

Title	Taxonomic Study on Some Members of Angiosperms from Htooma Mountain Area, Patheingyi Township, Mandalay
All Authors	Myat Hnin Wai and Soe Myint Aye
Publication Type	Local Publication
Publisher (Journal name, issue no., page no etc.)	Journal of the Myanmar Academy of Arts and Science, Vol. 13
Abstract	Taxonomic studies on some members of angiosperms from Htooma mountain area in Patheingyi Township, Mandalay were conducted. The flowering plants were collected, preserved, identified and classified. All together 12 species belonging to 12 genera of 9 families were included. Among them, <i>Aristolochia tagala</i> Cham., <i>Boscia variabilis</i> (Kurz) Coll. & Hensl <i>Paederia tomentosa</i> Blume, <i>Myriopteron paniculatum</i> Griff, <i>Streptocaulon tomentosum</i> Wight & Arn and <i>Sterculia versicolor</i> Wall. are medicinal plants, <i>Bombax anceps</i> Pierre and <i>Erythrina microcarpa</i> Kurz & Vahl are valuable trees, <i>Blinkworthia lycioides</i> Choisy, <i>Ceropegia lucida</i> Wall. and <i>Kalancho laciniata</i> (L.) Pers. are valuable species for ornamental purposes. <i>Aristolochia tagala</i> Cham. is under the basal angiosperms, and the rest species are under the clade eudicot. The description of the collected species with figures, Scientific names, Myanmar names, and flowering period have been mentioned. An artificial key to the species was also constructed and stated.
Keywords	Angiosperms, Patheingyi Township, Myanmar
Citation	
Issue Date	2015

Taxonomic Study on Some Members of Angiosperms from Htooma Mountain Area, Patheingyi Township, Mandalay

Myat Hnin Wai¹ & Soe Myint Aye²

Abstract

Taxonomic studies on some members of angiosperms from Htooma mountain area in Patheingyi Township, Mandalay were conducted. The flowering plants were collected, preserved, identified and classified. All together 12 species belonging to 12 genera of 9 families were included. Among them, *Aristolochia tagala* Cham., *Boscia variabilis* (Kurz) Coll. & Hensl *Paederia tomentosa* Blume, *Myriopteron paniculatum* Griff, *Streptocaulon tomentosum* Wight & Arn and *Sterculia versicolor* Wall. are medicinal plants, *Bombax anceps* Pierre and *Erythrina microcarpa* Kurz & Vahl are valuable trees, *Blinkworthia lycioides* Choisy, *Ceropegia lucida* Wall. and *Kalancho laciniata* (L.) Pers. are valuable species for ornamental purposes. *Aristolochia tagala* Cham. is under the basal angiosperms, and the rest species are under the clade eudicot. The description of the collected species with figures, Scientific names, Myanmar names, and flowering period have been mentioned. An artificial key to the species was also constructed and stated.

Introduction

The present study deals with the taxonomic study on some members of Angiospermae from Htooma mountain area, Patheingyi Township, Mandalay Region. The area is situated at the point of North Latitude 21° 58' 07" and East Longitude 96° 13' 30". The peak of the Htooma mountain is 440 metre above sea level. It is located approximately 18.53 km far away from the east of Mandalay. The range of mountain runs from north to south and surrounded by other mountains. Htooma mountain lies in a highly deformed zone and composed mainly of metamorphic and sedimentary rocks. The climatic condition of this area is entirely dry with a prolonged dry season.

Many researchers had done on taxonomic research works on angiosperms of various floristic regions of Mandalay in Myanmar. The plants collection and identification from Htooma mountain is still left to be studied. Therefore, the present work focus on this area and the flowering plants (angiospermae) were

¹ M.Res-Student, Department of Botany, University of Mandalay

² Associate Professor, Department of Botany, University of Mandalay

selected and studied. The record on detail morphological characters of floral parts are very useful information for identification of researchers in various fields of study like ecology, pharmacognosy, anatomy, ethnobotany, and industrial plants. There are many interested wild plants of taxonomic information on that area.

The aims and objectives of this research are to collect the some members of angiosperms from Htooma mountain and its vicinity, to understand the morphological characteristics of studied species, to get the valuable taxonomic informations and the inventory of species will be partially accomplished for the compilation of the flora of Mandalay Region.

Materials and Methods

Some members of angiosperms found in Htooma mountain area were collected and studied during the months of September, 2013 to February, 2014. The location map of the study area is shown in figure 1. The specimens were recorded by photographs and labelled the collected numbers. Field notes of the collected specimens were taken and the habitat of precise location. Identification of families, genera, and species were carried out by referring to key and Floristic literature like Heywood (1978 & 2011), Hooker (1885-1887), Backer (1963), Hutchinson (1967) and Dassanayake (1980 to 2001).

Plant collection and the preparation technique of herbarium specimens followed to the methods of Lawrence (1964), Radford (1986) and Simpson (2006). The index for nomenclatural data had been referred to Index Kewensis by which the names and synonyms of plants up to the rank of species being confirmed. All species were systematically arranged according to the classification system of Raveal and Chase (2011). The genera and species were arranged alphabetically under the families. The detail characters of flower structure and its parts were recorded by photographic images on the dissecting microscope. These were stated in figures of photographs.

All the collected species were prepared to herbarium specimens and deposited at the Botany Department of Mandalay University

Results

The angiosperms from Htooma mountain area were collected, identified and studied their taxonomic characteristics. All together 12 species belonging to 9 families were included. The taxonomic characteristics of the species were described systematically.

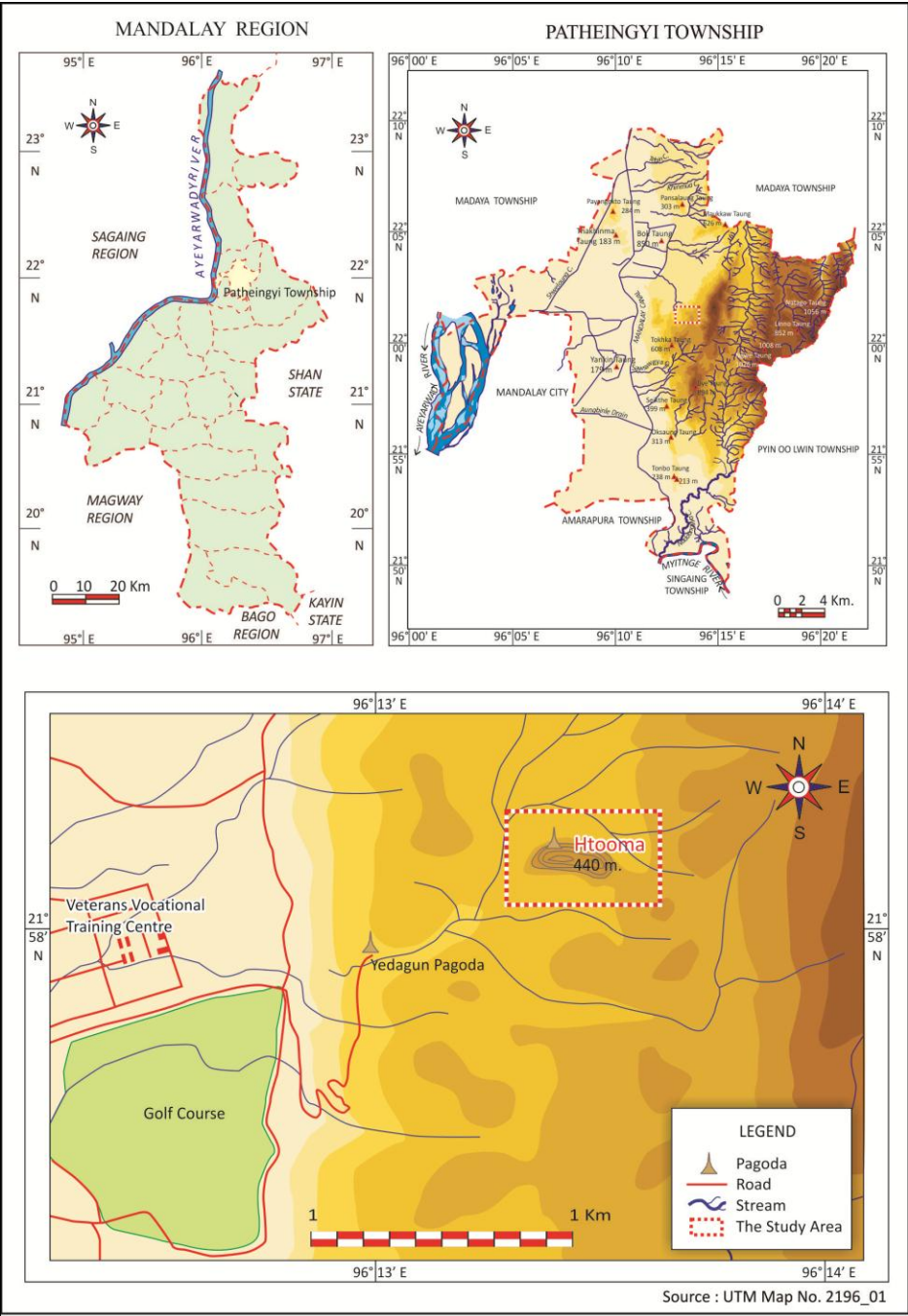


Figure 1. Location Map of the study area

An artificial key to the species studied

1. Plants succulent, xerophytic -----2. *Kalanchoe lanciniata*
1. Plants non-succulent, mesophytic ----- 2.
 2. Leaves compound ----- 3.
 2. Leaves simple ----- 6.
3. Flower zygomorphic -----3. *Erythrina microcarpa*
3. Flower actinomorphic ----- 4.
 4. Stamens free; placentation parietal -----8. *Boscia variabilis*
 4. Stamens united; placentation axile ----- 5.
5. Inflorescences uniflorous cyme; fruits loculicidal capsule ---- 4. *Bombax anceps*
5. Inflorescences panicles; fruits etaerious follicles ----- 5. *Sterculia versicolor*
 6. Leaves opposite----- 7.
 6. Leaves alternate ----- 10.
7. Ovaries inferior ----- 7. *Paederia tomentosa*
7. Ovaries superior ----- 8.
 8. Inflorescence solitary or 5-6-flowered; flower yellowish green with purple spots ----- 8. *Ceropegia lucida*
 8. Inflorescence many-flowered; flower white or dark pink ----- 9.
9. Leaves exstipules; leaf blade obovate, apex acute; fruits wingless -----
----- 10. *Streptocaulon tomentosum*
9. Leaves with pseudo stipules; leaf blade oblong, apex acuminate; fruit with winged like ridges ----- 9. *Myriopterion paniculatum*
 10. Stamens 12; carpels 6 ----- 1. *Aristolochia tagala*
 10. Stamens 5; carpels 2 or 3 ----- 11.
11. Fruit baccate; stem silk-hairy ----- - 11. *Blinkworthia lycioides*
11. Fruit capsular; stem pillose or glabrous ----- 12. *Ipomoea hedericifolia*

1. *Aristolochia tagala* Cham. in L., 7: 207. 1832. (Figure 2.A &B)

Aristolochia roxburghina Klotzsh in Monatsb. Borl. Akad. 596. 1859.

Family : **Aristolochiaceae Juss.**

Myanmar name : Eik thara muli

Flowering period : September to December

Perennial, twining herbs; Leaves simple, alternate, exstipulate; leaf blade ovate-lanceolate. Inflorescences axillary corymb, 3- to many-flowered. Flowers zygomorphic, bisexual, epigynous, greenish to reddish-brown. Perianth with globose base; tube cylindric; mouth oblique, funnel-shaped. Stamens 12; filaments sessile; anthers adnate to the stylar column. Carpels 6, united; ovary inferior, hexalocular, one- to many-ovulate, axile placentation; style columnar,

short; stigma 6-lobed. Fruits septicidal capsule, 6-valved, many-seeded. Seeds deltoid, endospermic.

Specimens examined: At the foot of the Htooma mountain; 9 October 2013; Myat Hnin Wai, collection no.13.

2. *Kalanchoe laciniata* (L.) Pers., Syn. Pl. 446.1805. (Figure 2 C&D)

Cytoledon laciniata L., Sp. Pl. 430. 1753.

Family : **Crassulaceae J.St.-Hil.**

Myanmar name : Mi malaung pan

Flowering period : November to March

Annual, erect herbs. Leaves simple, opposite and decussate; leaf blade obovate, very deeply divided, succulent. Inflorescences terminal panicate corymb, many-flowered. Flowers actinomorphic, bisexual, hypogynous, bright-yellow. Sepals 4, free, ovate. Corolla 5-lobed, ovate; lobes bright yellow. Stamens 8 in two series, free. Carpels 4, united at the base, ellipsoid; ovary superior, tetralocular, many-ovulate, green, axile placentation. Fruits follicles, ellipsoid-linear, many-seeded. Seeds minute.

Specimens examined: At the middle near the cave of Htooma mountain; 28 November 2013; Myat Hnin Wai, Collection no.21.

3. *Erythrina microcarpa* Kurz & Vahl, 1: 627.1835. (Figure 2 E&F)

Family : **Fabaceae Lindl.**

Myanmar name : Kathit lay

Flowering period : December to April

Perennial, tall unarmed trees. Leaves pinnately trifoliolate-compound, alternate; stipules caduceous; terminal leaflets largest, ovate, the lateral ones triangular. Inflorescences terminal or axillary simple racemes, many-flowered; Flowers zygomorphic, bisexual, hypogynous, red. Calyx 5-lobed, shortly bilabiate, reddish green. Standard ovate-lanceolate; wings orbicular; keel rhomboid. Stamens 1 + (9), diadelphous. Carpel 1, linear; ovary superior, unilocular, 1- to many-ovulate, densely pubescent, marginal placentation. Fruits capsular, young pods linear, densely pubescent, 6 - to 7-seeded. Seeds non-endospermic.

Specimens examined: From the foot to the top of the Htooma mountain; 12 December 2013; Myat Hnin wai, Collection no.23.

4. *Bombax anceps* Pierre, Fl. For. Cochinch. t. 175. 1753. (Figure 3 A&B)

Salmalia anceps (Pierre) Stearn in Blatter & Millard, Some Beautiful

Indian Trees, ed. 2, 129. 1955.

Family : **Malvaceae Juss.**

Myanmar name : Kokae letpan

Flowering period : December to January.

Perennial deciduous large trees. Leaves palmately- compound, alternate; stipules imbricating the terminal bud, caducous; leaflets 7 to 9, elliptic or elliptic-lanceolate. Inflorescences uniflorous, large and showy, appearing before the leaves. Flowers actinomorphic, bisexual, hypogynous, pale reddish, aromatic; young floral bud ellipsoid, green. Calyx 5-lobed, cup-shaped. Petals 5, connate at the base, twisted in bud, oblong-lanceolate. Stamens numerous, polyadelphous ; bundels 5, opposite the petals, connate above the base to form a common tube; anthers monothecous, dorsifixed, pinkish yellow. Carpels 5, united; ovary superior, pentalocular, numerous-ovulate, axile placentation. Fruits loculicidal capsule, many-seeded, brown, with 5 ribs, woolly inside, slightly pubescent without; valves woody, silky tomentose within. Seeds sub-globoid, black.

Specimen examined: From the foot at the top of the Htooma mountain; 5 January 2014; Myat Hnin Wai, Collection no.25.

5. *Sterculia versicolor* Wall., Pl. As Rar.1: 48, t. 59. 1829. (Figure 3 C&D)

Family : **Malvaceae Juss.**

Myanmar name : Shaw phyu

Flowering period : September to November

Perennial trees with grey bark, gummiferous. Leaves palmately-compound, alternate; stipules subulate; leaflets 5 - 7, broadly elliptic, stellate-hairy beneath. Inflorescences axillary panicles, many- flowered. Flowers actinomorphic, bisexual, hypogynous, orange-yellow, polygamous, fragrant. Perianth campanulate, 5-lobed, densely stellate-hairy without. Stamens numerous, monadelphous; staminal column curved, terminated by a head of 5 to 10 sessile anthers; anthers parallel; staminodes absent in pistillate flowers. Androgynophore present; ovary superior, pentalocular, 5-lobed, axile placentation; pistillode often present in staminate flowers. Fruits etaerio of follicles, many-seeded, oval-oblongoid, red, stellate-hairy. Seeds black, endospermic.

Specimens examined: Along the slope of the Htooma mountain Htooma mountain; 9 October 2013; Myat Hnin Wai, collection no.15.

6. *Boscia variabilis* (Kurz) Coll. & Hensl., Journ. L. Soc. 18. t. 1. 1890. (Figure 3 E&F)

Niebuhreria variabilis Kurz, Journ As. Soc. Beng. 43. 11: 68. 1874.

Family : **Capparaceae Juss.**

Myanmar name : Thamone

Flowering period : February to June

Perennial, small tree; stems and branches terete, erect, glabrous. Leaves 2- to 3- foliolate compound; stipules minute, caducous; leaflets oblong. Inflorescences axillary lax raceme, many-flowered. Flowers actinomorphic, bisexual, hypogynous, greenish yellow. Perianth 4, lanceolate, yellowish green. Stamens numerous, free, inserted at the middle of gynophores. Carpels 2, united; ovary superior, unilocular, many- ovulate, parietal placentation; gynophores 2.5cm long. Fruits baccate, oblongoid, many-seeded. Seeds minute, non-endospermic.

Specimens examined: Htooma mountain area; 2 February 2014; Myat Hnin Wai, collection no.27.

7. *Paederia tomentosa* Blume, Bijdr. 968.1826. (Figure 4 A&B)

P. barbulata Miq., Ann. Mus. Lugd. Bot.44. 255. 1869.

Family : **Rubiaceae Juss.**

Myanmar name : Pe bok nwe, Khwae ei bok

Flowering period : September to November

Perennial twining shrubs. Leaves simple, opposite and decussate; stipules triangular; leaf blade lanceolate-acuminate. Inflorescences axillary and terminal paniculate clustered cyme, many- flowered. Flowers epigynous, dull purple. Calyx small. Corolla 5-lobed, tubular, dull purple; lobes ovate. Stamens 5, inserted, epipetalous;; anthers linear oblong, white. Carpels 2, united, ellipsoid; ovary inferior, bilocular, one-ovulate, axile placentation. Fruits drupaceous, with 2 orbicular much compressed wingless pyrenes. Seeds 2, concave or convex, black.

Specimen examined: At the top of the Htooma mountain; 9 October 2013; Myat Hnin Wai, Collection no.17.

8. *Ceropegia lucida* Wall., Pl. As. Rar. 2. 33. t. 139. 1831. (Figure 4.C&D)

Family : **Apocynaceae Juss.**

Myanmar name : Unknown

Flowering period : July to September

Annual twining vines. Leaves simple, opposite and decussate; Leaf blade lanceolate. Inflorescences pendulous umbel, mostly solitary or 5- to 6-flowered. Flowers hypogynous, yellowish green with purple spots. Sepals 5, narrow linear, purplish green,. Corolla 5-lobed; pale green, inflexed from above the base; tubes funnel-shaped, dilated at the base below the middle; the dilated parts coronal

lobes 10, short, triangular, ciliate. Stamens 5; anthers yellow. Carpels 2, united; ovary superior, bilocular, many-ovule, axile placentation. Fruits follicular, many-seeded, brown, glabrous. Seeds non-endospermic.

Specimens examined: At the top of the Htooma mountain; 29 September 2013; Myat Hnin Wai, Collection on. 8.

9. *Myriopteron paniculatum* Griff., Calc. J. Nat. Hist. 4. 385. 1844.

(Figure 4.E&F)

Vicarya cristata Wall. ex. Voigt, Hort. Suburb. Calc 544. 1845.

Family : Apocynaceae Juss.

Myanmar name : Taw nwe cho

Flowering period : August to September

Annual twining shrubs; milky latex present. Leaves simple, opposite and decussate, leaf blade oblong. Inflorescences axillary paniculate cymes, many-flowered. Flowers actinomorphic, bisexual, hypogynous, white, twisted to the right, glabrous. Coronal scales 5, long filiform with broad base; stamens 5; filaments connate near the base. Carpels 2, united; ovary superior, bilocular, one-to many-ovulate, axile placentation. Fruits follicles, many-seeded, ovoid, straight with many longitudinally membranous wing-like regides. Seeds cosmoise, non-endospermic.

Specimens examined: At the foot of the Htoama mountain; 29 September 2013; Myat Hnin Wai, Collection no.10.

10. *Streptocaulon tomentosum* Wight & Arn., Conturib. 64.1834.

(Figure 5.A&B)

Family : Apocynaceae Juss.

Myanmar name : Myin sa gon ni

Flowering period : July to October

Perennial, twining shrubs; milky latex present, densely tomentose. Leaves simple, opposite and decussate; leaf blade usually obovate. Inflorescences axillary paniculate cymes, many-flowered. Flowers actinomorphic, dark pink. Calyx 5-lobed; lobes ovate, glandular within. Corolla 5-lobed; lobes ovate, dark purple. Coronal scales 5; anthers ditheous, basifixed, adhering to the stigma. Carpels 2, united; ovary superior, bilocular, many-ovuled, axile placentation; style 2, tapering to the apex with a common single convex and 2-lobed stigma. Fruits follicular, many-seeded, brown. Seeds non-endospermic.

Specimens examined: Along the slope of the Htooma mountain; 2 October 2013; Myat Hnin Wai, Collection no. 12.

11. *Blinkworthia lycioides* Choisy. in Men., Soc. Phys. Gener 6.430. 1833.

(Figure 5 C&D)

Family : Convolvulaceae Juss.

Myanmar name : Paung khaung long

Flowering period : September to December

Perennial, ascending shrubs or twiners; latex persent; Leaves simple, alternate, appressed silky hariy; leaf blade oblong-lanceolate. Inflorescences are axillary solitary cyme. Flowers greenish-white to white. Sepals 5, free, the outer two silky strigose without, succulent. Corolla tubular-campanulate; lobes limbs subacute. Stamens 5, inserted. Carples 2, united, globoid; ovary superior, bilocular, 2-ovulate, glabrous, axile placentation. Fruits baccate, globoid, pericarp leathery, greenish-white, brown when ripe, 1- to 4-seeded. Seeds flattened, black, glabrous.

Specimens examined: At the top of the Htooma mountain; 29 September 2013; Myat Hnin Wai, Collection no.6.

12. *Ipomoea hedericifolia* L., Syst. Nat.ed. 10.925.1759. (Figure 5 E&F)

I. angulata Lam., Tabl. Encycl. Meth. Bot.1: 464.1791.

I. coccinea Clarke in Hook., Fl. Brit. Ind. 4: 194.1883.

Family : Convolvulaceae Juss.

Myanmar name : Myat lay ni

Flowering period : October to February

Annual, twining herbs; milky latex present. Leaves simple, alternate; leaf blade ovate in outline, coarsely dentate to 3-lobed. Inflorescences axillary dichasial cymes, few-flowered. Flowers actinomorphic, bisexual, hypogynous, red. Sepals 5, unequal, oblong-rectangular. Corolla 5-lobed, salverform. Stamens 5, epipetalous, exserted. Carpels 4, united; ovary superior, tetralocular, 4-ovulate, axile placentation. Fruits capsular, globoid, brown, glabrous 3- to 4-seeded. Seeds pyriform, endospermic, densely appressed-hairy.

Specimens examined: At the foot of the Htooma mountain; 22 October 2013; Myat Hnin Wai, Collection no.16.

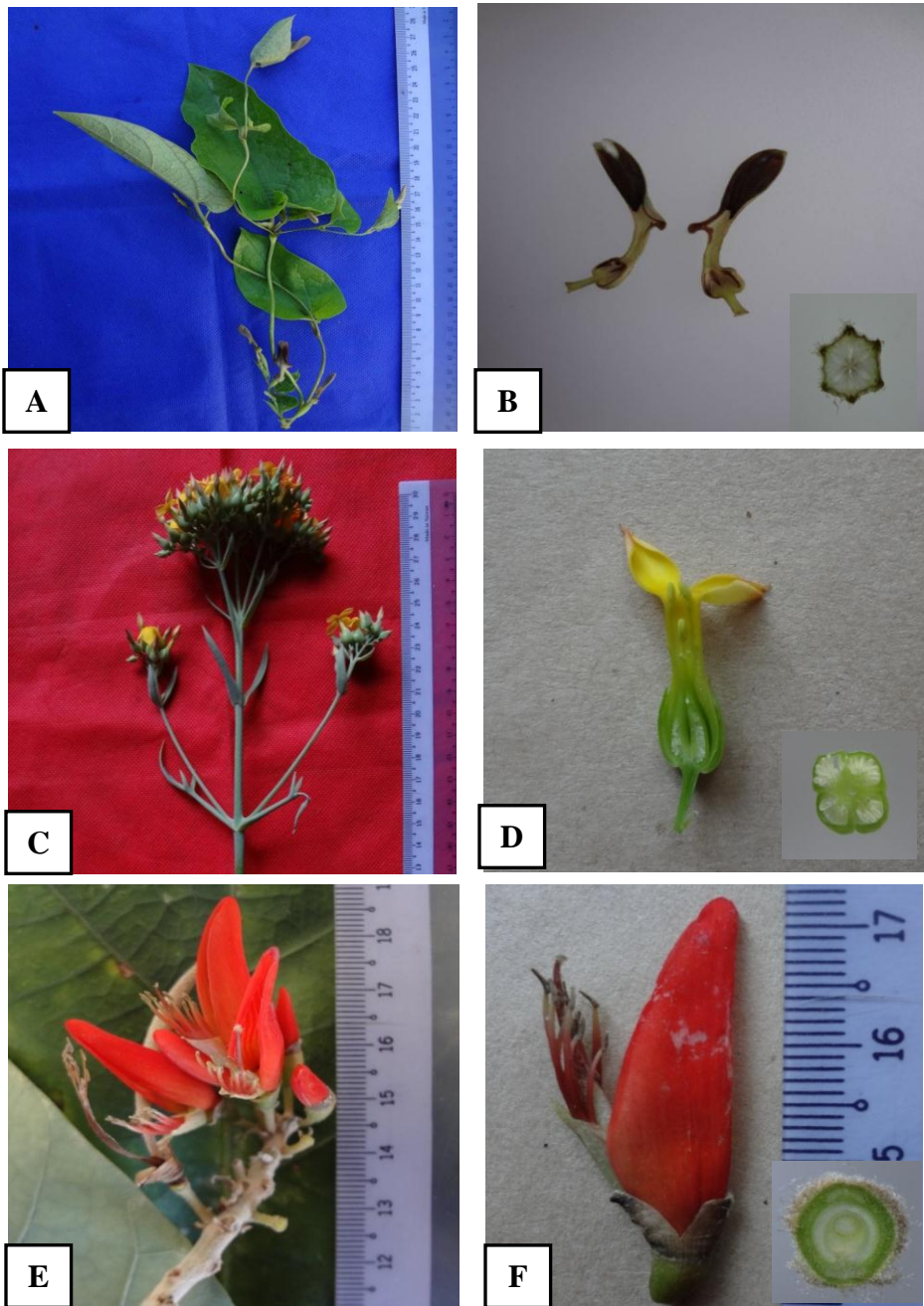


Figure 2. Habit, L.S. of Flower and T.S. of ovary of
A&B. *Aristolochia tagala* Cham; C&D. *Kalanchoe laciniata*
(L.) Pers; E&F. *Erythrina microcarpa* Kurz & Vahl

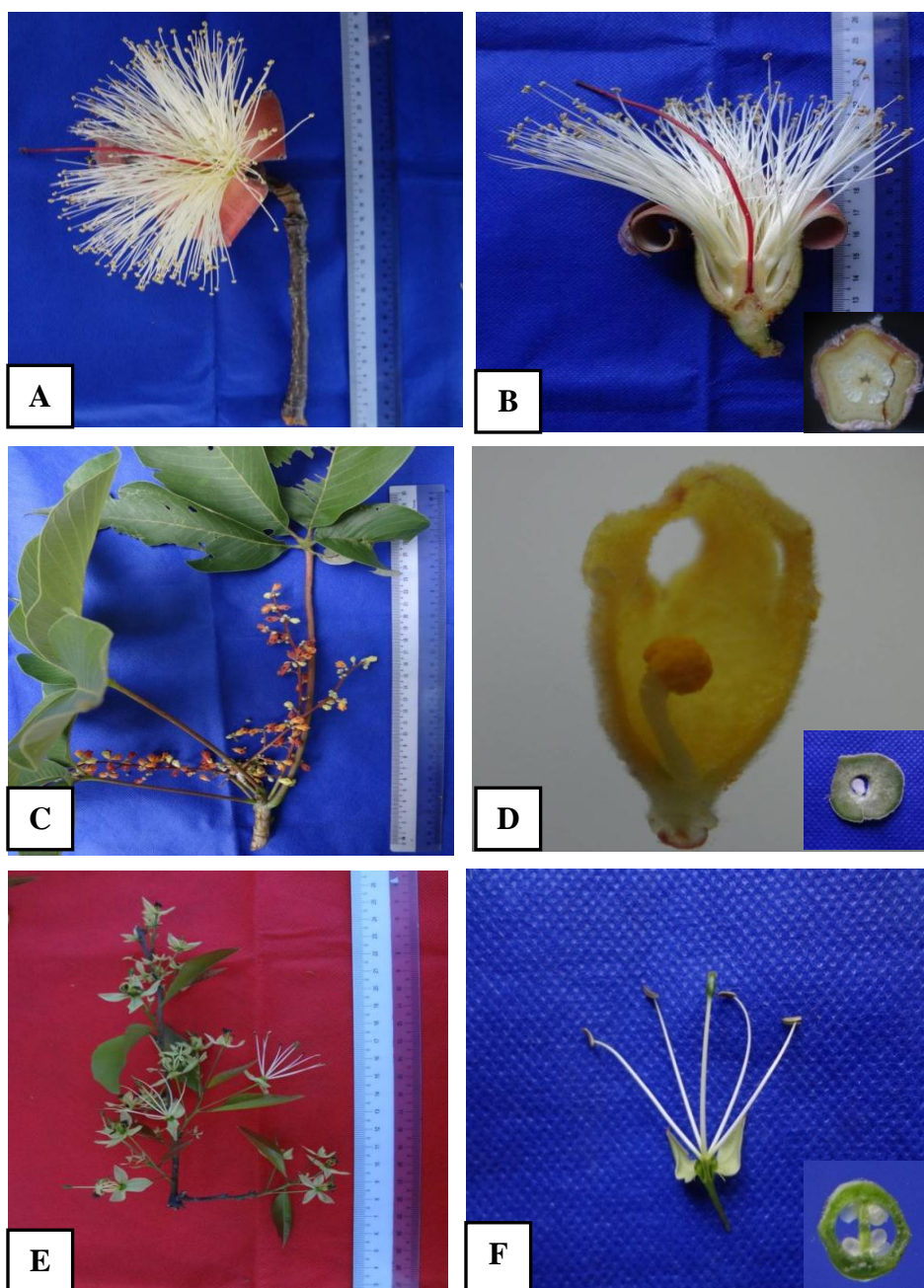


Figure 3. Habit, L.S. of Flower and T.S. of ovary of
A&B. *Bombax anceps* Pierre; C&D. *Sterculia versicolor* Wall;
E&F. *Boscia variabilis* (Kurz) Coll. & Hensl

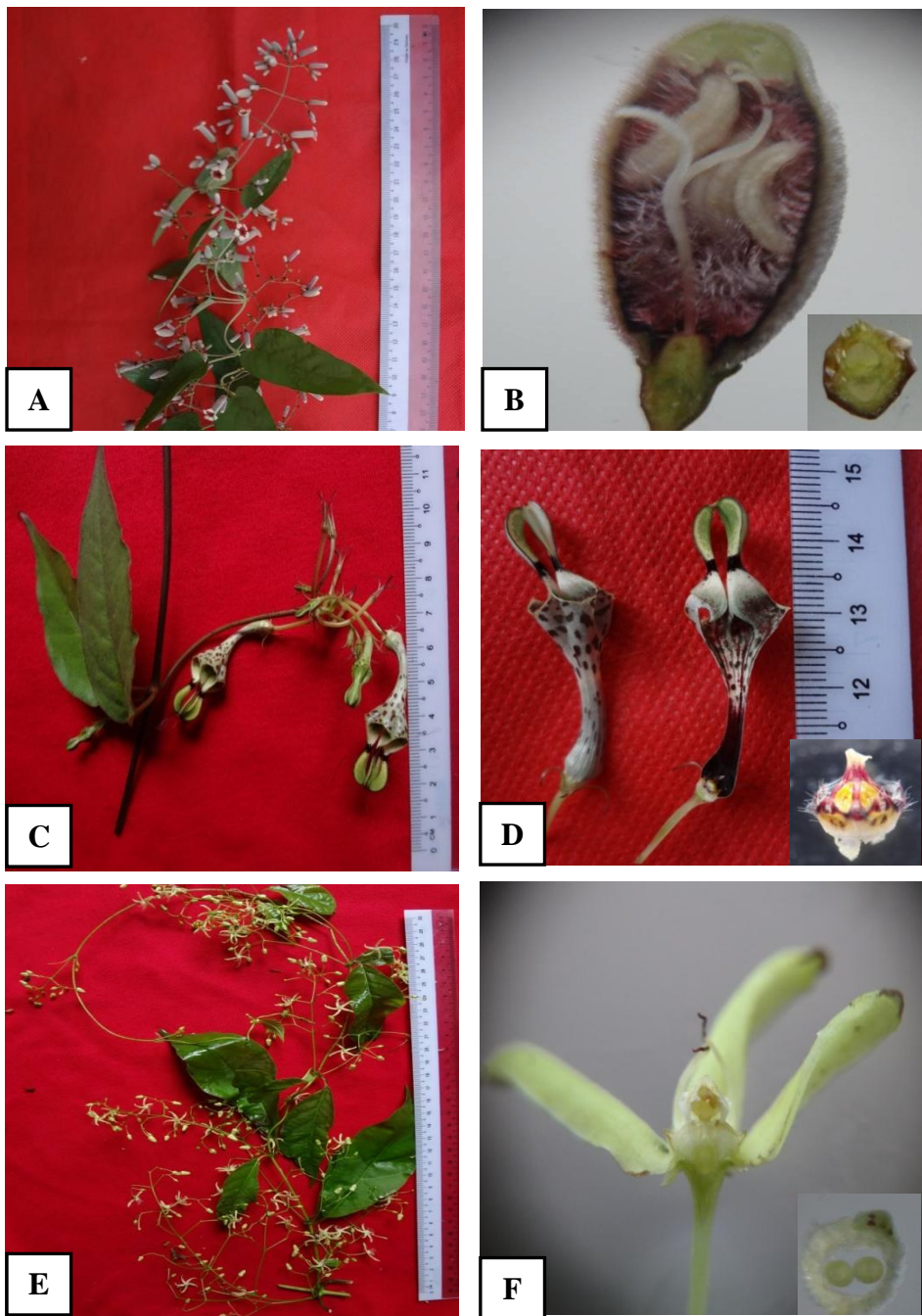


Figure 4. Habit, L.S. of Flower and T.S. of ovary of
A&B. *Paederia tomentosa* Blume; C&D. *Ceropegia lucida* Wall.;
E&F. *Myriopterum paniculatum* Griff

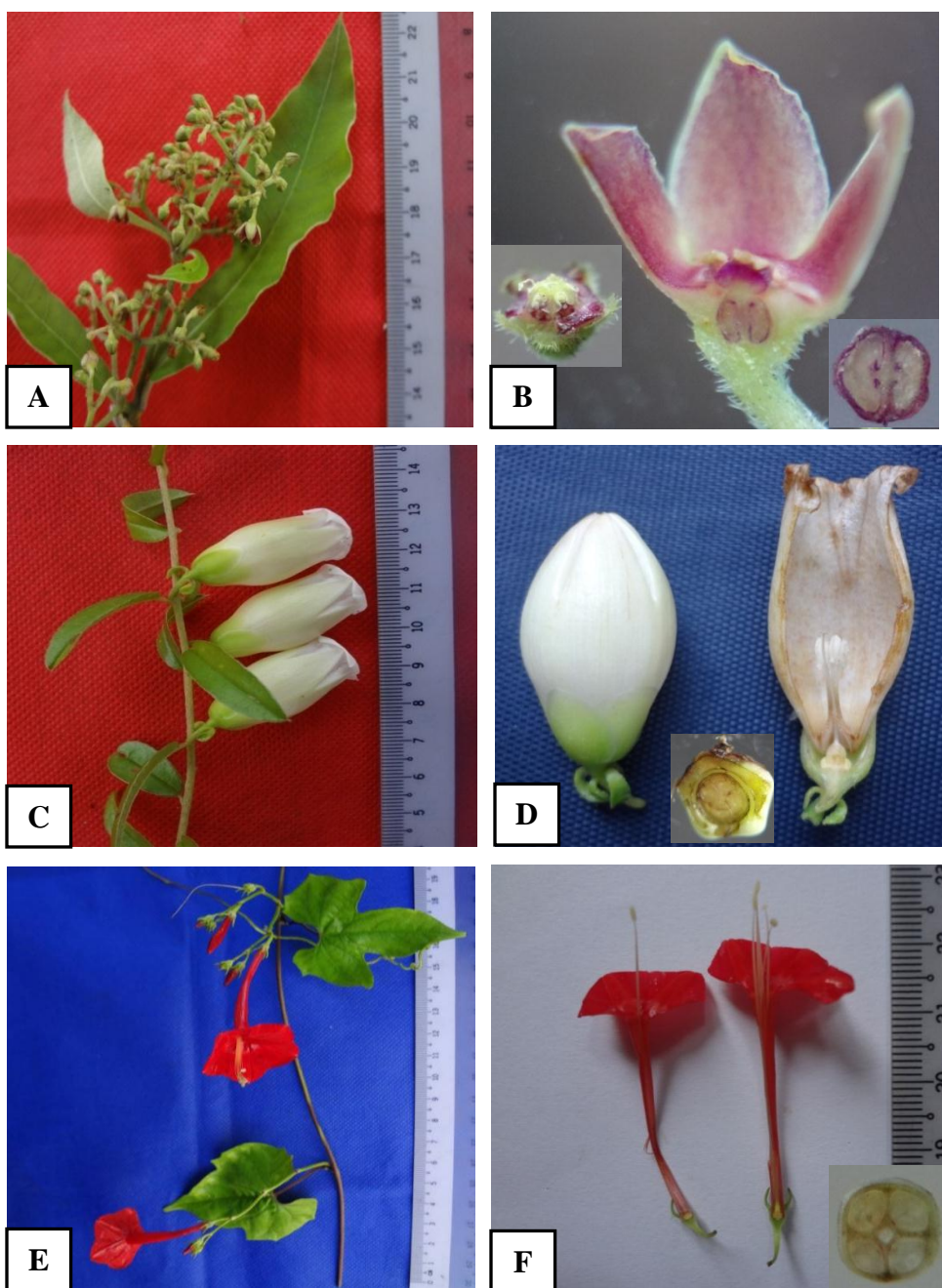


Figure 5. Habit, L.S. of Flower and T.S. of ovary of
A&B. *Streptocaulon tomentosum* Wight & Arn; **C&D.** *Blinkworthia*
lycioides Choisy; **E&F.** *Ipomoea hedericifolia* L

The angiosperms from Htooma mountain area were collected, identified and studied the morphological characteristics for taxonomic purpose. Twenty-nine species belonging to 26 genera of 15 families were resulted.

Erythrina microcarpa Kurz & Vahl is a large erect tree and distributed throughout the Htooma mountain. The plants are without prickles and red flowers on the simple raceme are distinct characters.

Bombax anceps Pierre. is naturally distributed wild species and mostly found on the slopes of the mountains. Because of the flowering period of *Bombax anceps* Pierre. is in January, flowering period is earlier than the other *Bombax* species. The filaments are filiform and white in red flowers. *Sterculia versicolor* Wall. (Shaw phyu) is a tree and growing mostly on the mountains. The white gums can be produced from the stem and local peoples cut the stem and extracted illegally. The fruits are etaerios of follicles and densely stiff stellate hairy. Formally *Bombax* was under Bombaceae and *Sterculia* was treated under Sterculiaceae. According to the recent APG III system of classification they are treated as the member of Malvaceae.

Apocynaceae is one of the naturally distributed families in Upper Myanmar. Previously Apocynaceae and Asclepiadaceae were treated as the separate families. Recently Asclepiadaceae is stated as the subfamily of Apocynaceae as Asclepionoideae. Therefore it is also the member of the Apocynaceae. *Ceropegia lucida* Wall. is very interesting species for its beautiful flowers and that species have not been found in everywhere in Myanmar. *Myriopteron paniculatum* Griff.(Taw nwe cho) is also peculiar species for its pseudo-stipulate leaves in that family. The panicles of pale yellow flowers are interested characters. *Streptocaulon tomentosum* Wight & Arn. (Myin sa gon ni) is a famous medicinal plant in traditional medicine. The twining stem with milky latex, villous leaves, reddish small flowers, and pair-wise follicles are distinct characters. This species is commonly found in food of the mountains.

In the present study *Blinkworthia lycioides* Choisy is an erect shrubs and the rest species are twiners. *Ipomoea hedericifolia* L. is easily recognizable by its beautiful red flowers and largely covering the trees and bushes at the beginning of winter season.

Htooma mountain is not so far from the Mandalay and most of the flat habitats were invaded of local peoples, farms, orchards, and new building of the monasteries. The slopes of the mountain is still covering by trees of peculiar natural species like *Erythrina microcarpa* Kurz & Vahl, *Boscia variabilis* (Kurz) Coll. & Hensl., and *Bombax anceps* Pierre. The twining and climbing species are also valuable for its usefulness in medicine like *Myriopteron paniculatum* Griff.

and *Streptocaulon tomentosum* Wight & Arn. *Kalancho laciniata* (L.) Pers., *Ceropegia lucida* Wall., *Blinkworthia lycioides* Choisy and *Ipomoea hedericifolia* L., possess the beautiful flowers and these wild flowering plants can be used in ornamental purpose.

Therefore the present research provides valuable information of taxonomic information for identification of naturally distributed wild species, helps to understand the distribution of peculiar trees, and contributes the characteristics of the medicinally and ornamentally important wild plants of the Htooma mountain area.

Acknowledgements

We would like to express my deep gratitude to Dr Nu Nu Yee, Professor and Head, Department of Botany, University of Mandalay, for her permission to carry out this research work.

We wish to thank Dr Yi Shan, Professor, Department of Botany, University of Mandalay for her valuable advice.

References

- Backer C.A & R.C Bakhuizen Van Den Brink, 1963. *Flora of Java*, Vol 1 to 3. Rijksherbarium, Lelyden, N.V.P. Noordhoff.
- Dassanayake, M.D., 1980-2001. *Arevised handbook of the flora of Ceylon*, Vol. 1-14, University of Peradeniya.
- Heywood, V.H. 1978. *Flowering plants of the world*. Oxford University Press, London.
- Heywood, V.H. 2011. *Flowering plants; A pictorial guide to the world flora*. General Editor: Leon Gray.
- Hooker J.D., 1885-1887. *The flora of British India*, Vol. 1-7, L. Reeve & Co.5 Henrietta Street, Covent Garden London.
- Hutchinson, J. 1967. *Key to the families of flowering plants of the world*. Claredon Press Oxford.
- Kress, J., Defilipps. Robert A, Farr E & Yin Yin Kyi. 2003. *A checklist of the trees, shrubs, herbs and climbers of Myanmar*. Department of Systematic Biology- Botany. National Museum of Natural History, Washington DC. USA.
- Lawrence, George H.M. 1964. *Taxonomy of vascular plants*. The Macmillan Company. New York.
- Radford, E. E. 1986. *Fundamental of plant systematics*. Haper & Sons Company New York.
- Raveal, J.L. & M.W. Chase. 2011. *APG III: Bibliographical information and synonymy of magnoliidae*. Phytotaxa 19: 71-134. ISSN 1179-3163 (Online edition). Magnolia Press.
- Simpson, M.G. 2006. *Plant systematic*, Elsevier Academic Press, Printed in Canada.