CHAPTER 1
INTRODUCTION

1.1 Introduction

Heritiera are plants widely distributed from East Africa and Madagascar to the Pacific (Tomlinson, 1986). In Thailand *Heritiera* comprises seven species: *H. formes* Buch.-Ham, *H. javanica* (Blume) Kosterm, *H. littoralis*, *H. macrophylla* Wall. Ex Kurz, *H. pavifolia* Merr, *H. simplicifolia* (Mast.) Kosterm. and *H. sumatrana* (Miq.) Kosterm (Smitinand, 1970). *Heritiera littoralis* has been found in the east and the south of Thailand. It has many local Thai names: Ngon kai thale (หงอนไก่ทะเล, central and Suratthani), Du hun (ดุหุน, Trang), Khai khwai (ไข่ควาย, Krabi) (Smitinand, 1980) and also a synonyms of *Heritiera minor* (Tomlinson, 1986).

H. littoralis is a mangrove plant. It can become a substantial tree (20 to 25 m tall) and is typically found in firm muds of the back mangrove zones near the terrestrial fringe which are upstream and low salinity sites. The leaves are variable in size and typically large (10 - 20 cm long) with the shapes of oval to elliptic. Its texture and colour, however, make them distinctive: the stiff leathery leaves are smooth and dark green on top while numerous tiny scales cover the lower leaf surface with a silvery white undercoat. The flowers are small, unisexual, organized in loose panicles and brownish red to pinkish purple in colour depending on the density of silver scales and hairs on the flower heads. The fruit appears in yellow-orange colour with an outstanding feature: a ridge on the outer edge resembling a chicken's comb (Thai name "Ngon kai thale"). The fruits occur in clusters which individual fruits may be 5-7 cm long. Fruit texture can be woody but also contain some spongy, buoyant tissues. The bark is grayish, fissured and scaly. *H. littoralis* appears to have a narrow salinity tolerance to both soil and tidal water-probably the basis of its upstream habitat preferences (Aksornkoae, 1992). In terms of medicinal uses, the Vietnameses use decoction of seeds to treat diarrhea and dysentery (Bamroongrugsa, 1999) while local fishermen in the Philippines use the sap as fish poison (Miles, 1991).

a. Tree

b. Bark

c. Leaves

d. Flowers

e. Fruits

f. Fruits

Figure 1 Parts of *Heritiera littoralis.*

1.2 Review of Literatures

Chemical constituents isolated from the three species of this genus were summarized in **Table 1**. Information from NAPRALERT database developed by University of Illinois in Chicaco and SciFinder Scholar copyright in 2005 will be presented and classified into group: Alkenols, Benzenoids, Coumarins, Flavonoids, Phenylpropanoids, Sesquiterpenes, Steroids and Triterpenes.

Table 1. Compounds from plant of *Heritiera* genus.

a. Alkenols **b.** Benzenoids **c.** Coumarins **d.** Flavonoids
e. Phenylpropanoids **f.** Sesquiterpenes **g.** Steroids **h.** Triterpenes

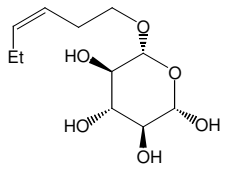
Scientific name	Investigated part	Compound	Bibliography
H. littoralis	not specific	betulinic acid, **25h** friedelin, **27h** oleanolic acid, **30h** taraxerol, **31h** 30-norlupan-28-oic acid, **34h** friedelan-3-one-29-ol, **28h**	Yan *et al*., 2005
	leaves	catechin, **6d** eriodictyol, **7d** kaempferitrin, **8d** kaempferol, **9d** kaempferrol-3-*O*-(6″-*O*-*E*-*p*-coumaroyl)-*β*-D-glycopyranoside (tribuloside), **13d** myricetin, **10d** quercetin, **11d** quercitrin, **12d**	Yan *et al*., 2004
	leaves	afzelin, **4d** astragalin, **5d** quercitrin, **6d** tribuloside, **13d** (Z)-3-hexenyl-*β*-D-glycoside, **1a** isolariciresinol-3a-*O*-*β*-D-glycoside, **14e**	Yoshio *et al*., 2000

Table 1. (continued)

Scientific name	Investigated part	Compound	Bibliography
H. littoralis	leaves	Me[-*β*-D-xylopyranosyl -(1→6)-*β*-D-glycopyranosyl]-salicylate, **2b** 2-*O*-[4-(3-hydroxypropyl)-2,5-dimethoxyphenyl]-1-*O*-*β*-D-glucopyranosylglycerol, **15e**	Yoshio *et al*., 2000
	root	heritol, **16f** heritonin, **17f** vallapin, **18f** vallapianin, **19f**	Miles *et al*., 1987 Miles *et al*., 1989 Miles *et al*., 1991
H. minor	Leaves and bark	friedelin, **27h** triacontanol, **31h** taraxerol, **31h** *β*-amyrin, **24h** *β*-sitosterol, **23g**	Ghosh *et al*., 1978
H. ornithocephala	heartwood	1-benzocepin-4(5H)-one, **20f** [1,1'-binaphthalene]-2,2'-diol, **22f** 2H-1-benzopyran-2-one, **3c** 7-hydroxycalamenene, **21f** 24-methylenecycloartenone, **33h** cycloartenone, **26h**	Cambie *et al.,* 1990
H. utilis (tarrietia utilis)	bark	lupeol, **28h**	Blair *et al*., 1970

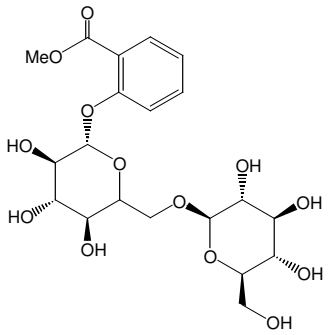
Structures

a. Alkenols



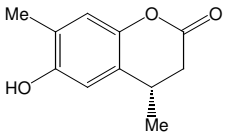
1a: (Z)-3-hexenyl-*β*-D-glycoside

b. Benzenoids



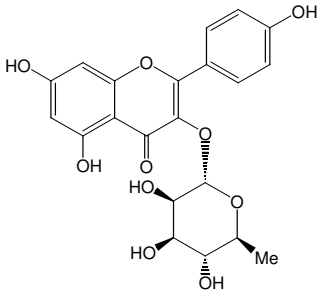
2b: Me[-*β*-D-xylopyranosyl-(1→6)-*β*-D-glycopyranosyl]-salicylate

c. Coumarins

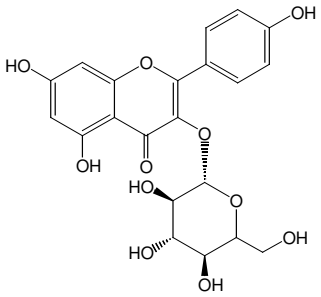


3c: 2H-1-benzopyran-2-one

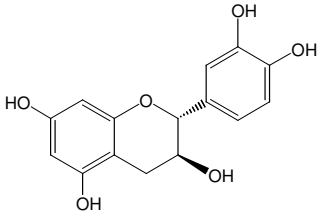
d. Flavonoids



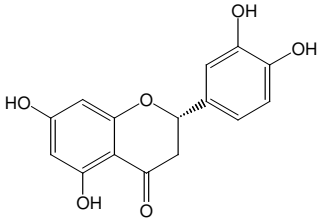
4d: afzelin



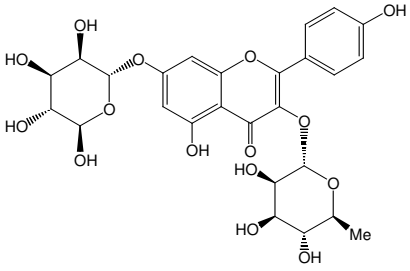
5d: astragalin



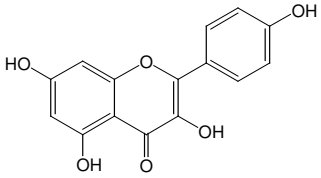
6d: catechin



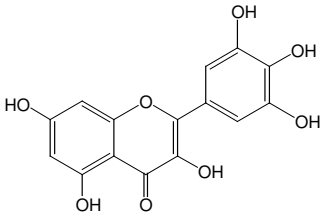
7d: eriodictyol



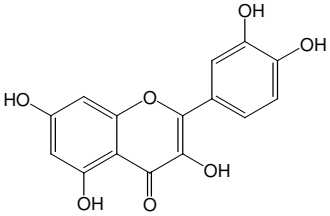
8d: kaempferitrin



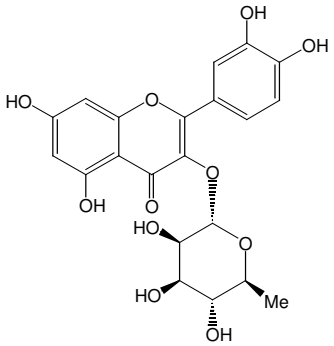
9d: kaempferol



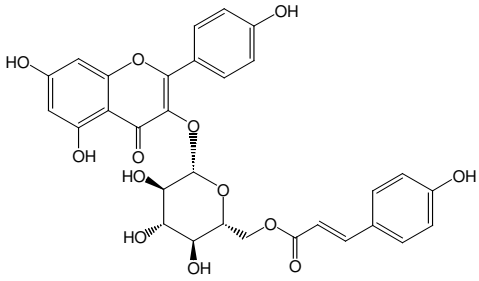
10d: myricetin



11d: quercetin

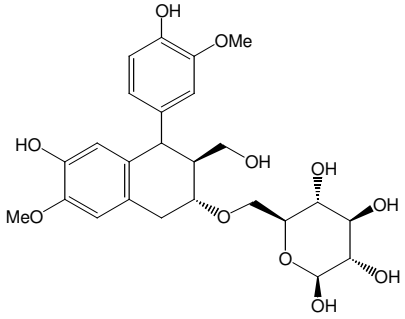


12d: quercitrin

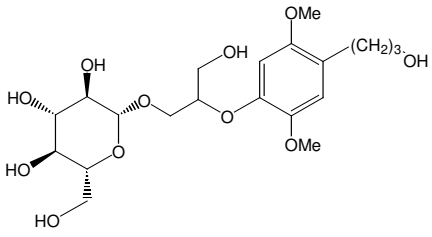


13d: tribuloside

e. Phynylpropanoids

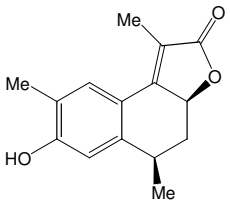


14e: isolariciresinol-3a-*O*-*β*-D-glycoside

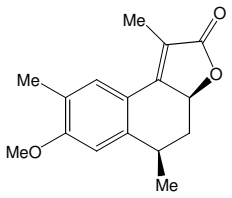


15e: 2-*O*-[4-(3-hydroxypropyl)-2,5-dimethoxyphenyl]-1-*O*-*β*-D-glucopyranosylglycerol

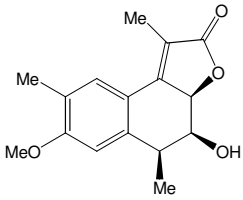
f. Sesquiterpenes



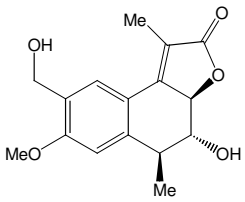
16f: heritol



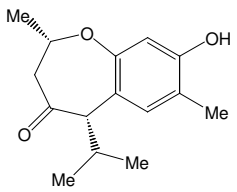
17f: heritonin



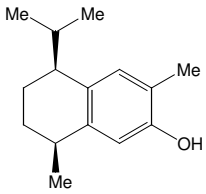
18f: vallapin



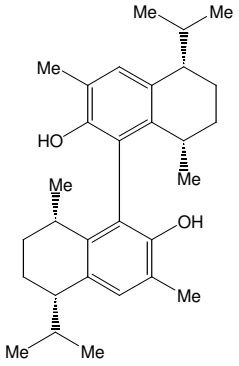
19f: vallapianin



20f: 1-benzocepin-4(5H)-one

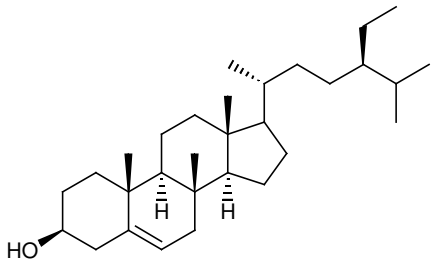


21f: 7-hydroxycalamenene



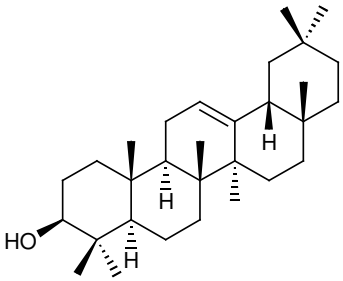
22f: [1,1'-binaphthalene]-2, 2'-diol

g. Steroids

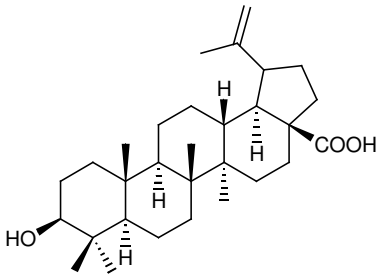


23g: β-sitosterol

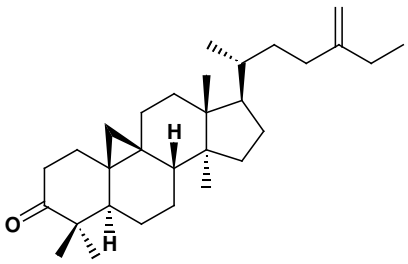
h. Triterpenes



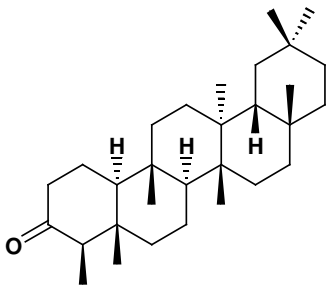
24h: β-amyrin



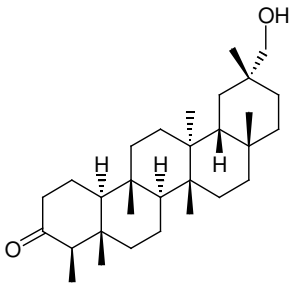
25h: betulinic acid



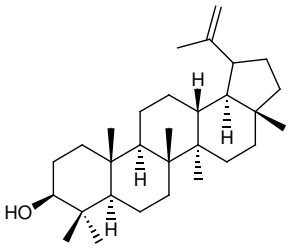
26h: cycloartenone



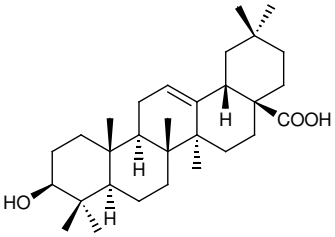
27h: friedelin



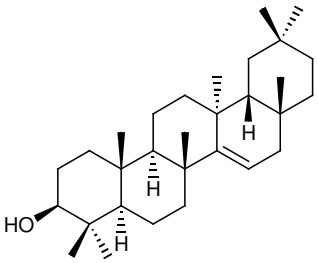
28h: friedelan-3-one-29-ol



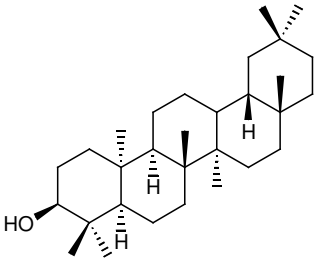
29h: lupeol



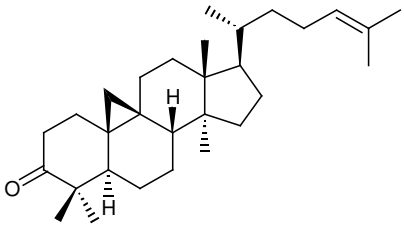
30h: oleanolic acid



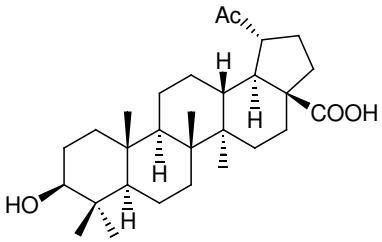
31h: taraxerol



32h: triacontanol



33h: 24-methylenecycloartenone



34h: 30-norlupan-28-oic acid

1.3 Objectives

The objectives of this research are as follow:

- to isolate pure compounds from the bark of *H. littoralis*.
- to determine the structure of pure compounds.
- to evaluate the biological activities of pure compounds.