

## CHAPTER 1

### INTRODUCTION

#### 1.1 Review of the Euphorbiaceae Family

The family Euphorbiaceae comprises about 300 genus and 5000 species distributed mainly in America and tropical Africa (1). The plants of the family Euphorbiaceae contain skin irritating and tumour-promoting diterpenoids, which have tiglane, ingenane, and daphnane skeletons (2). Some species in this family are used in folk medicine to treat skin diseases, gonorrhoea, migraines, intestinal parasites, and warts (3). In addition, several macrocyclic diterpenoids with antibacterial, anticancer, PGE2-inhibitory, anti-multidrug-resistant, prolyl endopeptidase inhibitory, antifeedant, anti-HIV and analgesic activity have recently been isolated from different *Euphorbia* species (4,5). They include jatrophane, ingol, myrsinane diterpenoids, leucocyanidol, quercitol, camphol, quercetrin, dihydroellagitannins and dimeric hydrolysable tannins-euphorbins (6,7). The antibacterial activity of several *Euphorbia* species has been evaluated in different occasions. The aqueous extract of *E. hirta*, used in traditional medicine for the treatment of dysentery, colic, ulcers, asthma and chronic bronchial infections showed activity against *Escherichia coli*, *Proteus vulgaris*, *Pseudomonas aeruginosa* and *Staphylococcus aureus* (8,9). The methanolic and acetone leaf extracts of *E. fusiformis* showed growth inhibition of *S. aureus*, *E. coli*, *P. aeruginosa*, *Klebsiella pneumoniae*, *P. vulgaris*, *Salmonella typhi* A and *S. typhi* B. (10). Ethanolic extract of *E. australis* showed activity against *Bacillus cereus*, *E. coli*, *K. pneumoniae*, *P. aeruginosa* and *S. typhimurium* (11). Similarly the ethanol, acetone and water extracts of *E. fruticosa* (12) and methanol extracts of *E. macroclada* showed inhibitory effects against *S. aureus* (13). These results may support the popular use of these plants in traditional medicine for the treatment of fever, wound infections and intestinal disorders.

## 1.2 Historical Background of *Acalypha indica* Linn.

*Acalypha indica* Linn. is a member of the Euphorbiaceae family. It is essentially a weed which grows in waste areas. In Thailand, *A. indica* is commonly known as “Tam-Yae-Maeo”. *A. indica* is a small annual herb, 15–90 cm high; stem erect, terete, longitudinally grooved, pubescent. Stipules narrowly triangular, 1–2 mm long, margin with glandular hairs. Leaves: petioles terete, 2.5–7(–8) cm long, longitudinally grooved above, pubescent; blades rhomboid, 3–7 by 2–6(–7.5) cm, chartaceous, base cuneate, margin crenulate-serrate, apex acute or obtuse, glabrous on both surfaces except for the pubescent veins; nerves 4 or 5 pairs. Inflorescences 1(or 2) together, bisexual, axillary (to terminally), (2–)4–9(–11) cm long, staminate part apical, 0.5–1.5 cm long, pistillate flowers at base. Staminate flowers 6–10 per node; bracts ovate-oblong or ovate-lanceolate, 0.8–1 by 0.2–0.3 mm, pubescent outside; buds subglobose, 0.3–0.7 mm in diameter; pedicel 0.1–0.2 mm long; sepals 4, ovate, c. 0.5 by 0.3 mm, glandular outside, puberulent. Pistillate flowers 1(–4) per node; bracts cup-shaped, 4–9 by 5–13 mm, remotely serrate with 8–12 teeth, glabrous inside, pubescent outside, with visible venation, with translucent dots; sepals 3, ovate, 0.7–1.5 by 0.3–0.5 mm, pubescent and with glandular hairs; ovary subglobular, c. 1.5 mm in diameter, pubescent, stigmas 2–3.5 mm long. Fruits 3-lobed, oblate or subglobular, 1.8–2.2 by 2–2.8 mm, pubescent and with glandular hairs. Seeds ovoid, 1.2–1.5 by c. 1 mm. Sometimes solitary irregular pistillate flowers at the end of the branches: pedicel 0.5–5 mm long; sepals 3 or 4, ovate-lanceolate, pubescent, style 1, attached at base of ovary, apex fimbriate, ovary 1-locular; fruit indehiscent, oblate, 2–3 by c. 2 mm, pubescent, with longitudinal suture in the center, appendages tubular at apex, 0.8–1 mm wide, fimbriate apically.

*A. indica* is widely distributed throughout the northern (Mae Hong Son, Chiang Mai, Lampang, Phitsanulok, Kamphaeng Phet, Nakhon Sawan), north-eastern (Maha Sarakham, Khon Kaen), eastern (Chaiyaphum, Nakhon Ratchasima, Buri Ram, Surin, Si Sa Ket, Ubon Ratchathani), south-western (Uthai Thani, Kanchanaburi, Ratchaburi, Phetchaburi, Prachuap Khiri Khan), central (Lop Buri, Phra Nakhon Si Ayutthaya, Saraburi, Nakhon Pathom, Pathum Thani, Nakhon Nayok, Nonthaburi, Bangkok), south-eastern (Sa Kaeo, Prachin Buri, Chachoengsao, Chon Buri, Chanthaburi) and

south peninsular parts of Thailand (Chumphon, Surat Thani, Krabi, Nakhon Si Thammarat, Phatthalung, Trang, Songkhla, Narathiwat).

It is also distributed in U.S.A. (Guam), Tropical Africa, India, Sri Lanka (Lectotype), China, Japan, Taiwan, Indo-China, Malaysia, Singapore, Philippines, Sumatra, Java, Lesser Sunda Islands, Timor and Celebes.

Ecology: Weeds in cultivation, along roadside; alt. 0–300 m.

Vernacular: Tam-Yae-Tua-Phu (ตำแยตัวผู้), Tam-Yae-Maeo (ตำแยแมว) (Central); Han-Maeo (หานแมว), (Northern); Lang-Ta-Kai (ลิงตาไก่) (Trang).

(14) The figure of *A. indica* is shown in Figure 1.1



**Figure 1.1** *A. indica* Linn.

*A. indica* has been recognized as a medicinal plant whose parts have been used as components in traditional medicine for various purposes, including the treatment of scabies (15), rheumatoid arthritis, syphilitic ulcer (16), and wound healing (17) and

used as laxative (18), anti-snake venom (19,20,21, 22), anti-implantation and an anti-estrogenic (23).

### **1.3 Historical Background of *Bridelia retusa* (L.) A. Juss.**

*Bridelia retusa* belongs to Euphorbiaceae family. It is a medium to large deciduous tree (up to 10-20 m high). In Thailand, it is commonly known as “Tengnam”. It is found in dry evergreen and deciduous forest and open land, e.g. India, Sikkim, Bhutan, Sri Lanka, Myanmar, Indochina, China, Thailand, Malay Peninsula and Sumatra (24). The tree is identified by rigid leathery leaves with straight parallel lateral veins and strong spines on the bark of young stems. It is a drought hardy species, produces root-suckers and a good coppicer. Leaf-blade is elliptic-oblong to elliptic-oblongate, 10-20 x 4-10 cm, tip somewhat pointed, sometimes blunt, base is rounded or roundly wedge-shaped, margin entire or wavy, thinly leathery, lateral nerves 15-20 pairs. Flowers are arranged in axillary fascicles and also in fascicles on leafless branches appearing as spikes. The fascicles are either unisexual or bisexual; axes densely puberulous; bracts small, acute; flowers stalked. Fruit is globose, fleshy sweetish drupe, about the size of a pea, purple-black, seated on a hard enlarged calyx. 1 or 2 seeds with fairly thick bony shells. It is distributed throughout India, in hotter parts along the base of the Himalayas from Kashmir to Mishmi, southward to Ceylon. Flowering: May-August. (25). The figure of *B. retusa* is shown in Figure 1.2.



**Figure 1.2** *Bridelia retusa* (L.) A. Juss.

*B. retusa* has been recognized as a medicinal plant whose parts have been used as components in traditional medicine for various purposes;

The paste of leaf is mixed with the leaves of *Curculig orchiodes* and the oils of castor, coconut and gingelly are applied externally to cure wounds (26) and for the treatment of skin diseases (27). A flavonoid isolated from the benzene fraction of the ethanol leaves extract of *B. retusa* showed antimicrobial activity against human pathogenic bacteria (28). The bark extract was used as contraceptive to develop sterility (29) and for the treatment of dysentery (30).

#### 1.4 Historical Background of *Cleidion javanicum* BL.

*C. javanicum* is in Euphorbiaceae family. Its Thai name is called “Dee-mee”. It is a large shrub up to 15 m tall found in forests at low and medium altitudes from India to New Guinea (31). Its bark is grey, smooth, minutely lenticellate; blaze dull orange. Branchlets terete, glabrous. The leaves are simple, alternate, spiral; stipules caducous; petiole 2-3 cm long, shallowly canaliculate, swollen at both ends, glabrous; lamina 8-20 x 3-8 cm, narrow-elliptic to obovate, apex abruptly acuminate, base acute to cuneate; margin remotely serrate, subcoriaceous, shining above, glabrous, pair of glands present at the junction of lamina and petiole above; secondary\_nerves 5-6 pairs with hairy domatia in the axils; tertiary\_nerves reticulo-percurrent. The leaves are alternate or sub-opposite, oblong, about 12 centimeters long, and 5 centimeters wide. The flowers are solitary or few in a cluster, and are borne on the axils of the leaves. Flowers unisexual; male flowers in long axillary spicate racemes; female flower solitary, axillary, peduncle elongated. The fruit is somewhat rounded and about 3 centimeters in diameter. The fruit shape is capsule, usually bilobed sometimes trilobed, with persistent style and stigma; seeds 1 per locule. Ecology in wet evergreen forests up to 900 m. It is distributed in Indomalaysia; in the Western\_Ghats- occasional in South and Central Sahyadris. (32). The figure of *C. javanicum* is shown in Figure 1.3.



**Figure 1.3** *Cleidion javanicum* BL.

*C. javanicum* has been recognized as a medicinal plant whose parts have been used as components in traditional medicine for various purposes;

The stem of this plant has been employed as an analgesic, antipyretic and a diaphoretic (33). Decoction of its leaves is reputed to cause abortion, whereas a decoction of the bark is given as stomachic. Its seeds are used for the treatment of constipation (34).

## **1.5 Research Aim**

1.5.1 To study biological activities of the crude and pure extracts of *A. indica* Linn., *C. spiciflorum* Merr. and *B. retusa* (L.) A. Juss.

1.5.2 To search for bioactive constituents from selected medicinal plants in 1.5.1 (isolation, purification and structure elucidation).