Taxonomic Study of the Family Acanthaceae used as traditional medicinal plants for ethnic groups in North, Central and Northeastern Thailand.

Winai Somprasong[1/] Srunya Vjarodaya[2/] Kongkanda Chayamarit[3/]

ABSTRACT

The Acanthus Family (Acanthaceae) is one of necessary plants for peoples across several regions in Thailand, especially in terms of traditional medicinal purposes. As mentioned, the case studies in North and Northeastern Thailand are summarized that further our understanding of the close relationships between traditional uses and indigenous people. The study showed that a number of 39 species 1 varieties reported with their uses. The most important ones are enumerated namely, Acanthus ebracteatus Vahl, *Acanthus montanus* T. Anderson, *Andrographis paniculata* (Burm.f.) Wall. ex Nees, *Barleria lupulina* L., *Barleria prionitis* L., *Barleria strigosa* Willd., *Clinacanthus nutans* (Burm.f.) Lindau, *Clinacanthus siamensis* Brem., *Dicliptera roxburghiana* Nees, *Graptophyllum pictum* Griff., *Justicia adhatoda* L., *Justicia diacantha* Imlay, *Justicia gendarussa* Burm.f., *Justicia glomerulata* Benoist, *Justicia procumbens* L., *Justicia quadrifaria* (Wall. ex Nees) T. Anderson, *Justicia ventricosa* Wall., *Nelsonia canescens* (Lam.) Spreng., *Peristrophe acuminata* Nees, *Peristrophe lanceolaria* (Roxb.) Nees, *Phlogacanthus curviflorus* Nees, *Phlogacanthus pulcherrimus* T. Anderson, *Rhinacanthus nasutus* (L.) Kurz, *Pseuderanthemun graciliflorum* (Nees) Ridl., *Pseuderanthemum palatiferum* (Nees) Radlk., *Rungia parviflora* (Retz.) Nees subsp. pectinata (L.) L.H. Cramer, Sanchezia oblonga Ruiz & Pav., *Staurogyne lanceolata* (Hassk.) Kuntze, Strobilanthes cusia Nees, *Strobilanthes lanceifolius* T. Anderson, *Strobilanthes nivea* Craib., *Strobilanthes pentstemonoides* (Nees) T. Anderson, *Thunbergia coccinea* Wall., Thunbergia fragrans Roxb. var. fragrans, Thunbergia grandiflora Roxb., Thunbergia hossei Clarke, Thunbergia laurifolia Lindl., Thunbergia similis Craib, Thunbergia fragrans Roxb. var. vestita Nees. It is

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apparent that, across local wisdom and acanthus species are valued for their remedies to common diseases and discomforts. The research focuses on their wide-ranging significance of medicinal plants that relate to human cultures which provide incentives for countries to protect, conserve and sustain them for agricultural purposes in the future.

Key words : Acanthaceae, traditional use, ethnic groups, Thailand

INTRODUCTION

The Family Acanthaceae is a large pantropical family of about 229 genera and 3,450 species in the world (Clarke, 1885). Most of them are herbs or shrubs, including twining forms, some are spiny. The four main centres of distribution are Indo-Malaya, Africa, Brazil and Central America but a few are in the temperate zone. (Cramer, 1998). The representatives of the family can be found in nearly every habitat, e.g. in dense or open forest, in thickets, on wet fields and valleys, at the sea coast and in marine areas, swamps and as an element in swamp forests (Benoist, 1936; Imlay, 1938). There were about 40 genera and over 230 species in Thailand and the majority are confined all over the country (Hansen, 1985). Acanthaceae was included the 221 genera treated by Scotland and Vollesen (2000), classify it into three subfamilies, i.e. Nelsonioideae, Thunbergioideae and Acanthoideae. The last one is the largest subfamily which composts of two tribes, i.e. Acantheae and Ruellieae. The latter tribe, comprising four subtribes and the selected two of them, subtribe Barleriinae and Andrographinae, are interesting to be revised for this research, due to their well-known as the Thai medicinal plants used by traditional herbalist. Some well-known species in tropical zone are Andrographis paniculata Nees and Barleria lupulina Lindl. (Khamfachuea, 2008; Tovaranonte, 1998)

Notably, as a result of the largely tropical distribution of Acanthaceae, species-level diversity remains poorly understood, and there is little doubt that many new species remain to be discovered. In particular, the Neotropics house the richest and most poorly documented angiosperm flora on Earth. It is thus not surprising that Neotropical acanthus family remains incompletely known, and it is to be expected many more species to be described from this region. This research aims to clarify the taxonomic revision of the subtribe Barleriinae, tribe Ruellieae sensu Scotland and Vollesen (2000), Family Acanthaceae, to study the morphological characters of the subtribe Barleriinae and

Andrographinae, Family Acanthaceae, to enumerate the number of species and construct the keys to subtribe, genera and species and to record the geographical distribution, ecological and phonological information, and uses of some species.

MATERIALS AND METHODS

(1) Taxonomic Treatment was conducted by means of the literature and herbarium specimens studies of the subtribe Barleriinae (both genera of Barleria L. and Lepidagathis Willd.) and the subtribe Andrographinae (both genera of Andrographis Wall. and Pholgacanthus Nees) examined at Thai and foreign herbaria as follows: Bangkok Herbarium, Department of Agriculture (BK), Forest Herbarium, National Park, Wildlife and Plant Conservation Department (BKF), Queen Sirikit Botanic Garden Herbarium, The Botanical Organization, Ministry of Natural Resources and Environment (QBG), the Biological Department Hebarium, Chiang Mai University (CMU), Prince of Songkhla University Herbarium (PSU), Royal Botanic Gardens, Kew (K), Royal Botanic Gardens, Edinburgh (E), and The Natural History Museum (BM) in the UK, Department of Systematic Botany, University of Aarhus (AAU) and Botanical Museum, University of Copenhagen (C) in Denmark, National Herbarium, Leiden (L) in the Netherlands, and Musum National d'Histoire Naturelle (P), France

(2) Field Survey and Specimens Collection of the subtribe Barleriinae (both genera of Barleria L. and Lepidagathis Willd.) and the subtribe Andrographinae (both genera of Andrographis Wall. and Pholgacanthus Nees) are conducted throughout the country by choosing from three regions, e.g. the north (13 ethnic groups): Chiang Rai, Chiang Mai, Mae Hong Son and Nan Province; the northeast (7 groups): Nong Khai, Bung Kan, Nakhon Phanom and Ubon Ratcha Thani); the central (2 ethnic groups): Tak, Kam Phaeng Phet, Ratcha Buri and Kanchana Buri Province (Figure 1 and Figure 2)

(3) Measurement of vegetative and reproductive features of dried specimens collected by the author, and herbarium specimens deposited in the above Thai and foreign herbaria are carried out by using a hand ruler or scale calibrated in cm and mm under the stereomicroscope for the characters of indumentum, leaves and flowers. To study morphological characters clearly, the specimens should be usually boiled at 60-80 degree Celsius to be more softer. Illustrations and photographs are provided for clarification. The herbarium specimens together with the voucher specimens are identified by taxonomic literature and the comparison

with the type specimens. Preparation the keys to subtribe, genera based on the significant morphological characters are constructed to prove their taxonomic units. The dried specimens are mounted on herbarium sheets with the label and registered for keeping in the main Thai herbaria such as BK, BKF, QBG, PSU, CMU, and K respectively. This present revision is based mainly on the study of herbarium material at BK, BKF, CMU, PSU, QBG and K (herbarium codes following Thiers, 2012). The work was undertaken between June 2008 and March 2012. Morphological characters and measurements were taken directly from living or dried herbarium specimens. Vegetative and reproductive parts were measured using an Olympus SZX9 stereomicroscope; up to 5 representative specimens of each species were measured to cover their variation. Ecological and distribution data were also recorded. In addition, photographs of living specimens were taken during the field expeditions. Distribution maps were recorded from herbarium materials and field expeditions. Illustrations for selected species were provided. Voucher specimens were deposited in BK. The enumeration of species for each species follows Imlay (1938) and Floras of neighbouring countries. The identifications are confirmed with the type specimens.

RESULTS AND DISCUSSIONS

The study on the family Acanthaceae among ethnic groups in Thailand (north Chiang Rai, Chiang Mai, Mae Hong Son and Nan Province; Northeast: Nong Khai, Bung Kan, Nakhon Phanom and Ubon Ratcha Thani; Central: Tak, Kam Phaeng Phet, Ratcha Buri and Kanchana Buri Province) (Figure 1 and Figure 2) during October, 2009 to September, 2010.

The study on the family Acanthaceae was diagnosed through details of corolla aestivation, cystolith, retinaula, number of stamen and seed data to serve the classification of this family. Benoist, 1936; Cramer, 1998; The classification of Acanthaceae followed by Scotland & Vollesen (2000) which are classified it into three subfamilies, i.e. Nelsonioideae, Thunbergioideae Acanthoideae (Figure 3). The last one is the largest subfamily which comprises two tribes, i.e. Acantheae and Ruellieae. The tribe Ruellieae was classified into 4 subtribes, i.e. Justiciinae, Ruelliinae, Barleriinae and Andrographinae. The taxonomic characters among each subfamily, tribe and subtribe are shown in Table 1

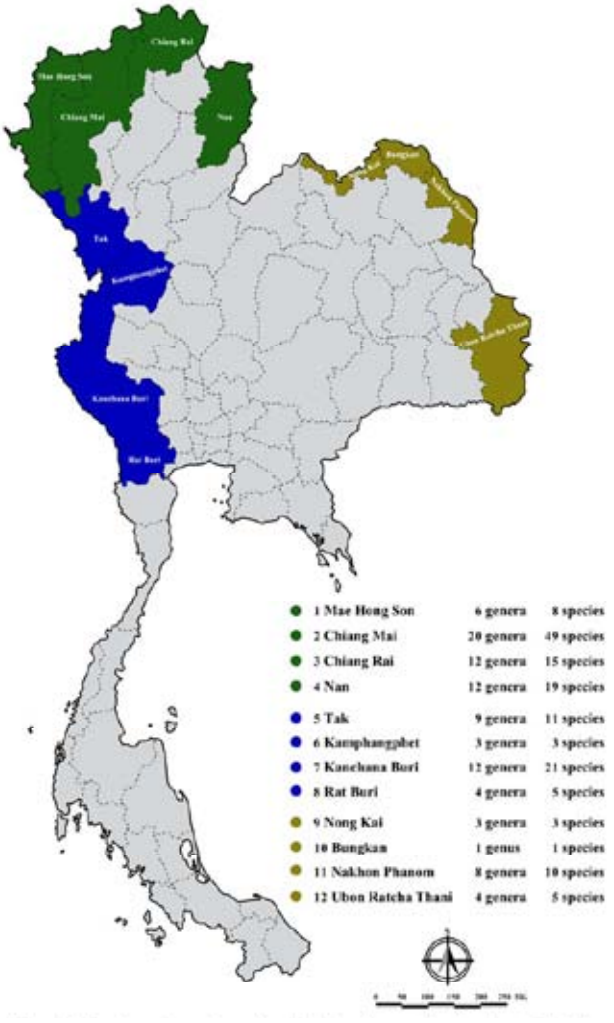

Figure 1. Map of surveying area for acanthus family in northern, central and northeastern Thailand

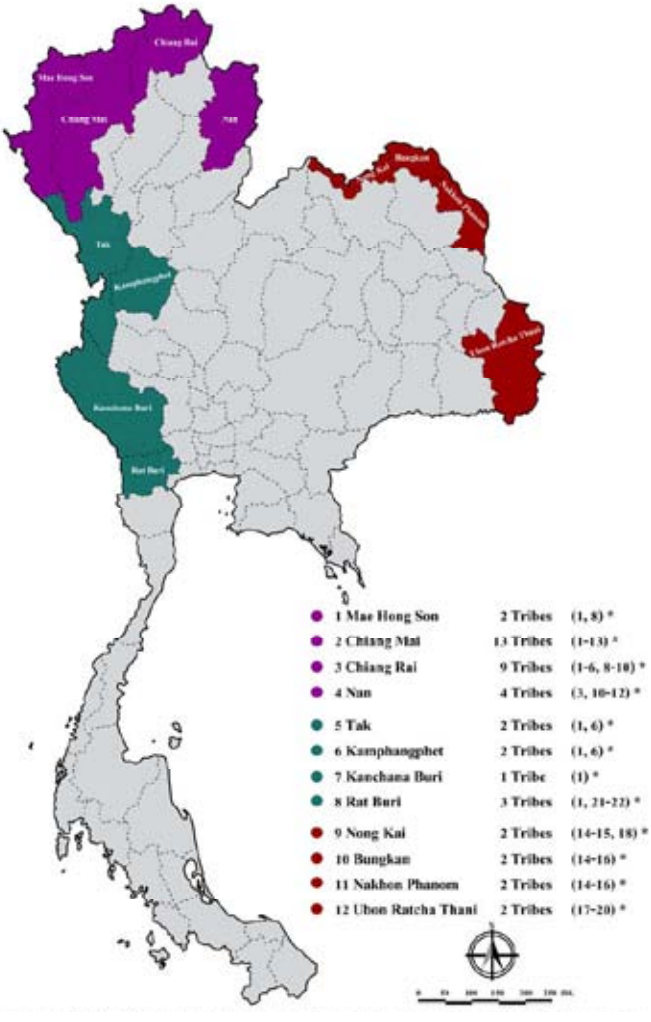

Figure 2. Map of ethnie groups using acanthus family in northern, central and northeastern Thailand

The result shows that Thirty nine species and two subspecies (41 taxa) of useful Acanthaceae were enumerated in Thailand. New incurrent use, botanical and Thai names and ethnic groups are listed (Table 2). Key to genera of selected species are provided as follow:

Medicinal uses

It is a well-known fact that many wild plants are also used for traditional medicines, food plants and other agricultural purposes. The list of plants in the acanthaceae family of ethnic groups in the north, northeast and central of Thailand were recorded in charge of botanical names, status and use. The

Table 1. Taxonomic characters among 3 subtribes of Acanthaceae

Subfamily/ tribe/ subtribe	Aestivation	Cystolith		Retinacula		stamen	seed
		absent	present	absent	present		
Nelsonoideae	Descending cochlear	-		-		2 or 4	16 or many
Thunbergioideae	Ascending cochlear	-		-		4	4
Acanthoideae Tribe Acantheae	Descending cochlear	-			+	4	2 or 4
Acanthoideae Tribe Ruellieae							
Subtribe Ruelliinae	Left contorted		+		+	2 or 4	2-4 or 6 or 8 or 16-Many
Subribe Justiciinae	Ascending cochlear		+		+	2 or 4	2 or 4
SubribeAndrographinae	Ascending cochlear		+		+	2	6 or 8 or 12-30
Subtribe Barleriinae	Quincuncial		+		+	4	4

Key to Genera of Acanthus Family in North, Northeastern and Central Thailand

1 Aestivation descending cochlear, retinacula absent

2 Stamen 2, Calyx lobe 4 fid 9.*Nelsoni*

2 Stamen 4 or 2, fertile 17.*Staurogyne*

1 Aestivation not descending cochlear aestivation, retinacula present

3 Climber, fruit dehiscent, drupe 18.*Thunbergia*

3 Herb, fruit dehiscent

4 Cystolith absent, leaves serrate 1.*Acanthus*

4 Cystolith present, leaves entire

5 Filament curtain, aestivation left contort

6 Ovule 1-2 or many

7 Stamen 2 fertile; 2 sterile 15.*Sanchezia*

Corolla

7 Stamen 2 or 4, fertile

8 Capsule petiolate; spathulate, seed arranged at the apex 13.*Ruellia*

8 Capsule sessile; long, seed arranged at the base

7.*Hemigraphis*

6 Ovule 2, corolla ventricose, stamen 4; didynamous, anther mucilage 16.*Strobilanthes*

5 Filament not curtain

9 Ascending cochlear aestivation

10 Ovule 2-4

11 corolla bilabiate

12 anther 1-celled 4.*Clinacanthus*

12 anther 2-celled 12.*Rhinacanthus*

13 Corolla tube short, bilabiate

14 Lip shallowly 3-lobed 6.*Graptophyllum*

14 Lip deeply 3-lobed

15 Flower solitary or more; arranged in bract

16 Capsule with fixed placenta 10.*Peristrophe*

16 Capsule with elastic placenta 5.*Dicliptera*

15 Spiked unilateral; 4 ranked with 2 ranked sterile; 2 ranked fertile

17 Capsule with elastic placenta, bract densely imbricate 14.*Rungia*

17 Capsule with non-elastic placenta or rarely, bract not imbricate 8.*Justicia*

11 Corolla not bilabiate

10 Ovule more than 4

18 Anther beard, seed sub-globose 2.*Andrographis*

18 Anther glabrous, seed globose 11.*Phlogacanthus*

9 quinquncial aestivation 3.*Barleria*

number of them are enumerated in 17 genera 39 species and one varieties. The results shows that most of them are indigenous plants (29 species one varietis) which are used in daily-use of the ethnic groups in the north (13 tribes). The report shows the record of methods to apply them for various symptoms and they are divided in categories as follows: (Table 2)

1. The species are used to cure symptom of pain and ache, *i.e. Acanthus*

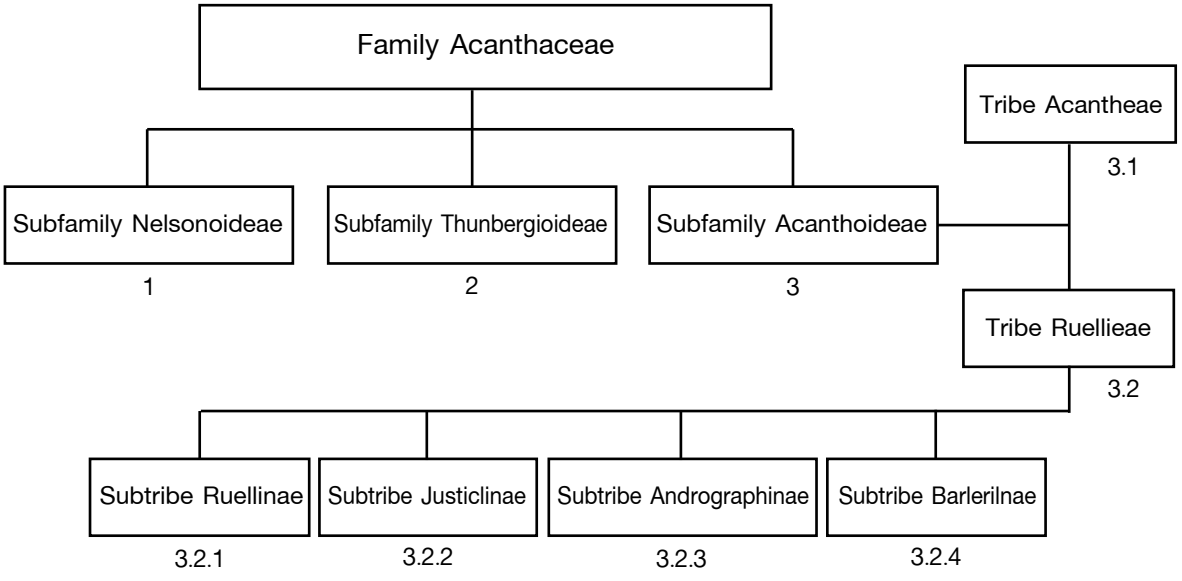

Figure 3. Diagram of Acanthaceae Classification

ebracteatus, A. montanus, Andrographis paniculata, Phlogacanthus curviflorus, Sanchezia oblonga.

2. The species are used to cure a fever, infantile convulsion, sore throat and cough, *i.e. Andrographis paniculata, Justicia adhatoda, Phlogacanthus curviflorus, Ruellia tuberosa, Staurogyne lanceolata, Strobilanthes anfractulosa, S. lanceifolius, S. penstemonoides, Thunbergia coccinea.*

3. The species are used to cure skin disease, insect poison and itchy symptom, *i.e. Barleria lupulina, Justicia adhatoda, J. diacantha, J. gendarussa, Nelsonia canescens, Peristrophe acuminata, Thunbergia coccinea, T. grandiflora, T. laurifolia.*

4. The species are used as a tonic, *i.e. Acanthus ebracteatus, Barleria cristata, B. strigosa, Dicliptera roxberghiana, Staurogyne lanceolata.*

5. The species are used to cure about stomach, abdomen, gastrointestinal tract and bloated symptom, *i.e. Barleria strigosa, Dicliptera roxberghiana, J. quadrifaria, Phlogacanthus curviflorus, Thunbergia fragrans var. fragrans, T. fragrans var. vestita, T. hossei.*

6. The species are used to cure wound and bleeding, *i.e. Graptophyllum pictum, Hemigraphis glaucescens, Justicia procumbens, Peristrophe lanceolaria, Thunbergia grandiflora.*

7. The species are used to cure about bone and related diseases, *i.e. Phlogacanthus curviflorus, Rhinacanthus nasutus.*

8. The species are used to cure about sexually transmitted disease, *i.e. Strobilanthes nivea.*

9. The species are used to cure

Table 2. List of some acanthus family and the use as medicinal purposes of ethnic groups in north, central and northeastern Thailand

Botanical Name	Status	Ethnic group	Use
Acanthus ebracteatus Vahl	Indigenous species	20 21	Stem boiled to cure the pain of human body (20) Whole plant used as a tonic, leaf pounded with alcohol to apply for curing a painful knee (21)
Acanthus montanus *T. Anderson*	Exotic	1	Mature leaf boiled to drink for curing diabetes and to decrease pains and aches.
Andrographis paniculata (Burm.f.) Wall. ex Nees	Indigenous species	15 18 20 21 22	Fresh leaf chewed to cure a fever, diarrhea. Mature leaf boiled to drink for curing pains and aches.
Barleria cristata L.	Indigenous species	1 2 3	Root used as a tonic (1) Whole plant boiled and used to bath to cure abnormal menses (2) Root pounded for applying to cure insect poison (3)
Barleria lupulina L.	Cultivated species	1 3 14	Root pounded for an extraction to cure insect poison (1) Root grinded with liquor to cure poison (3) Root grinded with liquor to be applied insect poison (13) Root grinded to be applied for curing skin disease (14)
Barleria strigosa Willd.	Indigenous species	1 2 16 18	Mature leaf boiled to drink as a tonic(1 2) Whole plant to be used for curing gastrointestinal tract disease(16 18)
Clinacanthus siamensis Brem.	Indigenous species		
Dicliptera roxburghiana Nees	Indigenous species	4	Whole plant boiled to drink for curing stomachache and bloated symptom and used for women as a tonic after childbirth
Graptophyllum pictum Griff.	Exotic species	13	Leaf grinded to be applied for stop bleeding
Hemigraphis glaucescens (Nees) C.B. Clarke	Indigenous species	5	Leaf pounded to cure serious wound or blisters
Justicia adhatoda L.	Indigenous species	2 3 8 10 11	Young leaf cooked in spicy soup (11) Root and leaf pounded to cure itchy symptom (11) Whole plant boiled and used to drink for curing fever and cough (2 8 10) Flower used to cure fever and bronchitis (3)
Justicia diacantha Imlay	Cultivated species	11	Whole plant grind to be applied for decreasing insect poison
Justicia gendarussa Burm.f.	Indigenous species	2 4 11	Whole plant grind to be applied for decreasing insect poison Leaf extraction used for curing skin disease
Justicia glomerulata Benoist	Indigenous species	2	Whole dried plant used as tea substitute in charge of a tonic property for women after childbirth
Justicia procumbens L.	Indigenous species	2 10 11	Leaf used to be scrub for applying serious wound
Justicia quadrifaria (Wall. ex Nees) *T. Anderson*	Indigenous species	4 6 7	Whole plant boiled to drink for curing stomachache and bloated symptom
Justicia ventricosa Wall.	Indigenous species	11 12	Leaf grinded with steamed water to massage for curing infantile convulsion
Nelsonia canescens (Lam.) Spreng.	Indigenous species	5	Leaf grinded to apply for curing itchy symptom
Peristrophe acuminata Nees	Indigenous species	11	Leaf grinded to apply for curing itchy symptom
Peristrophe lanceolaria (Roxb.) Nees	Indigenous species	5	Leaf grinded to apply for curing seriously infected wound

Remarks Ethnic group (1) North (1-13) 1 = Karen 2 = Yao 3 = Tai Lu 4 = Hmong 5 = Akha 6 = Lahu 7 = Paluang 8 = Shan 9 = Lisu 10 = Haw 11 = Lawa 12 = Khmu 13 = Native people (North)

(2) Northeast (14-20) 14 = Phutai 15 = Kha (So) 16 = Nyaw 17 = Kaloeng 18 = Yoy 19 = Buru 20 = Kula

(3) Central (21-22) 21 = Thai Song Dam 22 = Native people (Central)

Table 2. (continued)

Taxa	Status	Ethnic group	Use
Phlogacanthus curviorus Nees	Indigenous species	1 2 4 5 7	-Whole plant grind to be applied for curing swell, pain, liver disease (1 2 5) - Root pounded and mixed with alcohol to be applied for bone crack rehabilitation (4) - Root boiled with chicken to cure stomachache (4) - Leaf used for body massage to cure fever and infantile convulsion - Whole plant and leaf boiled to be used for bathing in charge of curing fever (7) - Leaf keep warm by the re to decrease fever and pain (11 12)
Rhinacanthus nasutus (L.) Kurz	Cultivated species	14 21 22	- Leaf grinded to cure ring-worm symptom and boiled to drink for curing gout
Ruellia tuberosea L.	Exotic species	13	Seed soaking with water to apply for wound and sore
Sanchezia oblonga Ruiz & Pav.	Exotic species	4	Mature leaf pounded into small parts to apply on the body to cure backache waist-ache, tendon-ache, muscle-ache and cyanosis
Staurogyne lanceolata (Hassk.) Kuntze	Indigenous species	5	Root and leaf boiled to drink for tonic property Leaf chewed for curing cough
Strobilanthes anfractuosa C.B. Clarke	Indigenous species	5	Whole plant boiled to drink for curing sore throat
Strobilanthes nivea Craib	Indigenous species	20	Whole plant and leaf used to cure gonorrhea
Strobilanthes lanceifolius T. Anderson	Indigenous species	2 6	Root boiled to drink for curing fever
Strobilanthes pentstemonoides (Nees) T. Anderson	Indigenous species	2	Root boiled to drink for curing fever
Thunbergia coccinea Wall.	Indigenous species	7 8	Young stem boiled to bath for curing fever (7 8) Root and leaf used for curing poison (3)
Thunbergia fragrans Roxb. var. fragrans	Indigenous species	13	Whole plant mixed with other plants boiled to drink for curing paralysis and symptom of an abnormal large blood vessel in the abdomen
Thunbergia grandiora Roxb.	Indigenous species	2 5	- Whole plant grinded to for applying on skin and boiled to bath for curing small skin protuberance, inammation and itchy symptom - Root, whole plant and leaf used for urine disease, urinary calculus - Leaf grinded to be applied for curing skin disease, serious wound, inammation
Thunbergia hossei Clarke	Indigenous species	13	Root mixed with Polygonum chinense boiled to drink for curing pain of lower abdomen in case of venereal disease
Thunbergia laurifolia Lindl.	Indigenous species	13 19	Leaf grinded to be applied for curing insect poison (13) Leaf and stem grinded to applied wound from hot water burn and skin irritation (13) Leaf used for medicinal components (19)
Thunbergia similis Craib	Indigenous species	13	Root boiled to drink for cyanosis
Thunbergia fragrans Roxb. var. vestita Nees	Indigenous species	13	Root mixed with Polygonum chinense boiled to drink for curing pain of lower abdomen in case of venereal disease

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ring-worm symptom, *i.e. Rhinacanthus nasutus.*

10. The species are used to cure liver diseases, *i.e. Phlogacanthus curviflorus.*

The Diversity of the Acanthaceae family used as traditional medicines shows that many species are used to cure a fever, infantile convulsion, sore throat and cough. Moreover, the species which are used to cure symptom of pain and ache are popular among the ethnic groups, like Phlogacanthus curviflorus and *T. laurifolia.* Both of them were reported by Tovaranonte (1998) in Tai Lue Hmong and Yao inSome Areas of Nan Province. and Khamfachuea (2008) in Karen at Ban Chan and Chaem Luang Subdistricts, Mae Chaem District, Chiang Mai Province.

CONCLUSIONS

1. The study on the family Acanthaceae was diagnosed through details of corolla aestivation, cystolith, retinaula, number of stamen and seed data to serve the classification of this family. The classification of Acanthaceae treated by Scotland & Vollesen (2000) which are classified it into three subfamilies, i.e. Nelsonioideae, Thunbergioideae Acanthoideae. The last one is the largest subfamily which comprises two tribes, i.e. Acantheae and Ruellieae. The tribe Ruellieae was classified into 4 subtribes, i.e. Justiciinae, Ruelliinae, Barleriinae and Andrographinae.

2. Thirty nine species and two subspecies (41 taxa) of Acanthaceae used as traditional medicines are enumerated in the ethnic groups of the northern, northeastern and central Thailand. New incurrent uses, botanical names of the acanthaceae family are listed. Key to genera are provided.

3. The various symptoms are divided in to 10 categories:

3.1 The species are used to cure symptom of pain and ache.

3.2 The species are used to cure a fever, infantile convulsion, sore throat and cough.

3.3 The species are used to cure skin disease, insect poison and itchy symptom.

3.4 The species are used as a tonic.

3.5 The species are used to cure about stomach, abdomen, gastrointestinal tract and bloated symptom.

3.6 The species are used to cure wound and bleeding.

3.7 The species are used to cure about bone and related diseases.

3.8 The species are used to cure about sexually transmitted disease.

3.9 The species are used to

cure ring-worm symptom.

3.10 The species are used to cure liver diseases.

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