CHAPTER I

INTRODUCTION

Lamiaceae is a family in the order Lamiales, generally regarded as one of the most highly evolved of all dicotyledon families. The Lamiaceae is closely related to the Verbenaceae, primary a woody tropical family, generally without essential oils and usually without a deeply four-lobed ovary. The small aquatic family Callitrichaceae is also considered to be an ally of the Lamiaceae (Heywood, 1978).

The family Lamiaceae consists of 160 genera and about 3000 species distributed over the whole earth, but especially abundant in the Mediteranean region, the Orient and the mountains of the subtropics (Bailey, 1949).

The description of plants in the Lamiaceae is as below (Keng, 1978)

Unarmed, erect, mostly aromatic (sometimes fetid-aromatic) herbs, sometimes woody at the base ; stem mostly quadrangular, sometimes conspicuously noded. **Leaves** decussate, rarely whorled, mostly simple, rarely lobed or pinnate, exstipulate. Indumentum of simple, capitate-glandular or stellate hairs, or a combination. (*Extra*-Mal. sometimes woody, climbing, spiny and with spiral leaves.) **Flowers** bisexual, mostly zygomorphic, axillary, in pairs, or in short, fascicled cymes forming verticillasters or in cincinni, in many cases compound into spurious spicate, racemose, capitate or paniculate, essentially cymose, in florescences. **Calyx** persistent, ± regular or unequally 4-5-toothed or-lobed, tubular or 2-lipped, sometimes with an appendage. **Corolla** tube long or short, sometimes with a hair-ring within, limb 5-, rarely 4-lobed, mostly 2-lipped and personate, lobes imbricate in bud. **Stamens** usually 4 and didynamous, inserted on the corolla tube, sometimes the upper (posterior) pair imperfect, rarely the lower pair barren (*Mosla*), filaments sometimes hairy, rarely connate at base ; anthers linear to round, cells parallel or divaricate, sometimes confluent, rarely one cell barren (*Anisomeles*), or disjoined by a slender connective (*Salvia*), basifixed. **Disk** usuaslly prominent, regular of irregular. **Ovary** superior,

consisting of 2 carpels, each of which is 2-celled by intrusion of the ovary wall. Style simple, mostly gynobasic ; stigma usually 2-fid, often with unequal arms. **Ovules** solitary, anatropous. **Fruit** consisting of 4 dry or rarely fleshy (*Gomphostemma*), 1-seeded schizocarpous nutlets which remain enclosed in the persistent calyx ; the scar of attachment usually small and basal but sometimes sublateral and large ; pericarp smooth or sculptured, endocarp sometimes hard ; exocarp sometimes becoming gelatinous when moistened. **Seed** small, erect or ± transverse (*Scutellaria*), ± exalbuminous ; seed-coat usually much deteriorated as to be almost negligible.

Lamiaceous Plants in Thailand

The occurrence of Lamiaceous plants in Thailand has been reported by Tem Smitinand in the Thai Plant Names (1980). These plants include various species as shown below. :-

Achyrospermum

A. wallichianum Benth. ex Hook. f.

Lacal name : ส้าฮอม Saa hom (Loei) ; ส้มป่า Hompaa (Chiang Mai).

Anisochilus

A. carnosus Wall.

Local name : หูเสือขาว Huu Suea khao (Prachuap khiri khan)

A. harmandii Doan

Local name : คูมวย Khuu muai (Chong Trat) ; ครูมวย Khruu muai (Trat)

Ceratanthus

C. annamensis G. Taylor

Local name : ข้าวก่ำ Khaao kam (Sakon Nakhon).

Coleus

C. amboinicus Lour.

Local name : เนียมหูเสือ Niam huu suea (Central) ; หอมด่วนหลวง Hom duan Luang, หอมด่วนหูเสือ Hom duan huu Suea (Northern) ; Indian Borage.

C. atropurpureus Benth.

Local name : เรซีผสมแดง Ruesee phasom Laeo (Central)

C. blumei Benth.

Local name : ว่านแล็อดแห้ง Waan Lueat haeng (Chiang Mai)

C. blumei var. *verschaffeltii* Lem.

Local name : เรซีผสมแดง Ruesee phasom laeo (Central)

C. parvifolius Benth.

Local name : มันขี้หนู Man khee nuu, มันหนู Man nuu (Peninsular) ; อูบีกะลิง U-bee Ka-ling (Malay-Nara-Thiwat)

C. tuberosus Benth = *C. parvifolius* Benth.

Dysophylla

D. auricularia Bl.

Local name : สาบแร้งสาบกา Saapraeng saapkaa (Surat Thani)

D. cruciata Benth.

Local name : เนียมดอกธูป Niam dok thuup, แพนหางค่าง Nae haang khaang (Loei).

D. stellata Benth.

Local name : เนียม Niam (kan-chanaburi) ; เนียมดง Niam dong (Ratchaburi).

Elsholtzia

E. kachinensis Prain

Local name : ผักด่วนดอย Phak luan doi, ผักเลี้ยน Phak luean (Chiang Mai)

Epimeredi

E. indicus Roth = *Anisomeles indica* (L.) Kuntze

Local name : กอมก้อหุ้ย Komko huai (Chiang Mai) ; สาบเสือ Saapsuea (Saraburi) ; หญ้าฝรั่ง Yaa farang (Pra chin Buri)

Eurysolon

E. gracilis Prain

Local name : หนวดแมว Nuat maeo (Loei)

Genisporum

G. coloratum Ktze.

Local name : ผักอีหลิงป่า Phak ee lueng paa, ห้อมป่า Hom paa (Chiang Mai).

Gomphostemma

G. intermedium Craib

Local name : หาดกบ Haat kop (Chiang Mai)

G. oblongum wall.

Local name : กลอนดู่ Klon duu (Trang) ; ขมหนอน Khon non (Surat Thani)

G. pholomides Prain

Local name : หอมฮอก Hom hok (Chiang Mai)

G. strobilinum Wall. var. *variegatum* Craib

Local name : ว่านนกคุ้ม Waan nok khom (Chiang Mai)

Hyptis

H. brevipes Poit.

Local name : ฉัตรพระอินทร์ Chat pra in (Southern)

H. suaveolens Poit.

Local name : การา Kaaraa (Surat thani) ; แมงลักคา Maeng lak khaa (Chumphon).

Isodon

I. coetsa Kudo

Local name : ปลวกน้ำ Pluak nam (Chiang Mai)

I. siriatus Kudo

Local name : หญ้าข้าวตกยก Yaa khaao tok, หญ้าปลวกดิน Yaa pluak Din, ไหวดิน Wai din (Chiang Mai)

I. ternifolius Kudo

Local name : ผักอีหลืน Phak ee luen (Chiang Mai)

Leonotis

L. nepetifolia R. Br.

Local name : ฉัตรพระอินทร์ Chat phra in (Central)

Leonurus

L. sibiricus Linn.

Local name : กัญชาเทศ Khon chaa thet (Ratchaburi), ซ้าซา Saa saa (Nakhon Phanom) ; ส่าน้ำ Saa nam (Loei) ; Mother worth

Leucas

L. aspera Lin

Local name : ผักหัวโต Phak hua to, หญ้าหัวโต Yaa hua to (Ratchaburi, kanchanaburi) ; หญ้านกเค้า Yaa nok khao (Chiang Mai)

L. chinensis R. Br.

Local name : น้ำดับไฟ Nam dap fai (Ratchaburi)

L. ciliata Benth.

Local name : หญ้าหัวเสือ Yaa hua suea, อังแตน Hang taen (Loei)

L. zeylanica R. Br.

Local name : เทียนตาก Thian taak (Chanthaburi) ; หญ้าปริก Yaa prik (Nakhon Si Thammarat).

Mentha

M. arvensis Linn. var *javanica* Hook.

Local name : มินต์อินโดนีเซีย Min indoneesia (Bangkok)

M. arvensis Linn. var *piperascens* Malinvaud

Local name : น้ำมันหมอง Nam man mong สะระแหน่ญี่ปุ่น Saranae yeepun (Bangkok) ; Japanese Mint.

M. cordifolia Opiz

Local name : มักงาะ Mak ngok, สะแน่ Sanae (Peninsular) ; สะระแหน่ Saranae, สะระแหน่สวน Saranae suan (Central) ; หอมด่วน Hom duan (Northern) ; Kitchen Mint.

M. javanica Bl.

Local name : สะระแหน่ญวน Saranae yuan (Central)

M. piperita Linn.

Local name : เปปเปอร์มินต์ Pepper min (Bangkok) ; Peppermint

M. pulegium Linn.

Local name : หมองลักน้ำ , สะระแหน่ญวน Saranae yuan (Bangkok).

M. spicata Linn.

Local name : สเปร์มินต์ Sapae min (Bangkok) ; Common Spear Mint.

Mesona

M. chinensis Benth.

Local name : เฉาก๊วย Chao kuai (chinese-Bangkok)

Microtoena

M. cymosa Prain = *M. insuavis* Prain ex Briq.

M. insuavis Prain ex Briq.

Local name : คำปอง Kham pong (Chiang Mai)

Mosla

M. dianthera Maxim.

Local name : ผักฮ้าน Phak haan (Chiang Mai)

M. cochinchinense Merr.

Local name : หางเสือ Haang suea หางเสือลาย Haang suea llaai (Loei)

Ocimum

O. basilicum Linn.

Local name : ห่อกวยซวย Ho - kuai - suai, ห่อวอซู Ho-Wo-su (Karen Mae Hong Son) ; โหระพา Horaphaa (General) ; อิ่มคิมขาว Im - khim-khaao (Shan-Mae-Hang Son) ; Common Basil, Sweet Basil.

O. canum Sims

Local name : ก้อมก้อขาว komko khaao (Northern) ; มังลัก Mang lak, แมงลัก Maeng lak (Central) ; Hairy Basil.

O. gratissimum Linn.

Local name : กะเพราญวน Ka phrao yuan (Bangkok) ; จันทน์ขี้ไก่ Chan kheekai, เนียมต้น Niam ton (Mae Hong Son) ; จันทน์หอม Chan hom, เนียม Niam (Chiang Mai) ; ยี่หร่า Yeerea, โหระพาช้าง Horaphaa chaang (Central) ; สะหลี่ดี Sa-lee-dee (karen-Mae Hong Son).

O. kirimandcharicum Gverke

Local name : กะเพราแขก Ka phrao khack (Bangkok)

O. sanctum Linn.

Local name : กอมก้อ Komko, กอมก้อดง komko dong (Chiang Mai) ; กะเพรา kaphrao, กะเพราขาว ka phrao khaao, กะเพราแดง ka phrao daeng (Central) ; ห่อกวอซู Ho-kwo-suu, ห่อตูปลู Ho-tuu-pluu (karen-Mae Hong Son) ; อิ่มคิมหล่ำ Im khim lam (shan-Mae Hong Son) ; Holy Basil.

O. sanctum Linn. var. *hirsutum* Back.

Local name : กะเพราขน Ka phrao khon (Central)

Orthosiphon

O. aristatus Miq.

Local name : บางรักป่า Baang rak paa (Prachuap khiri khan) ; หญ้าหนวดแมว Yaa nuat maeo (Chai nat) ; อีตู้ดง Ee-tuu-dong. (Phetchabun)

O. grandiflorus Bolding

Local name : หย้าแมว Pha-yap mek (Bangkok) ; หญ้าหนวดแมว Yaa nuat maeo (Central, Eastern, Chanthaburi)

O. rubicandus Benth.

Local name : แข้งขาน้อย Khaeng khaa noi, หนวดเสือเขี้ยว Nuat suea khieo (Loei)

Perilla

P. frutescens Britt.

Local name : งาขี้มอน Ngaa khee mon (Northern) งามน Ngaa-mon (Shan-Mae Hong Son) ; แง Ngae (Khan chanaburi) หน่อ No (Karen-Mae Hang Son) ; น่อง Nong (Karen-kan chanaburi)

P. ocymoides Linn.= *P. frutescens* Britt

Pogostemon

P. cablin Benth.

Local name : พิมเสน Phim sen (Bangkok)

P. glaber Roxb.

Local name : ก้อมก้อดง kom ko Dong (Chiang Mai)

P. menthoides Bl.

Local name : เพราดำ Phrao dam (Ranong) ; หอมป้อดอย Hom po doi (Chiang Mai)

P. plectranthoides Dest.

Local name : เหี่ยมงวงช้าง Niam nguang chaang (Central) ; อ้ม Om (Chiang Mai)

Salvia

S. coccinea juss.

Local name : ประทัดเล็ก Pra that Lek (Bangkok) ; Scarlet Sage

S. splendens ker-Gawl.

Local name : ประทัดเล็ก Prathat Lek (Bangkok) ; Scarlet Sage

Scutellaria

S. incurva Wall.

Local name : ก้ามปู Kaampuu (Pra-chin Buri) ; หญ้าคางเลือย Yaa khaang luet (Chiang Mai)

Description and uses of selected Thai plants in this study

Coleus amboinicus Lour

Shrub, 2-3 feet ; branches tomentosely pubescent, or hispid ; leaves petiolate broad, ovate, crenated, rounded at the base, or cuneate, very thick, hispid on both surfaces, or clothed with white villi, very fragrant, floral leaves hardly equal in length to the calyx ; racemes simple ; whorls 20-30 flowered or more ; calyx tomentose ; tube of corolla about twice as long as the calyx, defracted at the middle ; throat dilated ; lower lip a little dilated, boat shaped ; flowers smallish, pale blue. This plant has a pleasant aromatic odour and pungent taste (Drury, 1873).

The fresh leaves are frequently eaten, and mixed with various articles of food, drink or medicine. It possesses antibacterial, antifebrile and antitussive properties. They are used in treating coryza, influenza, hyperthermia, diaphoretic pyrexia and asthma (Medicinal Plants in Viet Nam, 1990) The Malay use its juice, or a decoction of it, though in a less degree, for pains in the neighbourhood of the stomach and heart (Burkill, 1935) In the Philippines macerated leaves are used with burns and also for bites of centipedes and scorpions, furthermore for dyspepsia, asthma, and as a medicine after childbirth (Keng, 1978).

Hyptis suaveolens Poit

A rigid, sweetly aromatic herb, sometimes attaining a height of 7 ft. Leaves broadly ovate, very variable, tomentose, flowers small, blue, in unilateral axillary or terminal clusters often arranged in panicles, nutlets blackish brown, ovoid, compressed. (Council of Scientific and Industrial Research, 1959)

H. suaveolens is considered to be stimulant, carminative, sudorific and lactogogue. An infusion of the plant is used in catarrhal conditions. The leaf juice is taken in cases of colic and stomachache (Burkill, 1935).

In the Philippines, the leaves and top are considered to be antispasmodic and used in antirheumatic and antisudorific baths and the root is chewed with betel nuts as a stomachic (Council of Scientific and Industrial Research, 1959)

Mentha arvensis Linn var *piperascens* Malinvaud.

The entire plant of *Mentha arvensis* var *piperascens* Malinvaud is good to prevent frostbite, fatigue, and the common cold This variety is the source of Japanese mint oil containg 80-90% menthol (Perry, 1980).

Mentha cordifolia Opiz

Leaves all or for the greater part with a broadly cuneate, rounded, tuncate or shallowly cordate base, ovate oval oblong (small ones sometimes suborbicular), usually with a broadly rounded or obtuse top, not rarely serratedentate form the very base, thickly herbaceous, with rather much sunken nerves on the upper surface, consequently subcorrugate, subglabrous or on the nerves shortly hairy, very densely gland-dotted on the lower surface ; stem quadrangular, not grooved, very thinly short-hairy on glabrous (Backer and Bakhuizen, 1965)

Ocimum basilicum L.

An erect, almost glabrous herb, 30-90 cm. high, native of Central Asia and North-West India, Leaves ovate-lanceolate, acuminate, toothed or entire, glabrous on both surfaces, glandular ; flowers white or pale purple, in simple or much-branched racemes, often thyrsoid; nutlets ellipsoid, black, pitted (Medicinal Plants in Vietnam,1990).

The oil possesses insecticidal and insect repellent properties ; it is effective against houseflies and mosquitoes (Council of Scientific & Industrial Research, 1966)

The leaves of *O. basilicum* are considered to be tonic, carminative and digestive ; a decoction of them is used to wash ulcers, and also is prescribed for vomiting ; the seeds are recommended to treat eye troubles. In Indo-china : the ashes of the roots are a suggested remedy for skin diseases. The seed have a mucilaginous seed coat which, in water, becomes a jelly with demulcent, stimulant, diuretic and diaphoretic properties (Perry, 1980).

Ocimum canum Sims

An erect, much-branched herb, found widely in the tropics to the Old World, and introduced into America. Leaves elliptic-lanceolate, entire or faintly toothed, almost glabrous, gland dotted, flowers small, white, pink or purplish, in more are less closely set whorls in spiciform racemes ; nutlets narrowly ellipsoid, punctulate, black. (Burkill, 1935).

The plant is used as a pot-herb. It possesses aromatic, carminative, diaphoretic and stimulant properties. A decoction of the plant is taken for coughs, that of leaves for dysentery ; it is also used as a mouth wash for relieving toothache. The juice of leaves is given to children for cold, catarrh and bronchitis ; paste of leaves is used as an

external application for parasitical skin affections. The volatile oil from the whole plant inhibits the growth of tubercular bacilli in a dilution of 1:50,000 ; the leaf oil shows antibacterial activity against Mycobacteria (Council of Scientific & Industrial Research, 1966).

Ocimum gratissimum Linn.

Much-branched perennial shrub, 1-1.5 m. high. Stems quadrangular, pubescent, woody at the base. Leaves opposite, apiculate, pubescent on both surfaces ; margins coarsely toothed. Inflorescence axillary or terminal in simple or branched whorled raceme ; flowers white. Nutlets subglobose, rugose. All parts of the plant are strongly scented. The whole plant is used in treating sunstroke, headache and influenza. It is also considered to be diaphoretic. It serves also as material for the extraction of essential oil and eugenol. Eugenol is used widely in odontology and for the synthesis of vanillin (Medicinal Plants in Viet Nam, 1990).

Oil of *Ocimum gratissimum* acts as a local anaesthetic and is useful as an external application for inflamed joints. It is considered digestive, tonic, stimulant, demulcent, diuretic, antiemetic and antiseptic. The leaf juice is given in stomachache. The seeds of the plant are given in headache (Council of Scientific and Industrial Research, 1966).

Ocimum sanctum L.

Erect, small plant, annual or perennial, about 1 m. in height. Stems and branchlets purple, pubescent. Leaves opposite, usually purplish-brown, long-petioled ; margins slightly denticulate, pubescent on both surfaces. Inflorescence in closed-whorled terminal raceme ; flowers small, lilac or white. Nutlets sub-globose, slighthly compressed. All parts of the plant are sweet-scented (Medicinal Plants in Vietnam, 1990).

The oil is reported to possess antibacterial and insectisidal properties. It inhibits the in vitro growth of *Mycobacterium tuberculosis* and *Micrococcus pyogenes* var. *aureus*. It has marked insecticidal activity against mosquitoes (Council of Sciences and Industrial Research, 1966).

The entire plant, except for the roots, possesses antibacterial, antifebrile and demulcent properties. It is prescribed for coryza, fever, headache, colic, diarrhoea, chest pains, vomitting chilblains, oedema and epistaxis (Medicinal Plants in Viet Nam, 1990)

The root is used in a decoction for fever, flowers are given with honey for bronchitis and seeds are mucilaginous, demulcent which are used like the seeds of *O. basilicum* (Burkill, 1935).

Perilla frutescens Britt

An annual herb, the stem branching, tomentose, 0.5-1.5 m. high. Leaves opposite, lengthily petiolate, oval, acuminate, pubescent, dentate, crenelate, limb 14 cm. long by 6 cm. wide, green occasionally marked reddish brown. Inflorescence an axillary and terminal raceme, 6-20 cm. long ; September-October. Flower small ; 3-8 ; calyx campanulate, teeth 5 ; corolla campanulate, white or violet, 5-lobed, stamens 4. Fruit a collection of globular nutlets, 2 mm. in diameter, reticulate, light brown. Southern China, Taiwan, Japan, northern Vietnam, Laos, Thailand, India, Burma. The leaves and seed are officinal. The taste is pungent the oder aromatic. The seeds are the source of a drying oil resembling linseed oil and comprising glycerides of linoleic, oleic, and palmitic acids (Keys, 1976).

The fruit is effective against cough in doses of 3 to 5 g per day in the form of a decoction (Medicinal Plants in Viet Nam, 1990).

Pogostemon cablin Benth.

Suffruticose, 2-3 feet, pubescent; stems ascending; leaves petioled, rhombo-ovate, slightly obtuse, crenato-dentate; spikes terminal and axillary, densely crowed with flowers interrupted at the base; calyx hirsute; segments lanceolate; filaments bearded; flowers white, with red stamens and yellow anthers (Drury, 1873).

The leaves of *P. cablin* yield the Patechouli Oil which is used in perfumery and medicine. The oil is almost a perfume by iteslf and is one of the finest fixatives for heavy perfumes. The dried leves are used for scenting wardrobes. The leaves and tops are added in both for their antirheumatic action (Council of Scientific and Industrial Research, 1969).

In the Philippines , an infusion of the fresh leaves is given in mentstruation and emmenagogue (Perry, 1980).

These are still some essential oil containing plants of Lamiaceae in the rain forests of Thailand which have not been investigated. These include plant species of the genera *Achyrospermum*, *Anisochilus*, *Ceratanthus*, *Coleus*, *Dysophylla*, *Elsholtzia*, *Genisporum*, *Gomphostemma*, *Hyptis*, *Isodon*, *Leonotis*, *Leonurus*, *Leucas*, *Mentha*, *Microtoena*, *Mosla*, *Ocimum*, *Orthosiphon*, *Pogostemon*, *Salvia*, *Scutellaria*.

The main objectives in this investigation are as follows:

1. to screen for new essential oils from little studied Thai Lamiaceous plants, the family Lamiaceae growing in the forests.

2. to evaluate the potential of the isolated essential oils for commercial use.

3. to study the antimicrobial activity of essential oils.

Additionally, this work also included Lamiaceous plants from Western countries, which are cultivated in Chiangmai by The Royal Project Foundation, namely, *Melissa officinalis* L., *Mentha piperita* L., *Mentha spicata* L., *Origanum majorana* L., *Origanum vulgare* L., *Rosmarinus officinalis* L., *Salvia officinalis* L., *Thymus* sp.1 (summer Thyme), *Thymus* sp.2 (winter Thyme) and *Thymus vulgaris* L. All of them are called Savory herbs. The aim is to analyze the chemical composition and percent of the oil for as spices produced in Thailand comparing with the imported one.