Malaysia, Thailand, Burma, the Philippines, and Vietnam. The bark is brownish and the wood is yellow-red. The stems are angular, glabrous, minutely lenticelled, and 2mm thick. The leaves are simple and exstipulate. The petiole is 4mm × 1mm. The blade of the leaf is ovate to elliptic-lanceolate, 6.8cm × 3.5cm – 9.2cm × 3.3cm, and papery. The base is rounded, obtuse, to broadly cuneate, and the margin entire or undulate. The apex of the blade is acute or long acuminate. The blade shows six pairs of secondary nerves. Inflorescences are axillary or sometimes subterminal, paniculate, many-branched, and 16.5cm long. The fruit is yellowish-green, globose, 2–3mm, punctuate-lineate or veined (Figure 10.17).

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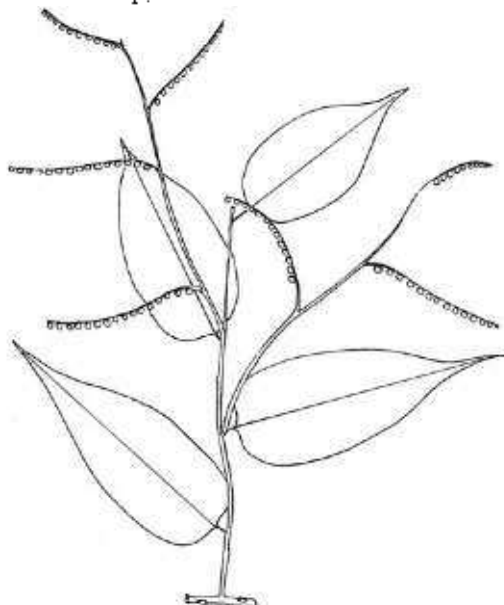


Figure 10.17 *Maesa ramentacea* (Roxb.) A. DC. [From: Flora of Thailand. No: 028.1. Geographical localization: Peninsular, Trang Chaiyng, AL: 100m. Oct. 10, 1948. Botanical identification: I. Srinunand.]

10.17.2 Ethnopharmacology

A paste of leaves is applied to scabies and other skin ailments. In Thailand, where the plant is called *ruai*, the leaves are mixed with rice and eaten to assuage retrosternal pains. The Chinese name for the plant is *cheng gan shu*.

The plant is known to elaborate an ichthyotoxic saponin known as saponin A.¹¹ An aqueous extract has inhibited growth of several species of a broad-spectrum fungus, probably because of its saponin content.¹²

10.18 MAESA TETRANDBRA A. DC.

[From: Arabic *maas* = *Maesa lanceolata* Forrsk. and from Latin *tetrandra* = four anthers.]

10.18.1 Botany

Maesa tetrandra A. DC. is a shrub that grows in Indonesia. The stems are 2mm in diameter and the internode is 1.5cm long. The leaves are simple and exstipulate. The petiole is 7mm long and channeled. The blade is elliptic-lanceolate, 7.4cm × 2.5cm – 4.5cm × 1.6cm, velvety below, and has four pairs of secondary nerves which are inconspicuous. The margin is coarsely crenate, the apex is acute or acuminate. The inflorescences are axillary racemes which are 3–6cm long. A pair of bracteoles is at the base of the calyx. The fruits are globose (Figure 10.18).

10.18.2 Ethnopharmacology

In Indonesia, the roots (Buy now from <http://www.drugswell.com>) are crushed and ingested as a remedy for fever, while a decoction of leaves and shoots affords a remedy for measles. The pharmacological potential of this plant is unexplored as of yet. One can reasonably expect quinones to be responsible for the antiviral property of the plant. Quinones abound in the family Ebenaceae, which is discussed in the next chapter.

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Figure 10.18 *Maesa tetrandra* A. DC. [From: Herbarium Bogoriense, Harvard University Plants of Indonesia. Botanical identification: J. A. McDonald, 1993. Cat #: 3862. Geographical localization: Kabaeria, Mountain Sabanpolulu, 1Km SSW of Tangkono, 5°16' S, 121°56' E. Alt.: 700–900m. Slope of rain forest.]

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J. T. 1995. Inhibition of fungal growth by an aqueous extract and saponins from leaves of *Maesa ramentacea* Wall. *Biochem. Sys. Ecol.*, 23, 17.

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CHAPTER 11

Medicinal Plants Classified in the Family Ebenaceae

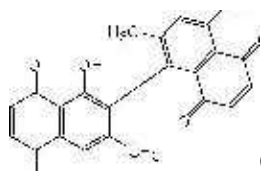
11.1 GENERAL CONCEPT

The family Ebenaceae (Gürke in Engler & Prantl, 1891), or Ebony Family, consists of five genera and approximately 450 species of trees known to elaborate a series of naphthoquinones and pentacyclic triterpenoid saponins (Figure 11.1). When searching for Ebenaceae, one might look into hillside primary rain forests. Ebenaceae are recognized by their fruits, which appear like little persimmons, often brownish, and seated on a persistent calyx of significant hardness. The wood of Ebenaceae is dense, very hard, and blackens upon exposure to light. The principles responsible for the peculiar color of ebonies are naphthoquinones. With regard to the pharmacological potential of Ebenaceae, the evidence for the existence of possible therapeutic agents is strong and it seems quite likely that further studies will result in the isolation and identification of certain antibacterial, antiviral, cytotoxic, monoamine oxidase inhibitors, antioxidant monomer dimers, or oligomers of naphthoquinones.

As a matter of fact, the evidence currently available suggests that naphthoquinones, which are planar intercalate with DNA, interfere with the mitochondrial electron respiratory chain reaction because of its ketone moieties, which tend to generate noxious free radicals. Some naphthoquinones are marketed as a drug such as atovaquone, which is used to treat malaria and *Pneumocystis carinii* infection. An interesting development from naphthoquinones is their antiviral and central nervous system (CNS) properties.

Plumbagin, isodiospyrin, and 8'-hydroxyisodiospyrin inhibit significantly the proliferation of Hepa, KB, Colo-205, and HeLa cell lines cultured *in vitro* (Kuo et al., 1997).¹ Lemulinol A significantly inhibits the enzymatic activity of mouse liver monoamine oxidase (MAO).³ The fruits of the *Diospyros* are astringent and often used to check bleeding and to treat diarrhea. The hydrolyzable tannins found in the fruits have displayed interesting pharmacological properties such as the lowering of blood pressure. Approximately 20 species of Ebenaceae are used for medicinal purposes in the Asia-Pacific, especially to expel intestinal worms and to treat viral infections. The seeds are often used for fishing, as these are ichthyotoxic.

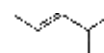
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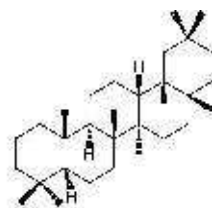
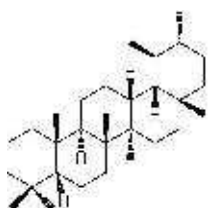
OH H3C



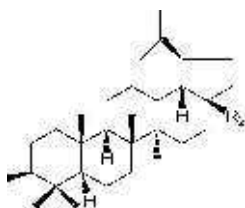
H3C O CH3 OH O OH O



Plumbagin Isodiospyrin 7-Methyljuglone



Ursane Oleanane



R2

R1

R1

H

Lupeol R1=β OH, R2=CH3 α Amyrin R1=β OH, R2=CH3 Betulin R1=β OH, R2=CH2OH Ursolic acid R1=β OH, R2=COOH. Betulinic acid R1=β OH, R2=COOH

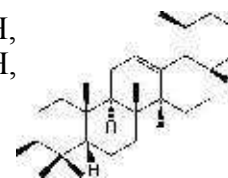


Figure 11.1 Examples of bioactive natural products from the Ebenaceae Family.

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11.2 DIOSPYROS LANCEIFOLIA ROXB.

[From: Greek *diospyros* = persimmon fruit and from Latin *lanceifolia* = lanceolate leaves.]

11.2.1 Botany

Diospyros lanceifolia Roxb. is a timber that grows to a height of 20m with a girth of 70cm in lowland and hill rain forests to an altitude of 700m in India, Sumatra, Philippines, Malaysia,

and Borneo. The bark is brown to black, smooth, or with fine cracks. The inner bark is bright yellow. The leaves are simple, oblong–elliptical to lanceolate, 4.5cm – 15cm × 2cm – 5cm with a base-pointed apex acuminate. The midrib is sunken above. It has up to nine pairs of secondary nerves. The petiole is 1cm long. The male inflorescence is a 3cm-long cyme. The male flowers are 4-merous, very small, and salver-shaped. The female flowers are solitary, small, and urseolate. The fruits are globose with a short apical beak, subglabrous, 2cm in diameter, and seated on a shallow 3–5lobed calyx (Figure 11.2).

11.2.2 Ethnopharmacology

In Indonesia, the seeds are used as a fish poison. The principles involved here might be their content of naphthoquinone derivatives such as biplumbagin and chitranone, which are known to be ichthyotoxic, as has been shown with the seeds of *Diospyros maritima*.⁴

11.3 *DIOSPYROS MALABARICA* (DESR.) KOSTEL.

[From: Greek *diospyros* = persimmon fruit and from Latin *malabarica* = from Malabar, India.]

11.3.1 Botany

Diospyros malabarica (Desr.) Kostel. (*Diospyros embryopteris* Pers., *Diospyros glutinosa* Koenig, and *Diospyros siamensis* Ridl. [non Hoch.]) is a magnificent timber tree that grows to a height of 37m with a girth of 2m. The plant is found in a geographical area that spans India, Thailand, and North Malaysia. The bole is straight and the wood is hard and dense. The bark is black, smooth, and the inner bark turns bluish on exposure to sunlight. The leaves are simple and exstipulate. The blade is elliptic or ovate, pointed or rounded at the base, and shows a midrib sunken above. There are 4–8 pairs of secondary nerves curving upward to form several series of loops near the margin. Tertiary nerves are reticulate. The male flowers are formed in 3–5 flowered cymes axillary. Stamens