CHAPTER I

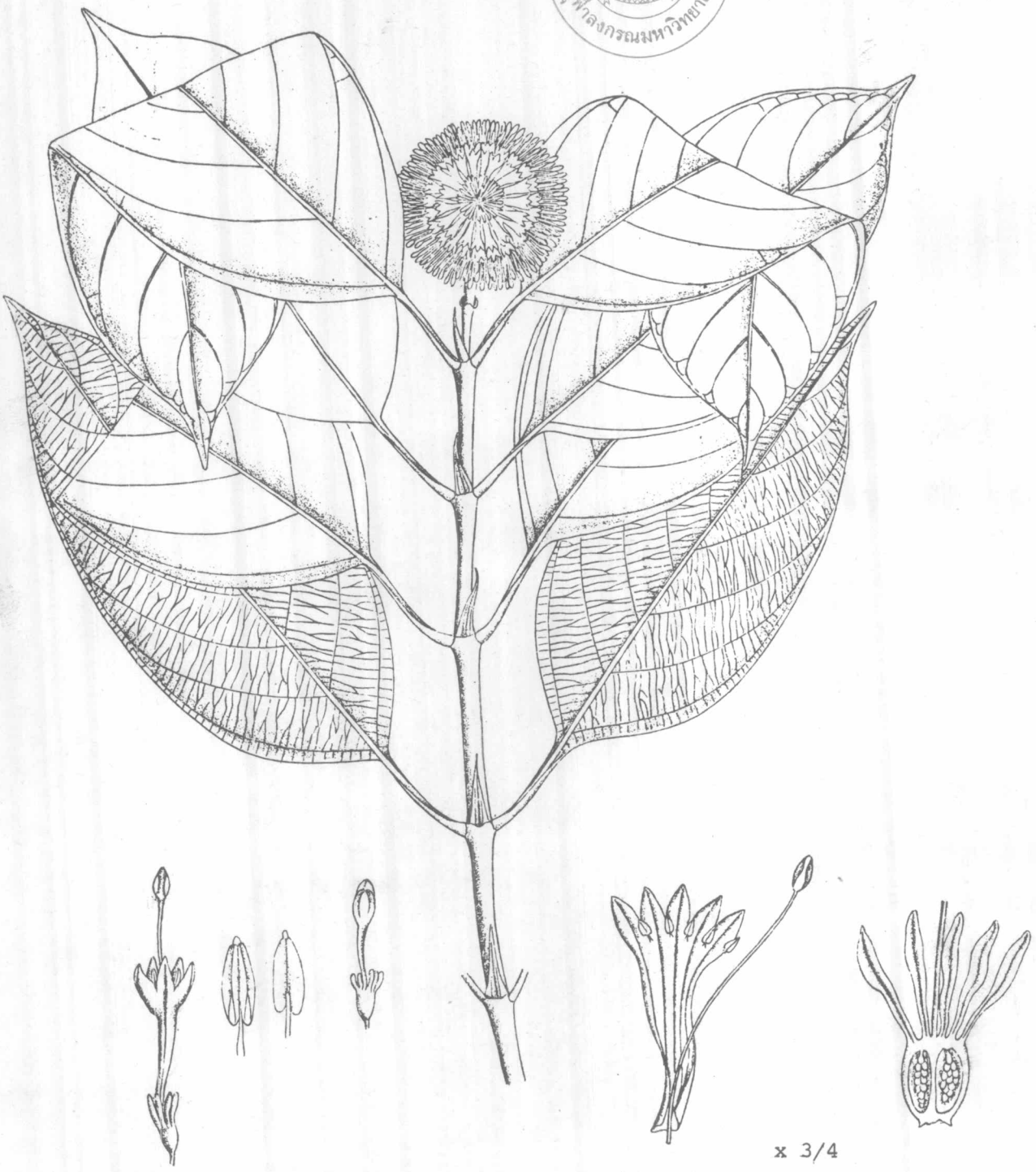
INTRODUCTION

Anthocephalus is a small genus (two species only)[1] of trees of the Tribe Naucleeae, Subfamily Cinchonoideae, Family Rubiaceae,[2] the one species, *Anthocephalus chinensis* A. Rich., being Indo-Malayan; the other, *Anthocephalus macrophyllus* Havil., being restricted to the Moluccas, where it is both wild and cultivated.[1]

Anthocephalus chinensis A. Rich., (Synonyms: *A. cadamba* Miq.; *A. indicus* A. Rich.; *A. morindaefolius* Korth.; *Nauclea cadamba* Roxb.; *Sarcocephalus cadamba* Kurz.)[3,4]

This plant is known in Thai as "Kra-thum" (กระทุ่ม), "Ka-thum" (กะทุ่ม) and also known in various local names in Thailand as Ka-thum-bok "กะทุ่มบก" (Bangkok), Ta-ku "ตะกู" (Sukhothai), Tum-luang "ตุ้มหลวง", Tum-niang "ตุ้มเหนียง", Tum-kan-yao "ตุ้มก้านยาว", Tum-kan-suang "ตุ้มก้านข้วง" (North), Ka-thum-phrai "กะทุ่มพราย" (Khonkaen), Ko-som "โกสัม" (Chaiyaphum), Khae-saeng "แคแสง", Ta-ko-som "ตะโกสัม" (Cholburi), Ta-ko-yai "ตะโกใหญ่" (Trat), Ka-thum-khi-mu "กะทุ่มขี้หมู" (South)[5]

It is a large deciduous tree of rapid growth, erect stem, about 9 meters high and girds up to 1.5 - 2.1 meters, branches horizontal, rounded crown rather drooping at the ends.[6] The trees are common in moist deciduous forests and thrive best in well-drained alluvial soil, grow rapidly in the first 6-8 years and



(after Kirtikar & Basu 1938)

Figure I กระท่าม *Anthocephalus chinensis* A. Rich.

attain their maximum size in about 20 years.[6] Bark dark-gray with numerous regular longitudinal fissures, the outer bark peeling off in small rectangular scales. Wood white, with a yellowish tinge, soft, even-grained. Leaves opposite, coriaceous, shining, glabrous above, pubescent beneath, elliptic-oblong, ovate, or ovate-cordate, acute, 7.5 - 17.5 cm by 4.5 - 11.0 cm, lateral-nerves about 10 pairs, prominent on both sides, looping within the margin; petioles 1.25 - 2.5 cm long; interpetiolar stipules lanceolate, early caduous. Flower-heads scented at night, 3.75 cm in diameter, yellow, solitary, terminal, peduncles stout, 2.5 - 3.75 cm long; bracts stipuliform. Calyx 5 lobes oblong, persistent, 0.5 cm long. Corolla-lobes lanceolate, acute, erect, imbricate in bud; tube 1.0 cm long, slender, dilated upwards, slightly pubescent outside. Stamens 5, on throat of corolla, filaments short. Styles and stigmas white. Ovaries non-confluent, 4-celled in the upper, 2-celled in the lower portion. Bracteoles none. Fruits a fleshy receptacle, globose, orange mass of closely packed, compressed angular capsules, crowned with the persistent calyx-lobes, seeds not winged, muriculate, minute.[7,8,11]

It has been mentioned earlier that *Anthocephalus cadamba* Miq. is a sacred tree of India with a series of Sanskrit names derived from "Kadamb" (กทัมพ). This name, carried to the Siamese Peninsula by natives of India–Buddhists probably–and extended to cover various allied trees, gave rise to Ka-tawm, *Mitragyna speciosa* Korth., Ka-thum, *Mitragyna javanica* Korth et Valeton,

and "Ka-tawm" in its turns has become "Ketum" and "Kutum" in Malay. "Nai thum" in Laos and "Kodam" in Indo-china are related names, the former in the Moi language stands as "thum", and in Cambodia as "Khtom". It is very interesting that "Kadamb" reaching the Peninsula through Java as a name for *Anthocephalus cadamba* Miq. has taken a different form.(9)

"Kadamb" is a name which varies considerably; it is Sanskrit. It gives rise to "Kadamba" which have been discussed under *Anthocephalus* "Ka-thum" and "Thum", which the Siamese apply with qualifying words to species of the genus, is of common origin with the Sanskrit names. The reason for Sanskrit names being so wide-flung lies in the circumstance that *Anthocephalus cadamba* Miq. is a sacred tree of Hinduism.(1)

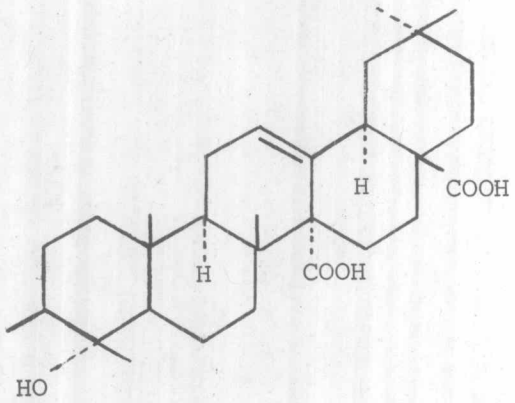
The tree sets flowers and fruits at the age of at least five years. In India, the flowers are offered in the temple of Siva. The flowers are small, white or yellowish, in large globose pendent heads. The receptacle becomes fleshy, and an edible compound fruit is formed about the time of the periodic leaf fall, and is eaten by men and animals. The seeds are dispersed by birds and bats.(1) The young leaves have a slightly aromatic odour and an unpleasent taste, whereas the older are without odour, and have a sour taste.(1)

This plant is known as "wild cinchona" in English and "Kadamb" in Hindi.(10) The bark of the tree is widely used in India as a febrifuge and tonic, and in uterine complaints, blood diseases,

leprosy and dysentery. A decoction of the leaves serves as a gargle in case of aphthae and stomatitis. The fresh juice of the bark is applied to the heads of infants when the fontanells sinks, and a small quantity mixed with cumin and sugar is given internally. In inflammation of the eyes, the bark juice with equal quantities of lime juice, opium and alum, is applied round the orbit. The compound fruit is used as astringent in case of diarrhoea. The claim for its use in the treatment of snake bite has been disproved.[1,6,11,12,13]

Early work on the chemistry of this plant was confused but Dymock et al reported that the bark contained a principle similar to cinchotannic acid.[14] Nadkarni reported the presence of a readily formed oxidation product of the nature of cinchona red.[15] Gupta et al have studied the constitutens of the essential oil of the flowers of the plant.[16] Prasad et al have investigated for its steroidal and alkaloidal constituents, including fats and reducing sugars of the bark.[10,17]

Further work was reported by Sahu et al for the isolation of a new pentacyclic triterpenic acid designated as cadambagenic acid from the stem bark and the structure[18] was assigned as :



Cadambagenic acid

A new saponin from stem bark was reported by Benerji et al the structure elucidation was established as α-L-rhamnopyranosyl-(1 →2)-α-L-rhamnopyranosyl-(1 →3)-α-L-fucopyranosyl-(1 →3)-cadambagenic acid.[65,66]

Brown et al[45,46,47,50] as well as Handa et al[79] investigated the presence of indole glycosidic alkaloids and non glycosidic alkaloids from this plant.

The use of *Anthocephalus chinensis* A. Rich. in folk medicine and the interest in the indigenous plants of Thailand stimulated a re-appraisal of the alkaloids present in the leaves.

The present investigation deals with the isolation, separation and characterisation of alkaloid isolated from the leaves of *Anthocephalus chinensis* A. Rich. growing in Thailand.

The Naucleeae is the subfamily of taxonomic confusion therefore isolation, separation and characterisation for the types of alkaloid presence in this plant might be worthwhile in supporting the classical taxonomy plays an important role in the classification of plants.