CHAPTER I

INTRODUCTION

The genus *Artocarpus* belongs to the family Moraceae of the order Urticarles. This genus consists of about 47 species distributed in Ceylon, India, Pakistan, Burma, Siam, Indo-China, South-China, Malaysia and Solomon Islands. Three species (*A. communis*, *A. heterophyllus* and *A. integer*) are cultivated throughout the tropics (Kochummen, 1978).

The plants in the genus *Artocarpus* are evergreen trees with milky juice. Leaves alternate, coriaceous, often very large, entire, lobe or pinnatifid, penninerved. Flowers monoecious, densely crowed on globose or oblong 1-sexual solitary usually axillary receptacles, often mixed with scales which are often thickened or peltate at the apex. Male flowers: Perianth 2-4-lobed or –partite; lobes obtus, valvate or slightly imblicate. Stamen 1, erect. Pistillode 0. Female flowers: Perianths tubular, confluent below with the receptacle; mouth minute. Ovary straight; ovule pendulous; style central or lateral; stigma entire (rarely 2-3 fid). Fruit a much enlarged fleshy oblong cylindric or subglobose entire or lobed receptacle, clothed with the greatly accrescent fleshy perianths and carpels (anthocarps) which have hardened spinescent or truncate or pyramidal or flat apices. Seed pendulous; testa membranous; albumen 0; embryo straight or incurved; cotyledons fleshly equal or unequal; radicle short, superior (Kirtikar and Basu, 1980).

According to Smitinand (1980), the species of genus *Artocarpus* found in Thailand are as follows.

Artocarpus altilis (Park.) Fosb. (*A. communis* J.R. & Forst, *A. incisa* Linn. f.)	ขนุนสำปะลอ Khanun sampalo (Central), สาเก Saake (Central for seedless variety) Bread Fruit Tree, Bread Nut Tree.
A. altissimus J.J. Smith	ไสน Sanai (Surat Thani).
A. chaplasha Roxb.	หาดส้าน Haat saan (Chiang Rai).
A. dadah Miq.	ทังคัน Thang kan, ม่วงกวาง Muang kwaang (Yala); หาดรุม Haat rum, หาดลูกใหญ่ Haat luuk yai (Trang).
A. elasticus Reinw. ex Bl.	กะออก Kaok, กะเอาะ Ka oh (Peninsular);

	ดือกะ Tue-ka (Malay-Yala); เอาะ Oh (Trang,Ranong).
A. gomezianus Wall. ex Tre′c.	ดะปัง Ta pang, ดำปัง Tam-pang (Malay-Peninsular); หาดหนุน Hatt nun (Northern).
A. heterophyllus Lamk. (*A. integrifolious* Linn. f.)	ขนุน Khanun (General); ขะนู Kha-nuu (Chong-Chanthaburi); ขะเนอ Kha-noe (Khmer); ซีคีย See-khuey, ปะหน่อย Pa-noi (Karen-Mae Hong Son); นะยวยซะ Na-yuai-sa (Karen-Kanchanaburi); นากอ Naa-ko (Malay-Pattani); เนน Nen (Chaobon-Nakhon Ratchasima); มะหนุน Manun (Northern, Peninsular); ล้าง Laang (Shan-Northern); หมักหมี้ Makmee (Northeastren); หมากลาง Maak-laang (Shan-Mae Hong Son); Jack Fruit Tree.
A. integer Merr.	จำปาดะ Champada (General); จำปาเดาะ Champaadoh (Peninsular); Champedek.
A. lakoocha Roxb.	กาแย Kaa-yae, ตาแป Taa-pae, ตาแปง Taa-paeng (Malay-Narathiwat); มะหาด Mahaat (Peninsular); มะหาดใบใหญ่ Mahaat baiyai (Trang); หาด Haat (General).
A. lanceifolius Roxb.	ขนุนป่า Khanunpaa (Peninsular); หนังกาปีโด Nang-kaa pee-to, หนังกาปีปิ๊ด Nang-kaa pee pit (Malay-Peninsular); นั่งกาปีแป๊ะ Nang-kaa pee-pae (Malay-Narathiwat).
A. nitidus Tre′c subsp. lingnanensis Jarrett (*A. parva* Gagnep.)	มะหาดข่อย Mahaat khoi (Surat Thani).
A. rigidus Bl.	ขนุนป่า Khanun paa (Peninsular)
A. rigidus bl. subsp .asperulus Jarrett.	ขนุนป่าน Khanun paan (Surat Thani).

Artocarpus lakoocha Roxb. and *A. gomezianus* Wall ex Tre′c are indigenous plants known in Thai as Mahaat and Hattnun, respectively.

Artocarpus lakoocha Roxb. is a large deciduous tree reaching 15-18 m. in height with a spreading head; bark rough, grey; young shoots thin, densely clothed with a soft grey, tawny or rusty tomentum. Leaves coriaceous, 10-30 by 5-15 cm., oblong, elliptic or subovate, entire (the young ones sometimes serrate), obtuse, cuspidate, glabrous and shining above, softly pubescent beneath, base broad or narrow, truncate or rounded; main nerves 6-12 pairs with reticulate venation between; petioles 1.3-2.5 cm. long, lanceolate tawny-pubescent. Flower in axillary globose shortly pedunculate heads; bracteoles peltate. Male flower: Sepals 2-3, triangular, truncate, puberulous. Stamen 1; filament broad below, tapering upwards; anther exserted, short, broad, 2-celled. Female flowers: Anthocarps completely united. Fruit 5-7.5 cm.diam., lobulate, smooth, velvety, yellow, edible. Seeds oblong, few, board, about 13 mm. across (Kirtikar and Basu, 1980).

Artocarpus gomezianus Wall. ex Tre′c. is a medium-sized to tall tree reaching 42 m. and 210 cm. girth. Bark: gray brown, cracking to scaly. Inner bark: pink, soft with creamy sap. Sapwood: pale yellow. Leaves: stalk 1.5-3 cm. long; blade leathery, oblong to elliptic, 11-25 x 7-16 cm., apex shortly pointed, base more or less rounded, glabrous on both surfaces, upper surface shining, secondary nerves 10-15 pairs, nervation prominent on both surfaces; midrib and nerves drying black. Flower heads: solitary in leaf axils; male head: obovoid to subglobose, 1-2.5 cm. across on 0.7-1.7 cm.long stalk. Fruit: subglobose, 8 cm. across, yellow pink flesh, drying brown or black, with smooth velutinous surface, stalk 1.5-4.5 cm. long. Seeds: ellipsoid, 1.2 x 1 cm. (Kochummen, 1978).

Several phytochemical studies on *A. lakoocha* have been reported (Venkataraman, 1972; Chauhan and Kumari, 1979; Pavaro and Reutrakul, 1976; Saraswat, 1979; Kapil and Joshi, 1960; Pavanasasivum and Sultabawa, 1973; Chatterjee *et al.*, 1982; Arora *et al.*, 1987; Mongolsuk *et al.*, 1957). The major components of the heartwood of *A. lakoocha* have been known to be stilbene derivatives, but their ^{13}C NMR properties have not been studied. As for *A. gomezianus*, no phytochemical work has been done on the roots, but its heartwood and leaves have been investigated (Venkataraman, 1972; Kingroungpet, 1994). A recent report on the tyrosinase inhibitory activity of some constituents of *A. insisus* prompted the author to

explore the posibility of finding other tyrosinase inhibitors from *A. lakoocha* and *A. gomezianus*.

Tyrosinase inhibitors have potential uses as food preservatives, insect controllers and skin whiteners. In this study, the extracts of *A. lakoocha* and *A. gomezianus* showed significant tyrosinase inhibitory activity (see result and discussion part). It is, therefore, interesting to investigate the two plants for both chemical and biological properties.

The main objectives in this investigation are as follows.

1. to isolate and purify compounds from the heartwood of *A. lakoocha* and the roots of *A. gomezianus*.
2. to determine the chemical structure of each isolated compound.
3. to evaluate the tyrosinase inhibition potential of each isolated compound.

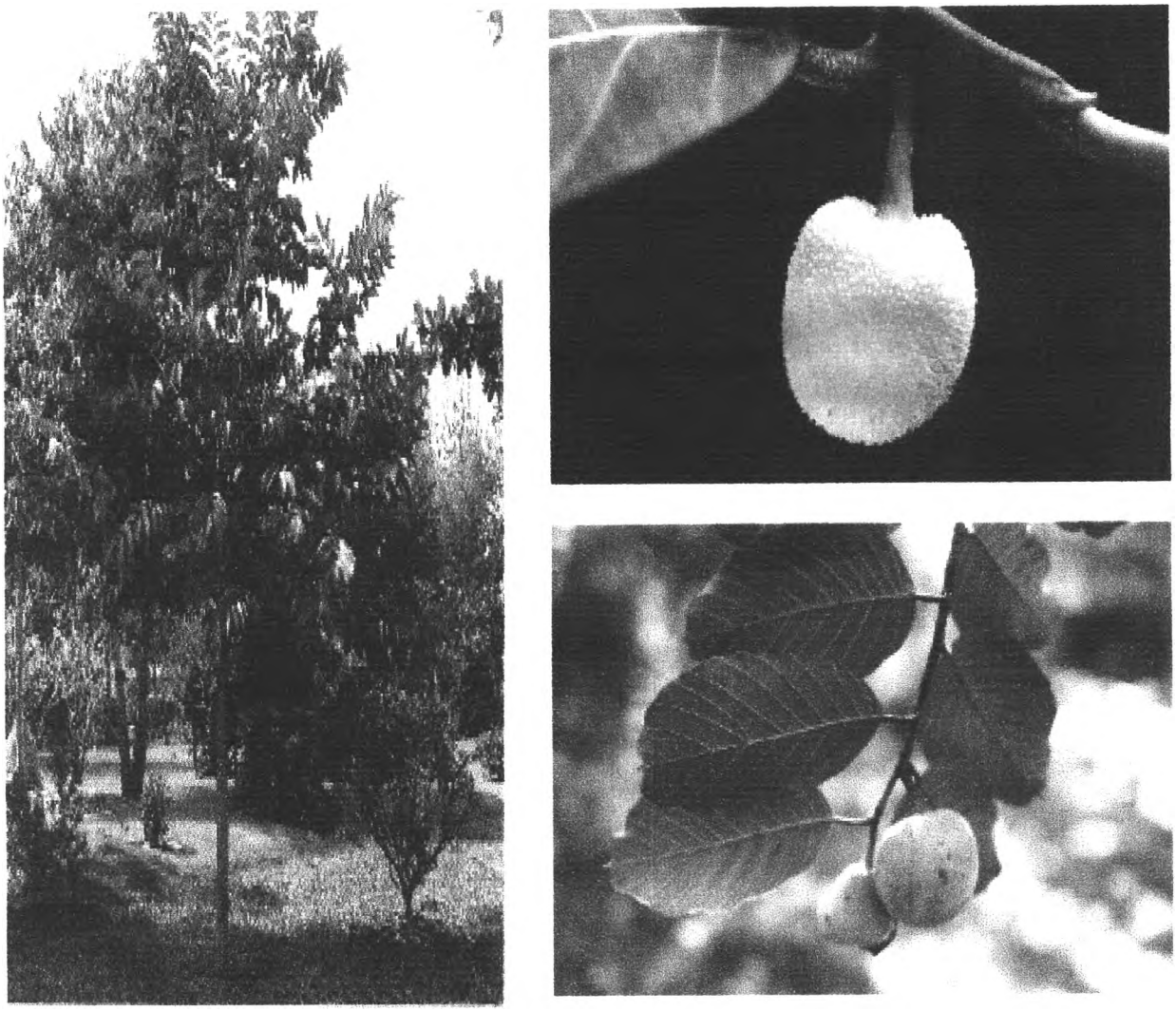

Figure 1 *Artocarpus lakoocha* Roxb.

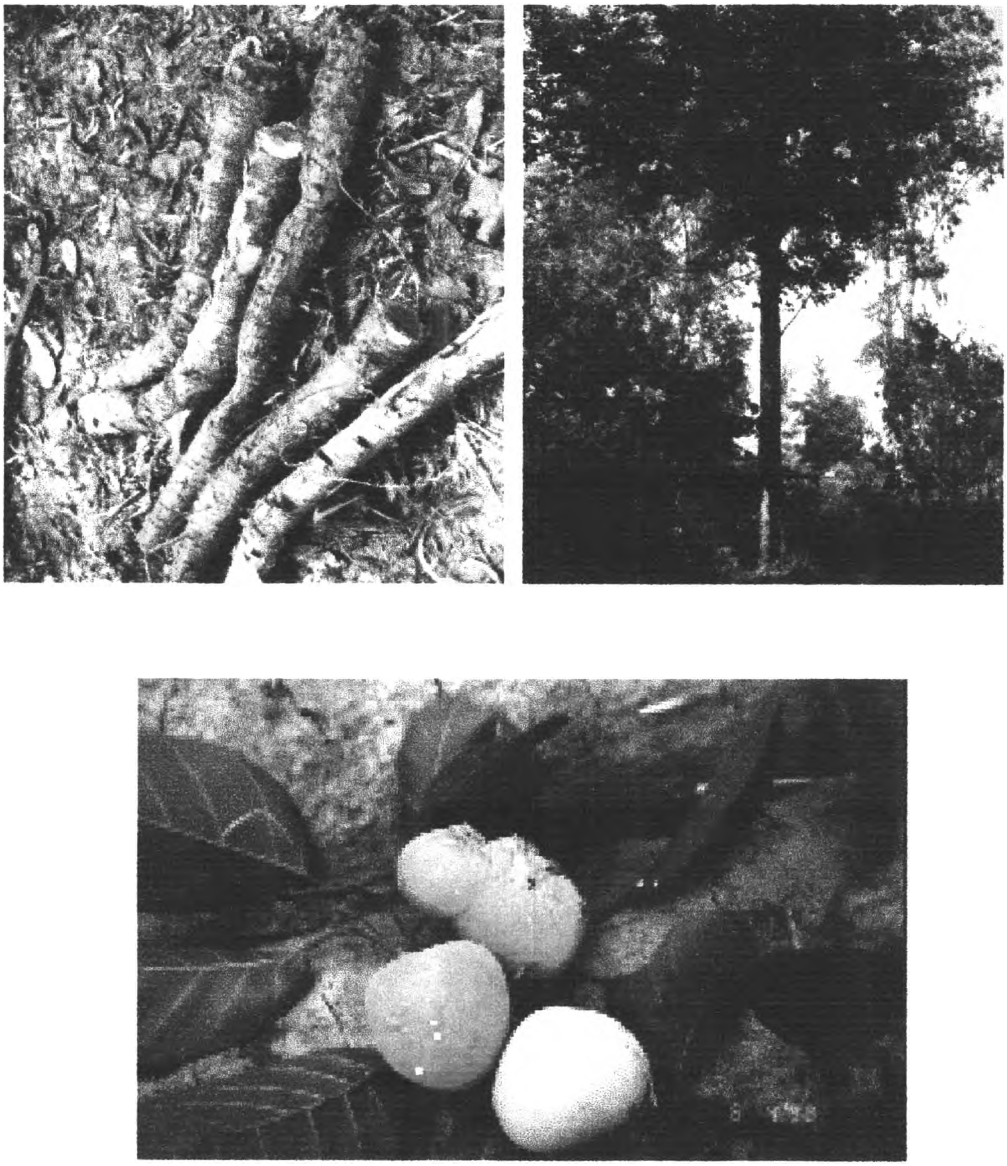

Figure 2 *Artocarpus gomezianus* Wall. ex Tre'c.