Standard Pharmacognostic Characteristic of Some Thai Herbal Medicine

Somporn Putiyanan*, Sunee Chansakaow, Ampai Phrutivorapongkul and Wannaree Charoensup

Department of Pharmaceutical Science, Faculty of Pharmacy, Chiang Mai University, Chiang Mai 50200, Thailand

**Corresponding author E-mail: somporn@pharmacy.cmu.ac.th*

ABSTRACT

The pharmacognostic characteristics of four popular medicinal herbs : Kaempferia parviflora Wall. ex Baker (Kra-chai-dahm), Gynostemma pentaphyllum (Thumb.) Makino. (Jiau-gu-lahn), Stevia rebaudiana Bertoni M. (Yaa-waan) and Thunbergia laurifolia Lindl. (Raang-chuet) have been standardized on part used for each plant. The result showed that they had significant differences in plant taxonomy, pharmacognostic characters and chemical constituents. The characteristics of medicinal herb comprise of botanical name, family name, part used, chemical constituent, medical use, character of powdered drug, microscopic character of powdered drug and primary test of plant extract which are useful to standardize and investigate contamination and adulteration.

Key words : Standard pharmacognostic characteristic, Thai herbal medicine

INTRODUCTION

The quality of medicinal plants significantly influences the development of drugs or health products for efficacy and efficiency to use. One factor that affects their quality is the variation of their active constituents which occurs in a variety of plant species, age, environment, non-standardised production process and the problems from adulteration as well as contamination. Standardization for quality control of both raw materials and finished products is believed not only to solve this poor quality problem but also to promote value of locally-natural resources, writing of Thai Herbal Pharmacopoeia, public confidence to use medicinal plant products, international trade forum and being the member of natural drug lists which corresponds to the public health's policy.

OBJECTIVE AND METHODOLOGY

The objectives of this research are to investigate and collect medicinal plants, including *Stevia rebaudiana* Bertoni M. (Yaa-waan), *Gynostemma pentaphyllum* (Thumb.) Makino. (Jiau-gu-lahn), *Thunbergia laurifolia* Lindl. (Raang-chuet) and *Kaempferia parviflora* Wall. ex Baker (Kra-chai-dahm) for preparation of

medicinal plant herbarium specimens, standardization of botanical taxonomy and pharmacognosy and also for primary screening of major chemical constituents in each plant whereas the research methodologies investigated these four plants from fifteen sources and then collected their varieties for preparation of medicinal plant herbarium specimens and plant identification at the same time. The herbarium specimens are deposited at the Faculty of Pharmacy, Chiang Mai University. Identification of these plants is made on both macroscopic characters by organoleptic method to identify external and internal characters including shape, texture, fracture, marking, color, odor and taste and microscopic ones to identify tissue or cell and chemical components produced and stored in that tissue or cell such as starch grain, crystal, oil globule, aleurone grain, together with amorphous components such as alkaloid, glycoside, tannin, resin and steroid etc. As expected, this research is useful for acquiring the standard of botanical taxonomy and pharmacognosy. Major chemical components in each plant were demonstrated for further standardization and quality control. Encouragement of learning skill in the field of pharmaceutical sciences and relative researches, both at the Faculty of Pharmacy and the other institutions like Thai Traditional Medicine Institute, primary health care work, public health promoters and other academic centers will also be initiated.

The investigation and collection of standard herbal medicine from 15 sources were done to assess the characters by organoleptic evaluation and identify the taxonomic identification to prepare the authentic herbarium specimens. These specimens are stored in Herbal Medicine Herbarium, Faculty of Pharmacy, Chiang Mai University. The different parts of powdered medicinal plants were identified for pharmacognostic characters.

Identification of powdered medicinal plants means to identify cell/tissue morphology under a microscope and with chemical tests of the characters or active constituents of medicinal plants for pharmaceutical use. After the powder of medicinal plants has been tested and analyzed to verify species, the powder will be tested for purity and quality. The plants were dried and ground in a no. 60 sieve to prepare the powdered medicinal plants. If there was any doubt about the plant species, microscopic examination of its cells had to be done. This process is also used to check for adulterants. The tissues of medicinal plants are different in type, shape, size, color and components, viz., crystals, starch grains, pollen grain, which are unique to each species. A micrometer is used to measure cell size. Microscopic studies need stain dye to differentiate cells/tissues present. Authentic powdered medicinal plants means the sample of medicinal plants has been identified (botanical name), origin known and age determined. Identification of powdered medicinal plants is done by putting some powder of a medicinal plant on a slide which has a stained solution, leave for 1/2 minute and cover with a cover slide (no air bubbles). Later, observe under a microscope to see the tissue characters, draw the cell portraits and emphasize the thickness and characteristics of the cells. Finally, measure the size of the cells by compound microscope with an ocular micrometer. (Putiyanan, 1999)

Methods and limitations of the study

1. Survey and collect samples of medicinal plants being described by standard procedure

2. Identify the taxonomic and pharmacognostic aspects of medicinal plant. (Backer et al., 1965; Bailey, 1949; Hooker et al., 1897; Maxwell, 2006. and Ridley et al., 1925)

3. Preliminary phytochemical screening of samples (Houghton et al., 1998)

RESULTS

From this survey of medicinal plants from 15 sources, the specimens were collected and vouchers deposited at the Faculty of Pharmacy Herbarium, Chiang Mai University. The samples also were prepared and identified in taxonomic and pharmacognostic aspects according to ICBN standards. The organoleptic (physical) method (hands, ears, eyes, nose, and tongue) was used to investigate external and internal characters including shape, texture, fracture, marking, color, odor and taste of various medicinal plant parts. Microscopic identification was done by investigating powdered specimens through a microscope to identify tissue or cell types and characteristics and chemical constituents. Plant parts being considered are such as roots and leaves. The constituents of medicinal plants have also been studied. These plant constituents are synthesized in the tissues/cells of medicinal plants. The major chemical constituents are starch grains, crystals, oil globules and aleurone. The amorphous constituents are alkaloids, glycosides, tannins, resins and steroids.

The preliminary phytochemical screening in *Kaempferia parviflora* Wall. ex Baker (Kra-chai-dahm) was done by extracting its chemical from tubers in alcohol and water. The alcohol-extracted sample showed a violet color as a positive test for alkaloids. Continuous alcohol extraction was done. The sample later was vaporized to dry in a vaporizing depressure oven. The extract was sticky and orange-yellow in color. The dry extract was tested for phytochemical characters (Table 1) : alkaloid test: the sample developed sediment in turbidity in the preliminary test, and when tested with Mayer's reagent and Wagner's reagent, the results were not clearly positive. The results were concluded as not having alkaloids. Phenolic and tannin tests: the sample presented a green color with ferric chloride solution in a preliminary test, and when tested with 1% gelatin and 1% gelatin + salt reagents, the results were not positive. The results showed that Kra-chai-dahm contained phenols but no tannins. Glycoside test: the sample tested with Shibata's solution presented an orange color which was a positive result for flavonones. The sample was also tested with Kedde's solution, if presented a violet color solution which changed from red-brown to violet in Libermann Burchads' reaction – a positive result for terpenes. The sample did not contain steroids since it has no cardiac glycoside compounds. Finally, sample was extracted by acid and tested with 25% ammonia which presented a color change from red to violet, then to blue-green – a positive result for anthocyanins.

The water-extracted samples tested resulted in similarity to the alcohol-extracted samples. Flavonones were not found in Shibata's test.

The preliminary phytochemical screening of Gynostemma pentaphyllum (Thunb.) Makino (Jiau-gu-lahn) was done by extraction of all parts in alcohol. The extract was sticky and dark green. The extract was tested for phytochemical characters (Table 2) : alkaloid test: the sample produced turbid sediment in a preliminary test, and when tested sample with Mayer's reagent and Wagner's reagent, the results were not clearly positive. The results indicated that there were no alkaloids in Jiau-gu-lahn. The sample had a positive result only for terpenes in the Libermann Burchad test where the color changed from red-brown to violet.

The preliminary phytochemical screening in *Stevia rebaudiana Bertoni* (Yaa-waan) was done by extracing above-ground parts in alcohol. The extract was tested for some phytochemical characters (Table 3) : the sample had positive results only for the Libermann Burchad test where the color changed from red-brown to blue-green, positively unclear result for terpenes or steroids.

The preliminary phytochemical screening of *Thunbergia laurifolia* Lindl. (Raang-chuet) was done by extraction of leaves in alcohol. The extract was sticky and dark green. The extract was tested for phytochemical characters (Table 4) : the sample had positive results only in the Libermann Burchad test where the color changed from red-brown to violet and to green (Table 1.), and positive sterols and alkaloid test : the sample produced turbid sediment in a preliminary test, and when tested sample with Mayer's reagent and Wagner's reagent, the results were not clearly positive. The results indicate there were no alkaloids in Rahang-jute leaves.

Table 3 The positive test for *Stevia rebaudiana* Bertoni (Yaa-waan) extract in the Libermann Burchad test.

Table 4 The positive test for *Thunbergia laurifolia* Lindl. (Raang-chuet) leaves extract in the Libermann Burchad test.

Phytochemical tests for *Kaempferia parviflora* Wall. *ex* Baker (Kra-chai-dahm) tubers showed that the major constituents are phenols, with no tannin, terpenes, or anthocyanins. In addition, the alcohol extraction showed flavonones. Phytochemical tests of *Gynostemma pentaphyllum* (Thunb.) Makino (Jiau-gu-lahn) showed that the major component is terpenes. Previous phytochemical tests of *Stevia rebaudiana* Bertoni (Yaa-waan) did not indicate any components. The major component is possibly carbohydrates, which were not tested here and phytochemical tests of *Thunbergia laurifolia* Lindl. (Raang-chuet) leaves showed that the major constituent is sterol.

The results of this study include a standard taxonomic and pharmacognostic identification of *Kaempferia parviflora* Wall. *ex* Baker (Kra-chai-dahm), *Gynostemma pentaphyllum* (Thunb.) Makino (Jiau-gu-lahn), *Stevia rebaudiana* Bertoni (Yaa-waan) and *Thunbergia laurifolia* Lindl. (Raang-chuet). These 4 species have been included as medicinal plants by the committee of standardization of medicinal plants strategies. The research results will be a guide for the identification of authentic

medicinal plants by macroscopic (morphological) and microscopic characters. In addition, the preliminary phytochemical screenings followed the standard by the International Code Botanical Nomenclature (ICBN). The results also checked for the adulteration and contamination of medicinal plants for consumers' safety. Medicinal plant quality control with an international standard will gain the confidence of using medicinal plant products and can increase the number of species on the national drug lists. A proper standard for testing medicinal plant quality can be expanded in macro unit in the future.

The details of standard pharmacognostic characteristic, including preliminary phytochemical screening of samples, are as follows: - Kra-chai-dahm : *Kaempferia parviflora* Wall ex Baker fam.Zingiberaceae, Jiau-gu-lahn : *Gynostemma pentaphyllum* (Thumb.) Makino fam.Cucurbitaceae, Yaa-waan : *Stevia rebaudiana* Bertoni M. fam.Compositae and Raang-chuet : *Thunbergia laurifolia* Lindl. fam.Acanthaceae.

	Kra-chai-dahm
Botanical name	Kaempferia parviflora Wall. ex Baker
Family	Zingiberaceae
Thai name	Kra-chai-dahm
Scientific synonyms	Boesenbergia pendurata (Roxb.) Holtt.

Herbarium specimen No.5 : 009724 at Herbarium of Faculty of Pharmacy, CMU.
Morphological description (Fig.1)

Perennial ground herb that grows to 90 cm tall with dark purple to black rhizomes and brown outside, unique odor. Storage roots are blotchy while young plants have thin root which grow to be tuber, the color of light purple to black leads to the name Kra-chai-dahm. The middle of the stems with light red color is sheath petiole densely covered with red speckling on light green. Leaves are simple, densely alternate, blades dark green upper epidermis, light green lower epidermis ; petioles green, oldest ones mottled with dark maroon. Flowers are zygomorphic symmetry solitary, with reddish purple or white pink bilabiate from tuber, 2 bracts, 6 stamens, anther is close to long, small style, stigma, brass-shape, hairless, dehiscent fruit split into 3 rays when mature. Seeds are quite large.

Pharmacognostic characteristic

Macroscopic character : morphological character (Fig.1)

Perennial herb 90 cm. tall with dark purple rhizomes and brown bark of rhizome, unique odor. Leaves simple, dark green upper epidermis and light green lower epidermis, petiole green to dark maroon. Flower solitary, reddish purple or white pink bilabiate form.

Microscopic character : Transverse section ; 1. parenchyma cell with many starch grains, 2.vascular bundle

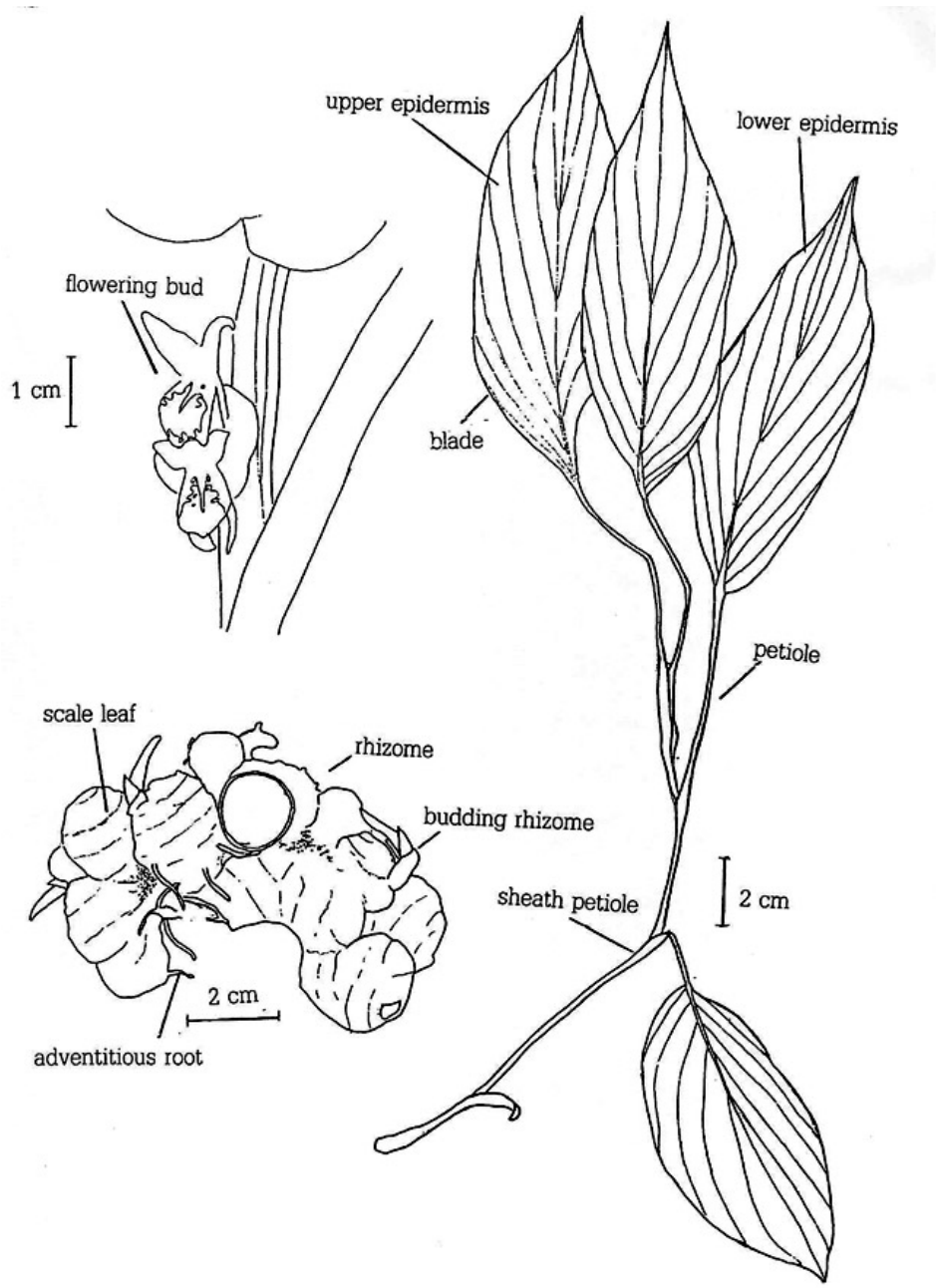
Powdered *Kaempferia parviflora* Wall. ex Baker rhizomes ; 1. vascular bundle with spiral vessel, reticulate vessel and bordered vessel, 2. many starch

grains, 3. parenchyma cell, 4. cork cell, 5. sclereid cell, 6. fiber cell, 7. covering trichomes.

Table 1. Species : *Kaempferia parviflora* Wall. ex Baker (Kra-chai-dahm).

Stain Solutions	Alcohol Extract			Water Extract		
Testing Parts	Rhizome					
Residue	Orange-yellow extraction			Dark Violet extraction		
	Test	Confirm		Test	Confirm	
1. Alkaloid		Ether	Alk.		Ether	Alk.
1.1 Dragendroff's reagent	Turbid Solution	turbid	turbid	Turbid Solution	clear	turbid
1.2 Wagner's reagent	Turbid Solution	turbid	turbid	Turbid Solution	clear	turbid
1.3 Hager's reagent	Turbid Solution	clear	clear	Turbid Solution	clear	clear
1.4 Mayer's reagent	Unchanged	clear	clear	Turbid Solution	clear	clear
2. Tannin	Test			Test		
2.1 1% Galatin	Unchanged			Unchanged		
2.2 1% Gelatin+Salt	Unchanged			Unchanged		
2.3 $FeCl_3$ Ts	Dark green solution			Blue-green solution		
3. Glycoside	Test			Test		
3.1 Anthaquinone Borntager's Reaction	Unchanged			Unchanged		
3.2 Coumarin UV Fluorescence	Unchanged			Unchanged		
3.3 Flavonol, Flavone Shibata's Reaction	Orange stain			Unchanged		
3.4 Saponin Foaming	Unchanged			Unchanged		
3.5 Cardiac Glycoside Kedde's Reaction	Violet stain			Violet stain		
3.6 Steroid Liberman Burchard's						
3.7 Terpene Liberman Burchard's	Color changed from red to violet			Color changed from red to violet		
3.8 Anthocyanin	Color changed from red to violet then to blue-green			Color changed from red to violet then to blue-green		

Figure 1. Macroscopic Character : Morphological Character of *Kaempferia parviflora* Wall. ex Baker.



Jiau-gu-lahn

Botanical name *Gynostemma pentaphyllum* (Thumb.) Makino
Family Cucurbitaceae
Thai name Cha-Satun, Panjakhan, South-China Human Ginseng, Siao Mo Ju Thien, Si Ye Thanh
English name Sweet Tea Vine

Herbarium specimen No.2:009723 at Herbarium of Faculty of Pharmacy, CMU
Morphological character (Fig 2)

Small, climbing plant with round green stems, branches climbing above ground 3-5 meters, adventitions roots at the bases of all petioles, compound leaves alternate covered with white hairs (trichomes) on both sides, leaflets ovate-lanceolate, serrate, greenish with bifid tendrils on opposite of leaves, no stipule. Inflorescence raceme with 2-3 flowers or solitary, small red flower, monoecious plant with staminate flower and pistillate flower on the same plant, staminate flower has 5 sepals, green with hairs, 5 partile petals with lanceolate segments, whitish yellow with hairs, 5 stamens. Pistillate flower : calyx and corolla as in the staminate flower. Ovary – 1 ovule with 3-4 styles and a stigma with 2 fid. Fruit globose, green berry, turn dark green to black when ripen.

Pharmacognostic characteristic

Macroscopic character : morphological character

Compound leaf alternate covered with white hairs (trichome) on both sides, leaflets ovate-lanceolate, serrate, greenish with bifid tendrils on opposite of leaves, no stipule

Microscopic character : Transverse section

1. epidermis : single, thin layer cell, mesophyll : consist of
   - palisade mesophyll : group of parenchyma cells that are long and organized located underline the upper epidermis
   - spongy mesophyll : group of parenchyma cells that are round and loosely-organized located over the lower epidermis
   - vascular bundle : collateral vessel
2. stomata : located at the lower epidermis, mixed types include anomocytic type, anisocytic type and diacytic type
3. epidermis cell : both polygonal and irregular shape Powdered *Gynostemma pentaphyllum* (Thumb.) Makeno leaf Dried, green powdered drug
1. covering trichomes – non-glandular multicellular, commonly found, some are collapsed trichome
2. stoma – several types, found at the lower epidermis : diacytic stoma, anisocytic stoma and diacytic stoma
3. epidermis, parenchyma, spongy mesophyll
4. bundle of fiber
5. reticulate, spiral, pored, bordered, and bordered pored vessel
6. starch grain, aleurone grain, longitudinal parenchyma over vein

Constants of the Structure of *Gynostemma pentaphyllum* (Thumb.) Makino Leaf

$$\text{stomatal number} = \frac{\text{number of stoma}}{\text{area of leaf surface in square millimeter}}$$

$$= 51.95$$

$$\text{stomatal index} = \frac{\text{number of stoma}}{\text{number of stoma + number of epidermal cell}} \times 100$$

$$= 7.64$$

$$\text{palisade ratio} = \frac{\text{number of palisade cell underline 4 epidemal cells}}{4}$$

$$= 1.66$$

$$\text{vein islet} = \text{smallest area surrounded by veins}$$

$$= 14.76$$

$$\text{vein islet number} = \frac{\text{vein islet}}{\text{area in 4 square millimeter}}$$

$$= 3.69$$

$$\text{veinlet terminal} = \text{terminal of branch of vein}$$

$$= 21.63$$

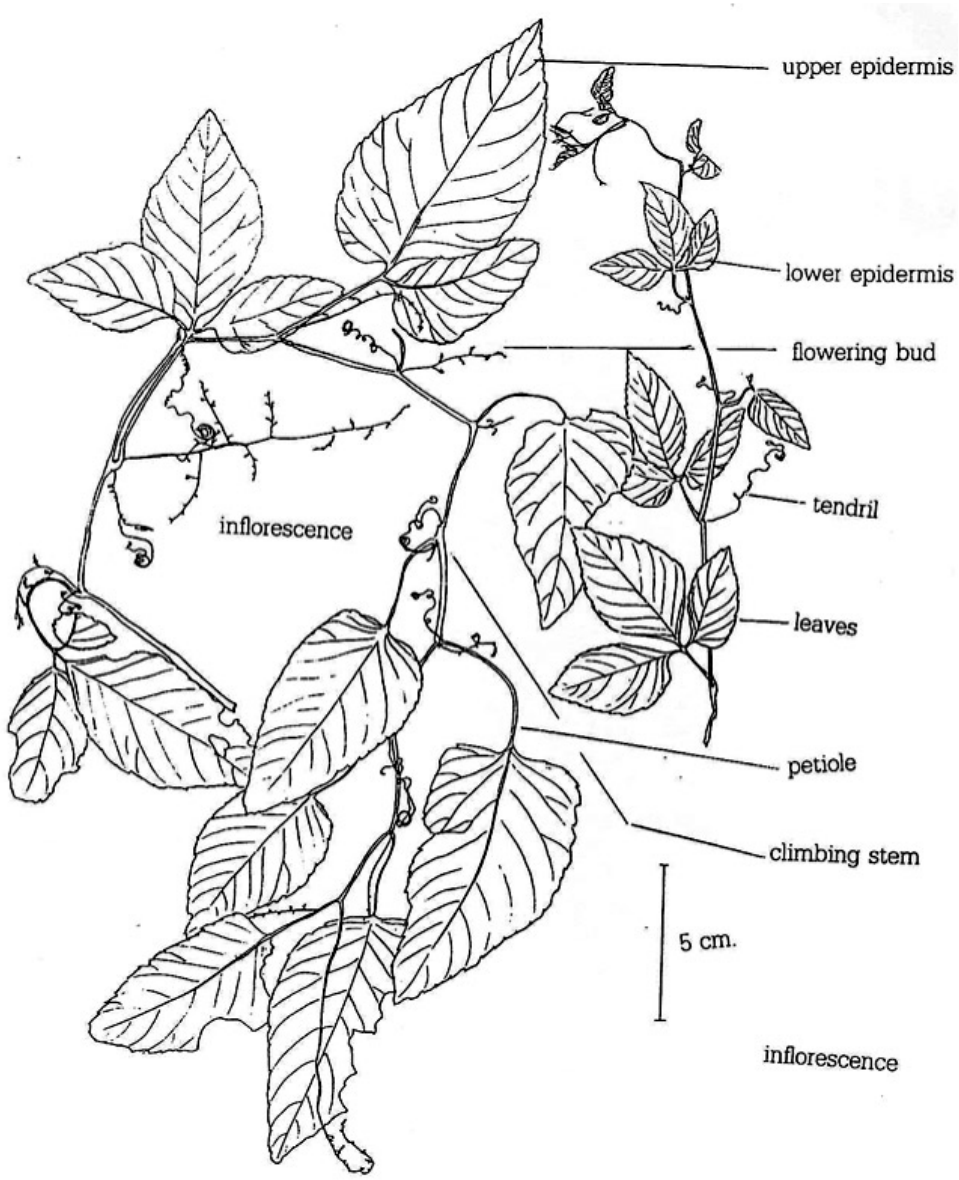
$$\text{veinlet terminal number} = \frac{\text{number of terminal of veinlet}}{\text{area in 4 square millimeter}}$$

$$= 5.41$$

Table 2. Species: *Gynostemma pentaphyllum* (Thumb.) Makino. (Jiau-gu-lahn).

Stain Solutions	Alcohol Extract			Water Extract		
Testing Parts	All parts					
Residue	Dark green extraction					
	Test	Confirm		Test	Confirm	
1. Alkaloid		Ether	Alk.		Ether	Alk.
1.1 Dragendroff's reagent	Turbid Solution	clear	clear			
1.2 Wagner's reagent	Turbid Solution	clear	clear			
1.3 Hager's reagent	Turbid Solution	turbid	clear			
1.4 Mayer's reagent	Turbid Solution	clear	clear			
2. Tannin	Test			Test		
2.1 1% Galatin	Unchanged					
2.2 1% Gelatin+Salt	Unchanged					
2.3 $FeCl_3$ Ts	Unchanged					
3. Glycoide	Test			Test		
3.1 Anthaquinone Borntager's Reaction	Unchanged					
3.2 coumarin UV Fluorescence	Unchanged					
3.3 Flavonol, Falvone Shibata's Reaction	Unchanged					
3.4 Saponin Foaming	Unchanged					
3.5 Cardiac Glycoside Kedde's Reaction	Unchanged					
3.6 Steroid Liberman Burchard's						
3.7 Terpene Liberman Burchard's	Color changed from red to violet					
3.8 Anthocyanin	Unchanged					

Figure 2. Macroscopic Character : Morphological Character of *Gynostemma pentaphyllum* Thumb. Makino.



Yaa-waan

Botanical name Stevia rebaudiana Bertoni M.
Family Compositae (Asteraceae)
Thai name Yaa-waan
English name Stevia, Sweet grass
Scientific synonyms -
Harbarium specimen No. 1 : 009728 at Herbarium of Faculty of Pharmacy, CMU

Morphological description (Fig.3)

Perennial herb that grows to 30-90 cm tall, tough stems with green, shrubby branches. The leaves are green, simple leaf arranged in opposite vernation and are lanceolate or oblong lanceolate with 1-1.5 cm in width and 3-4 cm long. The margin is serrate dentate with pappus. The flowers with white petal arranged in indeterminate heads inflorescence on terminal branches. The sepal with serrate margin is long conical shape and the petal base is sympetalous with 5 lobes. The white stamen with white pappus. The fruit is indehiscent fruit with single seed. The seeds are black with hairs (pappus).

Pharmacognostic characteristic

Macroscopical : morphological character (Fig.3)

Simple leaf, lanceolate or oblong lanceolate, 1-1.5 cm width, 3-4 cm long, serrate-dentate margins.

Microscopical of leaf :

Transverse section of leaf

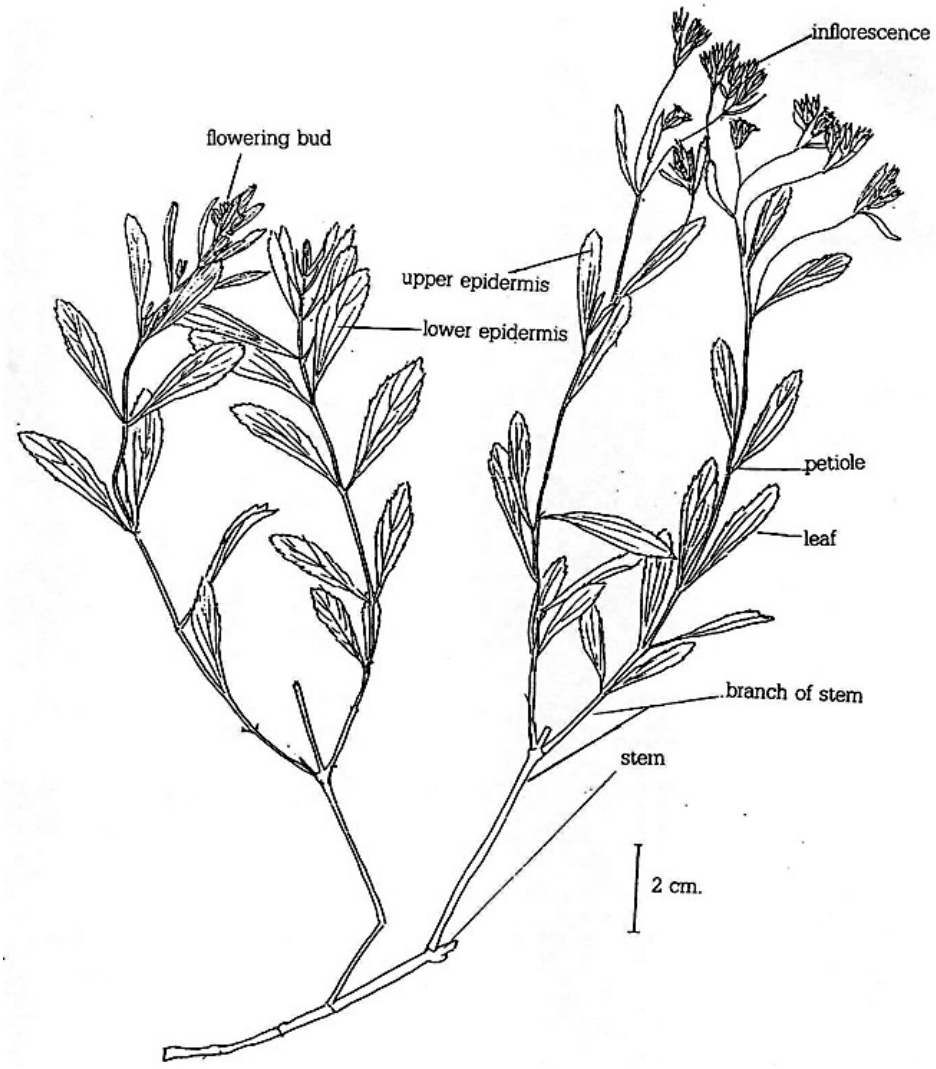
1. upper epidermis consist of linear cell wall, cuticle covered with trichomes and stoma
2. mesophyll consist of palisade mesophyll in single line with chloroplast
3. spongy mesophyll consist of vascular bundle
4. lower epidermis consist of linear cell wall with cuticle on leaf and trichomes
5. numerous calcium oxalate crystals, irregular shape with size range from 50-200 microns (μ).

Constants of the Structure of *Stevia rebaudiana* Bertoni M. Leaves

Powdered drugs are dry, yellowish to green, hygroscopic with unique odor.

1. covering trichomes are multicelluar, commonly found
2. anomocytic stoma on the lower epidermis
3. upper epidermis commonly found, as well as the palisade mesophyll
4. parenchyma - thick wall, with xylem and reticulate vessel from vein, petiole and epidermal cells
5. lignified bundle of fiber from the midrib, found commonly
6. reticulate vessel from the vein cells
7. parenchyma cells of the midrib contain starch grains and calcium oxalate crystal in some cells
8. calcium oxalate crystals are prism-like shape
9. pieces of epidermis from petiole and midrib
10. pieces of vessels - reticulate, spiral, and pitted vessel

Figure 3. Macroscopical Character : Morphological Description of *Stevia rebaudiana* Bertoni M.



Constants of the Structure of *Stevia rebaudiana* Bertoni M. Leaf

stomatal number	=	49.87
stomatal index	=	23.14
palisade ratio	=	5.79
vein islet	=	43.46
vein islet number	=	10.87
veinlet terminal	=	42.9
veinlet terminal number	=	10.73

Table 3. Species: *Stevia rebaudiana* Bertoni M. (Yaa-waan).

Stain Solutions	Alcohol Extract			Water Extract		
Testing Parts	Aboveground parts					
Residue	Green extraction					
	Test	Confirm		Test	Confirm	
1. Alkaloid		Ether	Alk.		Ether	Alk.
1.1 Dragendroff's reagent	Turbid Solution	clear	turbid			
1.2 Wagner's reagent	Clear Solution	clear	clear			
1.3 Hager's reagent	Turbid Solution	turbid	clear			
1.4 Mayer's reagent	Clear Solution	clear	clear			
2. Tannin	Test			Test		
2.1 1% Galatin	Unchanged					
2.2 1% Gelatin+Salt	Unchanged					
2.3 $FeCl_3$ Ts	Unchanged					
3. Glycoide	Test			Test		
3.1 Anthaquinone Borntager's Reaction	Unchanged					
3.2 coumarin UV Fluorescence	Unchanged					
3.3 Flavonol, Falvone Shibata's Reaction	Unchanged					
3.4 Saponin Foaming	Unchanged					
3.5 Cadiac Glycoside Kedde's Reaction	Unchanged					
3.6 Steroid Liberman Burchard's						
3.7 Terpene Liberman Burchard's	Color changed from Blue-green					
3.8 Anthocyanin	Unchanged					

Raang chuet

Botanical name : Thunbergia laurifolia Lindl.
Family : Acanthaceae (Thunbergiaceae)
Thai name : Kum-Lang-Chang-Peauk, Koub-Cha-Nang, Kreu-Kow-Quew, Ya-Quew (Central), Rahng-Yen, Nham-Nae (North), Yhum-Yae (Utraradit), Kauy (Yaa-La0, Du-Lhau (Pattani), Tid-Pud (Nakhon-Si-Thammarat), Nam-Nhong (Saraburi), Add-Aa, Yhum-Yae (Phetchabun), Jau-Lau-Di-Uuh, Chag-Ka-Lah, Pau-Nhor-Taue.
English name : Blue Thunbergia (Laurel Clock Vine)
Herbarium specimen No.3:009722 at Herbarium of Faculty of Pharmacy, CMU
Morphological description (Fig.4)

Medium-size, evergreen woody climber that have round green stems basal diameter 3 cm.; back finely striate, tan; , with clearly visible node and internode. Leaves are simple, opposite vernation, glabrous suface, long-ovate shape, crenate, leaf blades are dark green, 8-10 cm long, 4-5 cm wide, petioles are 2.5 cm long. Flowers are cyme, 3-4 florets per cyme, pedicels light green and light yellow, funnel form, 1 cm long, 5 petals split into 5 lobes, light purple or indigo blue ; calyx cream ; corella : narrow base cream. Fully-blossom flowers are 3 inches in diameter, with

white tube inside, green-red spot, light yellowish with violet bract, 4 stamens, fruits are sharp-end pods, 1 cm long, and dehiscence : mature fruits split into 2 pieces.

Pharmacognostic characteristic

Macroscopic characteristic (Fig.4) : Simple leaf with opposite vernation, glabous and sharpen ends leaves, obtuse, crenate margin, 8-10 cm long, 4-5 cm wide, 2.5 cm petiole long.

Microscopical characteristic :

Transverse section and surface section

1. upper epidermis : consist of 2 cell layers that covered with cutin, stoma and trichome

2. mesophyll : consist of 2 palisade mesophyll layers, having many cholo-plasts and more than 3 spongy mesophyll layers.

3. vascular bundle at vein

4. lower epidermis : consists of 2-3 cell layers that covered with cutin, but less than that of upper epidermis. The amount of anomocytic stoma in this part are more than that of upper epidermis

Powdered *Thunbergia laurifolia* Lindl. leaf

1. upper and lower epidermis with chloroplast and many anomocytic stoma from lower epidermis

2. varcular bundle with reticulate, bordered and spiral vessel

3. some trichome

Constants of Leaf Structure *Thunbergia laurifolia* Lindl. Leaf

stomatal number	=	39.22
stomatal index	=	27.75
palisade ratio	=	6.91
vein islet	=	25.06
vein islet number	=	6.27
veinlet terminal	=	15.03
veinlet terminal number	=	3.76

Figure 4. Macroscopic character : Morphological Description of *Thunbergia laurifolia* Lindl.

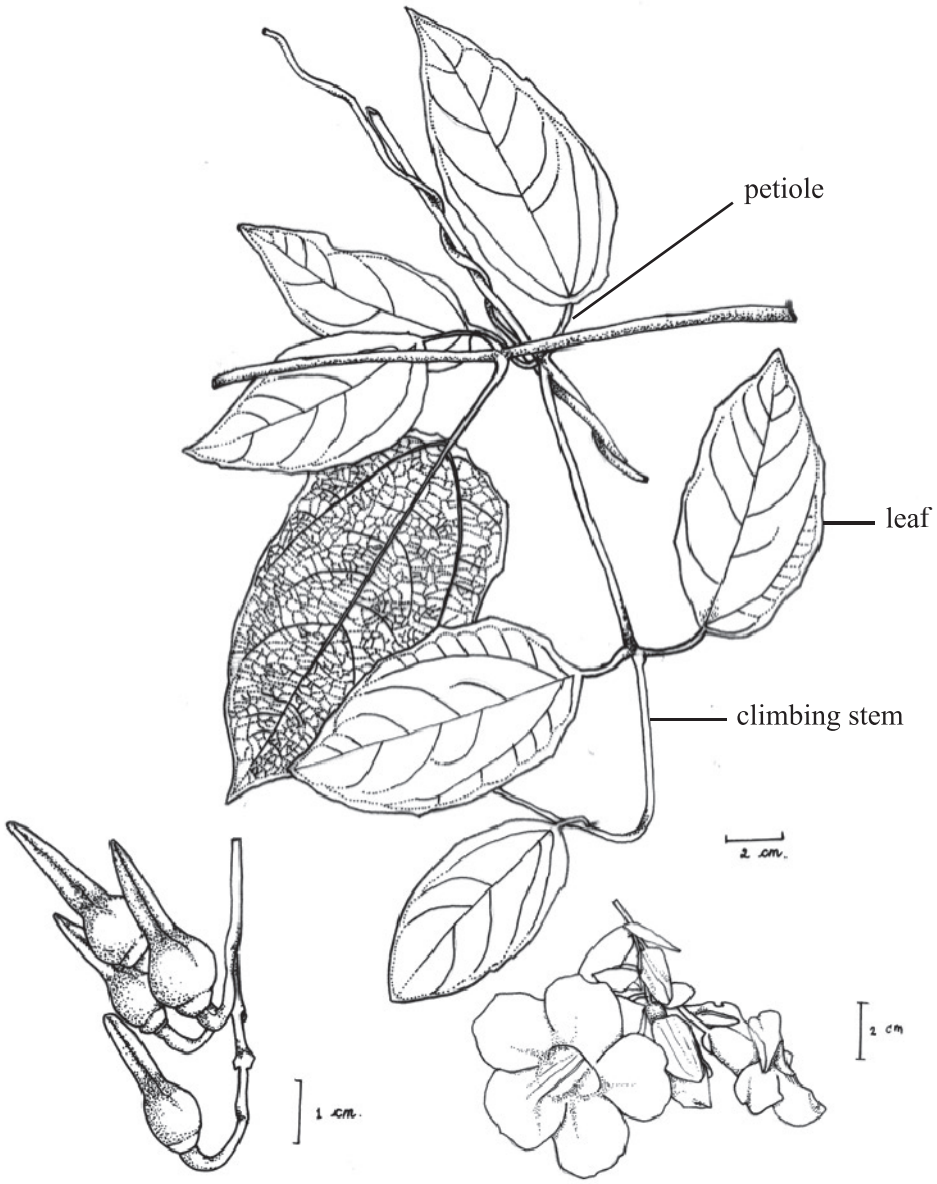


Table 4. Species: *Thunbergia laurifolia* Linld. (Raang-chuet).

Stain Solutions	Alcohol Extract			Water Extract		
Testing Parts	Leaves					
Residue	Dark green extraction					
	Test	Confirm		Test	Confirm	
1. Alkaloid		Ether	Alk.		Ether	Alk.
1.1 Dragendroff's reagent	Turbid Solution	clear	clear			
1.2 Wagner's reagent	Trubid Solution	clear	clear			
1.3 Hager's reagent	Turbid Solution	turbid	clear			
1.4 Mayer's reagent	Turbid Solution	clear	clear			
2. Tannin	Test			Test		
2.1 1% Galatin	Unchanged					
2.2 1% Gelatin+Salt	Unchanged					
2.3 $FeCl_3$ Ts	Unchanged					
3. Glycoide	Test			Test		
3.1 Anthaquinone Borntager's Reaction	Unchanged					
3.2 coumarin UV Fluorescence	Unchanged					
3.3 Flavonol, Falvone Shibata's Reaction	Unchanged					
3.4 Saponin Foaming	Unchanged					
3.5 Cardiac Glycoside Kedde's Reaction	Unchanged					
3.6 Steroid Liberman Burchard's	Green rings between layers					
3.7 Terpene Liberman Burchard's						
3.8 Anthocyanin	Unchanged					

DISCUSSION AND CONCLUSION

This study was done by qualitative analysis, without inferential statistics. The descriptive analyses were done by taxonomic and pharmacognostic methods to investigate morphology and habitat of medicinal plants. In addition, the analyses were done by scientific methods to investigate the characters, properties and components of plant cells to identify and clarify with stain tests. The results are reliable and portray the morphology, type and sizes of cells with 400X compound microscope, and identification of active constituents of medicinal plants. This study was aimed to identify authentic medicinal plants cells/tissues as standard samples and isolate the morphology, size and type of cells to verify the quality of the medicinal plant. The investigation of powdered medicinal plants generates scientific skills and expertise. The tables below present the results of 4 studied medicinal plant species; *Kaempferia parviflora* Wall. ex Baker (Kra-chai-dahm), *Gynostemma pentaphyllum* (Thumb.) Makino. (Jiau-gu-lahn), *Stevia rebaudiana* Bertoni M. (Yaa-waan), and *Thunbergia laurifolia* Lindl. (Raang-chuet).

From this research, the standard of morphological and microscopical characters, main chemical constituents were obtained from each plant, for example, carbohydrate from Yaa-waan leaves, terpenes from Jaew-ku-laan leaves, sterols from

Raang-chuet leaves and phenolic, terpene and anthocyanin groups from Kra-chai-dam. Also habit, habitat, medicinal plant geography and biodiversity of these plants have been subjected to standardization by governmental organization concerned. Finally, this research results will be a guidance for medicinal plant quality control in the way of international standard so that confidence in medicinal plant products will occur and raise the number of national drug lists some day.

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