

## CHAPTER I



### INTRODUCTION

Medicinal plants are rich natural resources. They are cheap, effective and have less harmful side-effects than synthetic drugs (1). Thai people know well about herbal medicine for a long time. Documents recording the use of herbal medicine were found in palm leaves, koi paper and marble tablets. In the past, medicinal plants were used in simple forms like alcoholic extract of dried whole plants ("Yaa Dong Lao") or as ingredients in foods and drinks. But nowadays, there are trends towards isolating and identifying the active ingredient in these plants in order to understand the principle behind the therapeutic effects and in search for more potent drugs. Accordingly, medicinal plants are widely studied by modern techniques in a more scientific way. Plaunoi and Plao Yai are medicinal plants always used together by the Thais to remedy ailments (2). Recently, an effective anti-peptic ulcer drug has been extracted from Plaunoi (*Croton sublyratus* Kurz.) (1,3). The active compound was plaunotol. It is likely that Plao Yai, which is a closely related plant, will contain similar chemicals which are effective drugs, thus Plao Yai is another interesting medicinal plant.

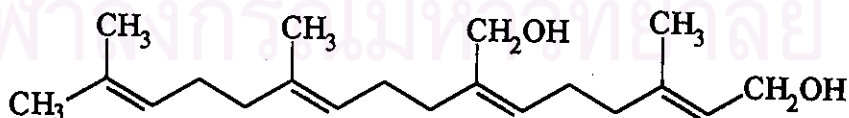


Figure 1 The Structure of Plaunotol from *Croton sublyratus* Kurz.

Plao Yai belongs to the Euphorbiaceae family (4). The scientific name of Plao Yai is *Croton oblongifolius* Roxb. In this family, there are 800 genera and 5000 species. Plao Yai was found in evergreen forests, deciduous forests and groves of brushwood which are not more than 700 meters above sea level (5). Apart from "Plao Yai", which is called by the Central, *Croton oblongifolius* Roxb. have several local names including : Khwa-wuu (Karen in Kanchanaburi), Seng-khe-khang, Sa-kaa-waa and Saa-kuu-wa (Karen in Mae Hong Son), Poh (Kamphaeng Phet), Plao luang (Northern) and Haa-yoeng (Shan in Mae Hong Son) (5).

In indigenous medicinal herb pharmacopoeia (5,6,7,8), all parts of Plao Yai are useful. For instance barks are used to inhibit chronic enlargements of livers and inhibit remittant fever, leaves can remedy liver complaints, scabies and kill parasite, fruits and seeds are purgative and are used in treatment of snake-bite, flowers are used to kill parasite, albumum used to aid digestion and in remedy of leprosy, heartwood is remedy of faint, pus and is used as laxative and roots are remedy in dysentery, chronic rheumatism, purgative and are poisonous in larger doses.

#### General Characterization of the Plants in the Genus Croton (9)

The genus *Croton* comprises 700 species of trees or shrubs. Leaves are usually alternate with 2-glandular stipule at the base. This plant is monoecious. Their flowers are solitary or clustered on the rachis of a terminal raceme and bracts are small. Male flowers contain 5-calyx, 5-petals and disk of 4-6 glands opposite the sepals. There are many stamens inserted on a hairy receptacle and anthers are adnate with parallel cells. In female flowers, sepals are usually more ovate than the male, petals are smaller than the sepals or missing and disk annular of 4-6 glands are opposite the sepals. There are three ovary with solitary ovule in each cell, styles are usually long and slender. Seeds are smooth, albumen copious and broad cotyledons.

General Characterization of *Croton oblongifolius* Roxb. (5,6,7,9)

*Croton oblongifolius* Roxb. is a medium sized tree. Its calyx and ovary are clothed with minute orbicular silvery scales. Leaves are 5.7-11.5 by 12.5-25.0 cm in size, and crowded toward the end of the branchlets. The shape of leaf blade is oblong-lanceolate and the base is usually acute with no apparent glands above the petioles which are 1.3-6.0 cm long. Flowers are pale yellowish green and solitary in the axils of minute bracts on long erect racemes. The male flowers locate in the upper part of the raceme and the females in the lower part. Male flowers are slender and have the length of pedicels of 4.0 mm. Calyx is more than 6.0 mm long and segments are ovate, obtuse and more than 2.5 mm long. Petals are 3.0 mm long, elliptic-lanceolate and woolly. The twelve stamens are inflexed in bud and the length of filaments are 3.0 mm. In female flowers, the pedicels are short and stout. Its sepals are more acute than in the male with densely ciliated margins. Petals are 2.0 mm long, with densely woolly margins. The three styles are 4.0 mm long. Diameter of fruit is less than 1.3 cm, slightly 3-lobed and clothed with small orbicular scales. In each fruit, the number of seeds are eight which are 6.0 mm long, rounded and quite smooth on the back.

The stem-bark, leaf, flower and fruit of *Croton oblongifolius* Roxb. are shown in Fig. 2 (10).

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Figure 2 The stem-bark, leaf, flower and fruit of *Croton Oblongifolius* Roxb.

Previous Studies in Chemical Constituents of *Croton oblongifolius* Roxb.

In 1968, P. S. Rao, G. P. Sachdev, T. R. Seshadri and H. B. Singh (11) studied on the barks of *Croton oblongifolius* Roxb. From light petroleum crude extract, they found a new diterpene alcohol that can not identified,  $\beta$ -sitosterol and oblongifoliol.

In 1969, V. N. Aiyar, P. S. Rao, G. P. Sachdev and T. R. Seshadri (12) found 19-deoxyoblongifoliol from the bark of *Croton oblongifolius* Roxb.

In 1970, V. N. Aiyar and T. R. Seshadri (13) studied on the major diterpene acid component in ether crude extract from the barks of *Croton oblongifolius* Roxb. and this was identified as Isopimara-7(8),15-diene-19-oic acid.

In 1971, V. N. Aiyar and T. R. Seshadri found three new minor components of the stem-bark of *Croton oblongifolius* Roxb. One was *ent*-isopimara-7,15-diene, the second was *ent*-isopimara-7,15-diene-19-ol and the third was *ent*-isopimara-7,15-diene-19-aldehyde (14). Furthermore, they found a diterpene acid named acetyl aleuritolic acid from the bark of *Croton oblongifolius* Roxb. (15). They also found the mistake in assigning the structure of oblongifoliol and deoxyoblongifoliol that they proposed in 1968 and 1969. The corrected structure of two compounds are revised and confirmed by spectroscopic data and chemical reactions (16).

In 1972, V. N. Aiyar and T. R. Seshadri studied on the stem-bark of *Croton oblongifolius* Roxb. and found furanoid diterpenes, one was a new acid, *ent*-15,16-epoxy-3,11,13(16),14-clerodatetraen-19-oic acid and the second was (-)-hardwickiic acid (17). They also studied the other parts of *Croton oblongifolius* Roxb. such as root-bark, wood and leaves. The compounds isolated from root-bark and wood were similar to those from the stem-bark but in smaller quantities. In leaves only waxy materials were found (18).

In 1996, Chutima Surachatpun (19) studied on the bark of *Croton oblongifolius* Roxb. From hexane crude extract found a new 14-membered ring that named crotoembraneic acid.

The chemical constituents of *Croton oblongifolius* Roxb. are summarized in Fig. 3

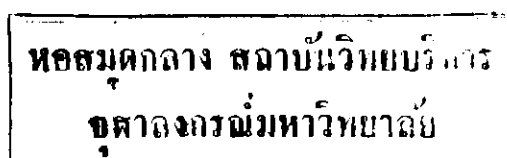


Table 1 Comparison of Chemical Constituents of Parts of *Croton oblongifolius* Roxb. (18)

Compounds	% wt./wt. (air-dried plant)			
	stem-bark	root-bark	wood	leaves
Oblongifoliol	0.350	0.150	0.100	-
19-Deoxyoblongifoliol	0.100	0.080	0.040	-
Oblongifolic acid	0.150	0.060	0.030	-
<i>ent</i> -Isopimara-7,15-diene	0.050	0.030	0.020	-
3-Deoxyoblongifoliol	0.050	0.030	0.010	-
<i>ent</i> -Isopimara-7,15-diene-19-al	0.050	0.020	0.010	-
Acetyl aleuritolic acid	0.030	-	-	-
11-Dehydro-(-)-hardwickiic acid	0.050	0.030	0.010	-
(-)-Hardwickiic acid	0.100	0.050	0.040	-
Waxy material	-	-	-	0.300

All parts of *Croton oblongifolius* Roxb. have been used as herbal medicine and always used with *Croton sublyratus* Kurz. From previous researches (11-18), the compounds which are isolated from Plao Yai have not yet had pronounced effective activities as plaunotol from *Croton sublyratus* Kurz. The structure of compounds that have been isolated so far, were not so similar to plaunotol which is a diterpene contain double bonds. It is believed that the effective compound in *Croton oblongifolius* Roxb. should have a structure similar to plaunotol. In previous researches (18), in the woods of *Croton oblongifolius* Roxb. was found compounds similar to those found in stem-bark and root-bark although in lower quantities. Thus, the object of this research can be summarized as follows :

1. To extract and isolate the chemical constituents from the woods of *Croton oblongifolius* Roxb.
2. To identify the chemical structure of compounds which were isolated.

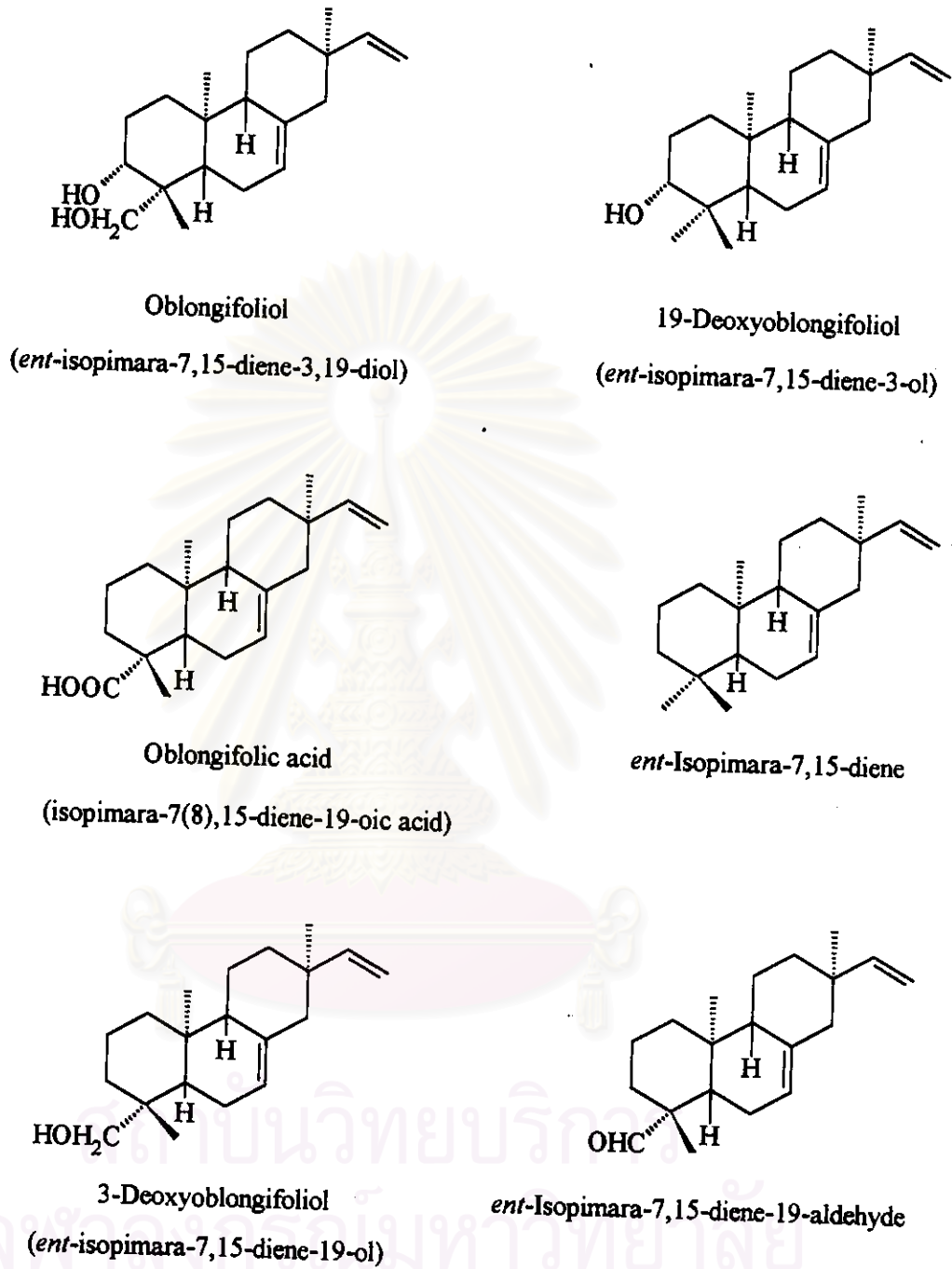


Figure 3 The Structure of the Chemical Constituents of *Croton oblongifolius* Roxb.

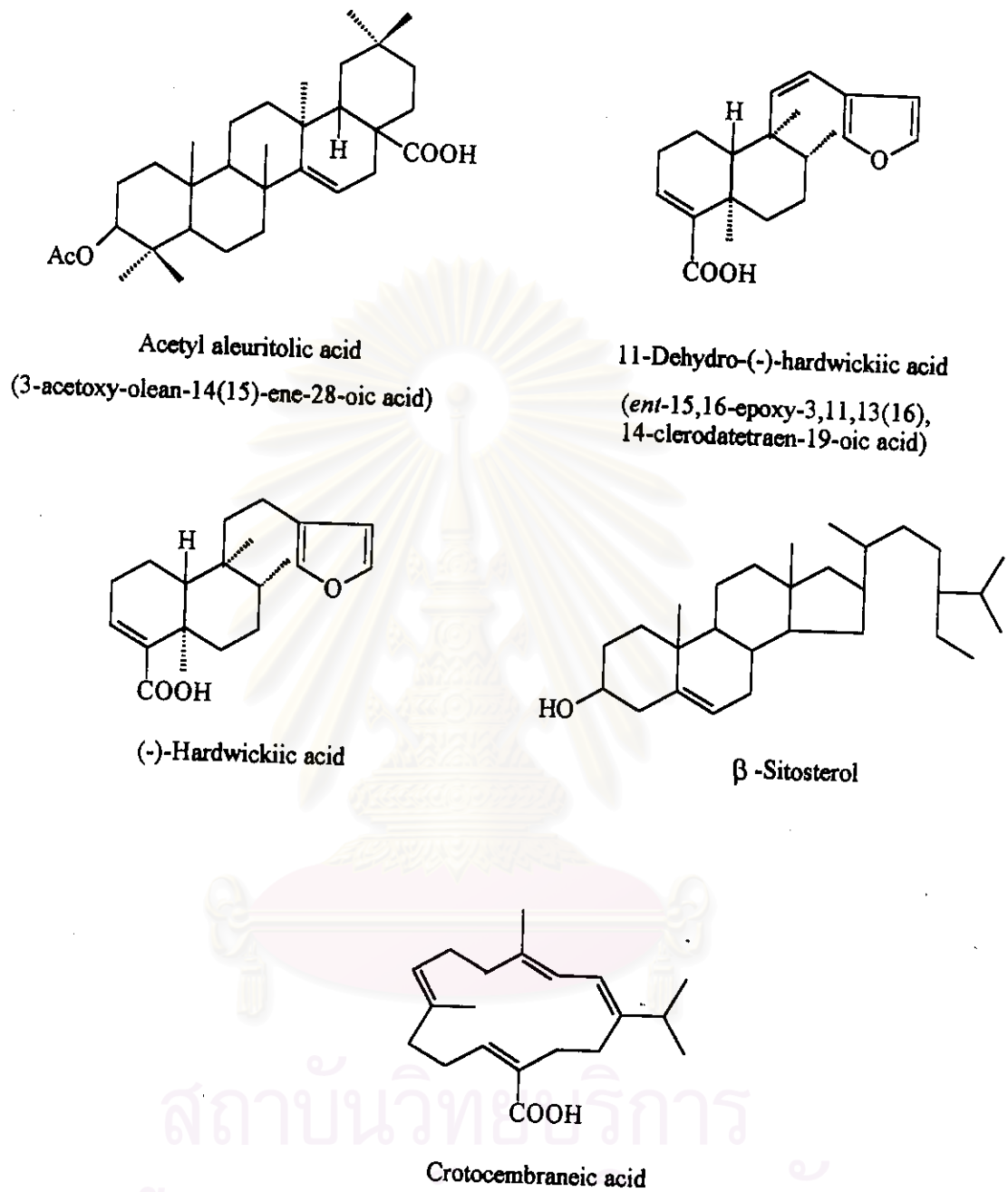


Figure 3 The Structure of the Chemical Constituents of *Croton oblongifolius* Roxb. (continued).