

Taxonomic Study on Some Species of Euphorbiaceae from Banmaw Area, Banmaw Township

Seng Nan*

Abstract

This research paper describes a study of some Euphorbiaceae family grown in Banmaw area. The specimens were collected during the flowering and fruiting periods. As the result of collection made throughout the area, 12 species belonging to 9 genera from Euphorbiaceae family have been identified and recorded. The studied species are useful for timber and fuel such as *Antidesma diandrum* Roth., *Bridelia moonii* Thw., *Bridelia retusa* (L.) Spreng., food such as *Antidesma diandrum* Roth., medicine such as *Acalypha hispida* Burm.f., *Euphorbia heterophylla* L., *Euphorbia hirta* L., *Jatropha podagrica* Hook., *Ricinus communis* L. and *Sauropus assimilis* Thw. and ornament such as *Acalypha hispida* Burm.f., *Euphorbia heterophylla* L., *Euphorbia pulcherrima* Willd.. The scientific names, Myanmar names, English names, flowering period, morphological characters, and presented with coloured photographs.

Key words: Taxonomic character, inflorescences, unisexual

Introduction

The family Euphorbiaceae consists of about 300 genera and 7500 species, of cosmopolitan distribution, but best developed in tropical and subtropical regions. By far the largest genus is *Euphorbia*, with about 1500 species, found in all parts of the world. Some other large genera are *Croton* (700), *Phyllanthus* (400), *Acalypha* (400), *Macaranga* (250), *Antidesma* (150), *Drypetes* (150), *Tragia* (150), *Jatropha* (150), and *Manihot* (150) (Cronquist 1981).

The Euphorbiaceae is a large family of flowering plants, including some 300 genera and over 5000 species of dicotyledonous herbs, shrubs and trees. Some of the genera are very large, such as *Phyllanthus*, *Euphorbia*, *Croton*, and *Acalypha* (Heywood 1978).

This family is also known as spurge family. The family is taxonomically characterised by the presence of watery juice, latex or milky sap, the unisexual flowers, the superior ovary, and trilocular with axile placentation, the collateral and pendulous ovules. The highly specialized inflorescence of *Euphorbia* is called a cyathium. This is usually a small cup-shaped structure consisting of a turbinate involucre which bears a number of glands of varying shape around its rim. Within the involucre are numerous male flowers, each of very simple structure, surrounding a single central female flower (Heywood 1978).

According to Valkenburg and Bunyapraphatsara (2002), *Acalypha* is widespread throughout the tropics, and comprises about 430 species, *Phyllanthus* has a pantropical distribution and comprises over 700 species. *Euphorbia* comprises over 2000 species and occurs worldwide, most species are found in tropical, subtropical and warm temperate regions.

* Assistant Lecturer, Department of Botany, Banmaw University

The family contains many species of both economic and decorative importance species. Castor oil is obtained from the oily endospermic seeds of *Ricinus communis*. In Myanmar, Biodiesel is produced from seeds of *Jatropha curcas* and it is popular nowadays. It is also used as a powerful purgative. The latex of many *Euphorbia* species is used medicinally as a purgative. It has antidiarrhoeal and antibacterial properties, and is used to treat boils, warts, wounds and other skin disorders. The leaves of several *Euphorbia* species are used to treat asthma. *Phyllanthus* has diuretic and purgative properties and is used in the treatment of chest complaints, conjunctivitis, cough, diabetes, diarrhoea, oedema, fevers and smallpox. The leaves of *Acalypha indica* are used in decoction or powdered for their laxative properties and are applied to sores and ulcers. *Euphorbia pulcherrima*, *Jatropha podagrica*, are grown as garden ornamentals all over the world.

These all information and knowledge push to study the taxonomy of family Euphorbiaceae. The present study deals with 12 species belonging to 9 genera of family Euphorbiaceae. This research works are going to be carried out to identify, describe and record the taxonomic characters of some members of family Euphorbiaceae.

Materials and methods

The member of species were collected and studied from Banmaw Area. All of the collected specimens were recorded by colored photographs while flowering time. Precise locations of the plant collection were made by using the Global Positioning System (GPS) Map Navigator and the habit nature of specimens including flowers and its colour were recorded in field note.

Taxonomic identification of the specimens were carried out by referring to available literature such as Hooker (1875-1897), Backer & Brick (1963-1968), Dassanayake (1980-2001), and Qi-ming & De-lin (2007-2009). All the studied species were described with taxonomic descriptions and were also constructed their artificial key. The comparable characters of the studied species were also tabulated and described in Appendices.

All of nomenclatural studies were finalized by referring to the web site of International Plant Names Index (IPNI) and online Botanical Database of Tropical Plants (TROPICOS). Myanmar names and their distribution of the studied species were furnished from the Checklist of Hundley & Chit Ko Ko (1987) and Kress *et al.* (2003).

The studied species were systematically arranged into families according to the classification system of AGP IV (2016). The arrangement of genera and species under the families were placed alphabetically. The collection of Specimen were air dried and pressed. The dried Specimen was mounted on the herbarium sheets with the labels of field data. They were kept in the Herbarium of Botany Department, Banmaw University for references and other fields of studies.

Results

In the present research, 12 species belong to 9 genera from family Euphorbiaceae.

Superorder	Order	Family	No.	Scientific-name
		Euphorbiaceae	1.	<i>Acalypha hispida</i> Burm.f.
			2.	<i>Antidesma diandrum</i> Roth
			3.	<i>Balispermun montanum</i> (Willd.) Muell.
			4.	<i>Bridelia moonii</i> Thw.
			5.	<i>Bridelia retusa</i> (L.) Spreng.
			6.	<i>Euphorbia heterophylla</i> L.
			7.	<i>Euphorbia hirta</i> L.
			8.	<i>Euphorbia pulcherrima</i> Willd.
			9.	<i>Glochidion stellatum</i> (Retz.) Bedd.
			10.	<i>Jatropha podagrica</i> Hook.
			11.	<i>Ricinus communis</i> L.
			12.	<i>Sauropus assimilis</i> Thw.

Family : Euphorbiaceae (Juss 1789)

Tree, shrubs, herbs climbers or succulents, with hairs ranging from simple to dendritic and T-shaped to stellate and lepidote. Clear or milky latex is present in many taxa. It can be variously colored but is usually white or red; the white milky latex of subfamily Euphorbioideae is usually toxic. The leaves are simple or palmately compound, entire to toothed or deeply lobed. Stipules are generally, but not always, present and can be minute and caducous to large and foliaceous. Leafless succulent species are often spiny superficially resembling cacti. Inflorescences are diverse. The tribe Euphorbieae is characterized by highly specialized pseudanthial inflorescences (cyathia), consisting of bracts subtending 4-5 staminate inflorescences and a terminal pistillate flower. The flowers are unisexual. Sepals, petals, disks, staminodes and pistillodes may be absent or present. The stamens range from 1-1000 and free or variously fused. The ovary is superior, of (1-)2-5(-20) fused carpels, forming as many locules, each with a single apical axile, ovule. The fruit is characteristically an explosive shizocarp, with typical dehiscence and persistent columella. In many taxa, the fruit is indehiscent.

Acalypha hispida Burm.f., Fl. Ind. 303. t. 61.1768. (Figure 1. A)

Myanmar name	: Kyaung - hmi - pan
English names	: Chenille plant, Red hot cattail
Flowering period	: Almost throughout the year

Morphological characters - Perennial, dioecious, shrubs; stems and branches cylindrical, glabrous and young shoots with upcurved hairs. Leaves simple, alternate, stipulate, petiolate; stipules lanceolate, pubescent, caducous; petioles slender, upcurved-hairy; blades broadly ovate, truncate at the base, serrate along the margin, narrowly acuminate at the apex, pubescent on both surfaces while young. Inflorescences axillary, catkin, with very dense pistillate flowers only, male flowers not seen; peduncles, much longer than the leaves, with upcurved-hairy. Flowers deep-red, unisexual, actinomorphic, 5-merous, hypogynous, apetalous, bracteate, sessile, ebracteolate; bracts lanceolate, pubescent, persistent. Calyx shallowly cupular, deeply 3- to 4- partite, minute; lobes ovate, concave, ciliate along the margin, pubescent without, glabrous within. Ovary subgloboid, tricarpeal, fused, trilobular, with one ovule in each locule on the axile placenta, densely translucent strigose; styles 3, connate, filiform, fimbriate, red; stigma 3, divided into filiform segments. Fruits and seeds not available.

Antidesma diandrum Roth, Trimen. Handb. Fl. Ceylon 4: 44.1898. **(Figure 1. B)**

Myanmar name : Kinbalin
 English name : Unknown
 Flowering period : July to September

Morphological characters - Perennial, dioecious, deciduous shrubs; stems much branched, terete, brownish finely pubescent. Leaves simple, alternate, stipulate, petiolate; stipules linear; blades ovate-lanceolate, 5-11 by 1.0-2.5 cm, obtuse at the base, entire along the margin, acute at the apex, lower surfaces covered with reddish-brown tomentose on the nerves, upper surfaces glabrous. Inflorescences terminal and axillary spike. Flowers light yellow, unisexual, actinomorphic, 4-merous, hypogynous, apetalous, ebracteate, sessile, ebracteolate. Sepals free, shortly 4-lobed. Stamens 2, free, exerted; anthers dithecal, basifixed, longitudinally dehiscent; disk cushion-like, glabrous. Ovary ellipsoid, superior, monocarpellary, unilocular with 2-ovules in the locule on the pendulous placenta; style very short; stigma bifid. Fruits drupe.

Balispermun montanum (Willd.) Muell., Arg. in DC. Prosr.15 (2): 1125. 1866. **(Figure 1. C)**

Jatropha montana Willd., Sp. Pl. 4: 563. 1805.

Myanmar name : Hnat cho
 English name : Unknown
 Flowering period : October to December

Morphological characters - Perennial, monoecious shrubs; stems and branches terete or subangular, strigose. Leaves simple, alternate, stipulate, petiolate; stipules glandular; blades ovate-oblong or lanceolate, obtuse and biglandular at the base, serrate or sinuate-toothed along the margin, acute at the apex, glabrescent. Inflorescences axillary paniculate raceme with numerous staminate flowers above and solitary pistillate flowers at the base; peduncles 2.5-9.5 cm long, strigose. Flowers yellowish in male flowers and pinkish red in female, unisexual, actinomorphic, pentamerous, hypogynous, apetalous, bracteate, sessile, ebracteolate; bracts ovate, caducous. Sepals orbicular, concave, greenish yellow, puberulous, with disk glands 5 in male flower; sepals 5, ovate, greenish yellow, toothed along the margin, pubescent, with disk

glands 5 in female. Stamens 15- to 20, in 2 series, free, on a small receptacle, slightly exerted; anthers subreniform, ditheous, basifixed, longitudinally dehiscent. Ovary globoid, densely strigose, tricarpellary, fused, trilocular, with one ovule in each locule on the axile placentae, with annular disk; styles 3, about 1 mm long, connate at the base; stigmas 3, deeply bifid, recurved, red. Fruits septicidal capsule.

***Bridelia moonii* Thw., Enum. Pl. Zeyl. 279. 1861. (Figure 1. D)**

Myanmar name : Unknown
 English name : Unknown
 Flowering period : August to September

Morphological characters - Perennial, monoecious, trees; stems and branches terete, fulvous-tomentose, later glabrescent. Leaves simple, alternate, stipulate, petiolate; stipules early deciduous; blades elliptic-oblong, cuneate at the base, entire and undulate along the margin, acute at the apex, pubescent beneath, glabrescent. Inflorescences axillary, glomerules on normal leafy branches. Flowers yellowish, unisexual, actinomorphic, pentamerous, hypogynous, bracteates, sessile, ebracteolate; bracts very small. Sepals 5, triangular or triangular-lanceolate. Petals 5, oblong, very small. Stamens 5, connate into a staminal column; anthers ovate, ditheous, basifixed, longitudinally dehiscent. Disc annular, slightly undulate in staminate ones; urceolate in pistillate one. Ovary ovoid, superior, bicarpellary, fused, bilocular, with 2 ovules in each locule on the axile placentae; styles united half for their length; stigma bifid. Fruits berry.

***Bridelia retusa* (L.) Spreng., Syst. Veg. 3: 48. 1826. (Figure 1. E)**

Clusia retusa L., Sp. Pl.: 1042. 1753.
 Myanmar name : Saik che bo
 English name : Unknown
 Flowering period : October to September

Morphological characters - Perennial, monoecious, a spiny trees; stems and branches terete, fulvous-tomentose, later glabrescent. Leaves simple, alternate, petiolate, stipulate; stipules linear, 2-3 mm long, caducous; blades elliptic-oblong to elliptic-oblong, thinly rounded at the base, entire and undulate along the margin, acute at the apex, tomentose on both surfaces. Inflorescences leaf-less axillary spikes; peduncles up to 20 cm long. Flowers yellowish, unisexual, actinomorphic, pentamerous, hypogynous, petaliferous, bracteates, sessile, ebracteolate; bracts small, acute. Sepals 5, triangular-lanceolate. Petals 5, oblanceolate. Stamens 5, connate into a staminal column; staminal column very short; anthers ovate, ditheous, basifixed, longitudinally dehiscent. Disc annular, entire and undulate in staminate ones; urceolate in pistillate one and enclosing the ovary; pistillode bifid in staminate one. Ovary globoid, superior, bicarpellary, fused, bilocular, 2 ovules in each locule on the axile placentae; styles barely united at very base; stigma globose. Fruits berry.

***Euphorbia heterophylla* L., Sp. Pl. 453. 1753. (Figure 1. F)**

Myanmar name : Se pale
 English name : Mexican fireweed

Flowering period : September to December

Morphological characters - Annual, herbs, rich in milky juice; stems and branches angular with longitudinal ribs, variously hirsute to subglabrous. Leaves simple, alternate, stipulate, petiolate; stipules gland-like; blades linear to rhomboidal, with scarlet blotch at base, attenuate at the base, entire or sinuate along the margin, acute at the apex, glabrous on both surface. Inflorescences cyathium, in the upper leaf axil, forming a terminal dense cluster; cyathium; involucre campanulate, with pedunculate; glands stipitate, solitary, funnel-shaped with circular opening, lacking petaloid appendage. Flowers yellowish green, unisexual, actinomorphic, trimerous, hypogynous, apetalous. Staminate flowers numerous in a cyathium; pedicels articulate with one stamen; anthers ditheous, basifixed, longitudinally dehiscent. Pistillate flower solitary in a cyathium with an exserted pistil, on the long pedicel; ovary superior, glabrous, tricarpeal, fused, trilocular with one ovule in each locule on the axile placentae; styles 3, basally connate; stigma 3, bifid. Fruits capsule.

Euphorbia hirta L., Sp. Pl. 454. 1753. (**Figure 2. A**)

Myanmar names : Hmin that pin; Kywe chaung min sae

English name : Unknown

Flowering period : June to October

Morphological characters - Annual, monoecious, herbs, with milky-juicy; stems terete, sparingly branched above base, unbranched at tip, multicellular hairs. Leaves simple, opposite and distichous, stipulate, petiolate; stipules subulate, hairy; blades ovate to ovate-oblong, unequally cuneate at the base, finely serrate along the margin, subacute at the apex, pubescent on both surfaces. Inflorescences axillary or terminal, cyathia with peduncle; involucre minute, cup-like with 4 glands; cyathium, peduncles 4-5 mm long. Flowers greenish brown, unisexual, actinomorphic, trimerous, hypogynous, apetalous, the pistillate one surrounded by the numerous staminate flowers, each flower with articulate pedicels and minute scales at the base. Stamen one; filament basifixed, longitudinally dehiscent. Ovary ovoid, superior, stipitate, hispid, tricarpeal, fused, trilocular, with one ovule in each locule on the axile placenta; styles 3, slightly connate at the base; stigma 3, bifid, purplish. Fruits capsule.

Euphorbia pulcherrima Willd- ex Klotzsch, in Otto E Dietr. Allg. Gartens.ii. 1834. (**Figure 2. B**)

Myanmar names : Ganaing-Kyetthayay

English name : Poinsettia

Flowering period : November to March

Morphological characters - Perennial, monoecious shrubs, with milky latex; stems and twigs hollow, tomentose. Leaves simple, alternate, upper ones more crowded below the inflorescence and smaller, exstipulate, petiolate; blades ovate-elliptic-oblong, cuneate at the base, shallowly lobed and cleft along the margin, acute at the apex, pubescent on both surfaces. Inflorescences terminal, cyathia with peduncle; involucre campanulate, yellowish green, with orange yellow single gland; cyathium. Flowers red, unisexual, actinomorphic, trimerous, hypogynous, apetalous, bracteates, pedicellate, ebracteolate, the pistillate one surrounded by the numerous staminate flowers, each flower with articulate pedicels and minute red scales at

the base; bracts stalked, oblong-lanceolate, showy, entire, large, red; involucre campanulate, yellowish green. Stamen one; red, anthers ditheous, basifixed, longitudinally dehiscent. Ovary globoid, superior, glabrous, tricarpeal, fused, trilocular, with one ovule in each locule on the axile placenta; style 1, reddish yellow; stigma 3, bifid, recurved, red. Fruits capsule.

***Glochidion stellatum* (Retz.) Bedd., For. Man. 194. 1873. (Figure 2. C)**

Phyllanthus stellatus Retz., Obs. Bot. 5: 29. 1789.

Myanmar name : Unknown

Local name : Unknown

Flowering period : June to September

Morphological characters - Perennial, monoecious, small trees; stem branched slightly glabrous. Leaves simple, alternate, stipulate, petiolate; stipules triangular; blades lanceolate, acute at the base, entire along the margin, obtuse at the apex, glaucous and glabrous on both surfaces. Inflorescences axillary, laxly distributed at node through the branches. Flowers yellowish green, unisexual, actinomorphic, hexamerous, hypogynous, apetalous, ebracteate, pedicellate, ebracteolate. Sepal 6, oblong, 1-2 long, glabrous. Stamens 3, connate into a column; staminal column; anthers attached to the column. Ovary globoid, superior, tricarpeal, fused, 5-10 locular with 2 ovules in each locule; styles thick, about 2 mm long. Fruits capsule.

***Jatropha podagrica* Hook., Bot. Mag.t. 4376. 1848. (Figure 2. D)**

Myanmar name : Ta-pin-shwe-htee

English name : Gouty-stemmed *Jatropha*

Flowering period : October to December

Morphological characters - Perennial, monoecious shrubs, with watery juice; stems and branches terete, glabrous, with bulbous at base of stem. Leaves simple, spirally arranged or alternate, stipulate, petiolate; stipules capillary multifid glandular hairs, filiform; petioles fistular; blades orbicular to broadly ovate, with 3- to 5- lobed, auriculate at the base, entire along the margin, shortly acuminate at the apex, glabrous on both surfaces. Inflorescences axillary or terminal dichasial cymes, terminated by solitary pistillate flower and laterally-sided by staminate flowers. Flowers red, unisexual, actinomorphic, pentamerous, petaliferous, bracteate, pedicellate, ebracteolate; bracts minute, caducous. Calyx campanulate, with 5-partite; lobes ovate. Petals 5, ovate-oblong, 6-7 mm long; disk glands 5, obovoid, yellow, free or united into a ring. Stamens 8 or 9, free, exserted; filaments 2-3 mm long, red; anthers linear, ditheous, basifixed, longitudinally dehiscent. Ovary subgloboid, glabrous, tricarpeal, fused, trilocular with one ovule in each locule on the axile placenta; styles 3, basally connate, glabrous; stigma 3, bifid, yellowish green. Fruits capsule.

***Ricinus communis* L., Sp. Pl. 1007. 1753. (Figure 2. E)**

Myanmar name : Kyet su

English name : Castor oil plant

Flowering period : December to February

Morphological characters - Perennial, tree-like herbs; stems and branches fistular, glaucous. Leaves simple, alternate, stipulate, petiolate; stipules sheath-like, suborbicular, with bearing 1 or 2 glands; blades peltate or suborbicular in outline, with 7- to 9-lobed, lobes lanceolate to oblong-lanceolate, cordate at the base, doubly serrate with gland-tipped teeth along the margin, acute at the apex, glabrous on both surfaces. Inflorescences terminal or leaf-opposed, long panicle consisting of sub-sessile cymes, accompanied with male below and female above. Flowers greenish-yellow, red or purplish-red, unisexual, actinomorphic, pentamerous, hypogynous, apetalous, bracteates, pedicellate, ebracteolate; bracts ovate or lanceolate; bracteoles minute. Calyx shallowly campanulate, deeply 5-partite; lobes lanceolate. Stamens numerous, monadelphous, in adense several-branched fascicle, exserted; filaments filiform, unequal, glabrous; anthers globose, dithecal, dorsifixed, longitudinally dehiscent. Ovary subglobose, covered with fleshy soft green spines, trilocular, fused, trilobular, with one ovule in each locule on the placenta; styles 3, connate at the base, yellowish-green or red; stigmas 3, bifid, yellowish green or red, densely papillose on the inside. Fruits capsule.

Sauropus assimilis Thw., Enum. Pl. Zeyl. 284. 1861. (**Figure 2. F**)

Myanmar name : Kyet tha hin
 English name : Unknown
 Flowering period : June to August

Morphological characters - Perennial, monoecious shrub; stems slender, slightly winged, glabrous; branches cylindrical, smooth. Leaves simple, alternate, distichous, stipulate, petiolate; stipules linear; blades broadly ovate to ovate-lanceolate, rounded-obtuse at the base, entire along the margin, subacute at the apex, glabrous on both surfaces. Inflorescences axillary cyme of one pistillate and two to three staminate flowers on short peduncle. Flowers yellowish or reddish, unisexual, actinomorphic, pentamerous, hypogynous, apetalous, bracteates, pedicellate, ebracteolate; bracts fimbriate, 3 mm long. Sepals 6, free, rounded, minutely red-papillate, persistent. Stamens 3, fused; staminal column truncate. Ovary globose, trilocular, fused, trilobular, with one ovule in each locule on the axile placenta; styles 3, free, recurved; stigmas bifid. Fruits baccate.

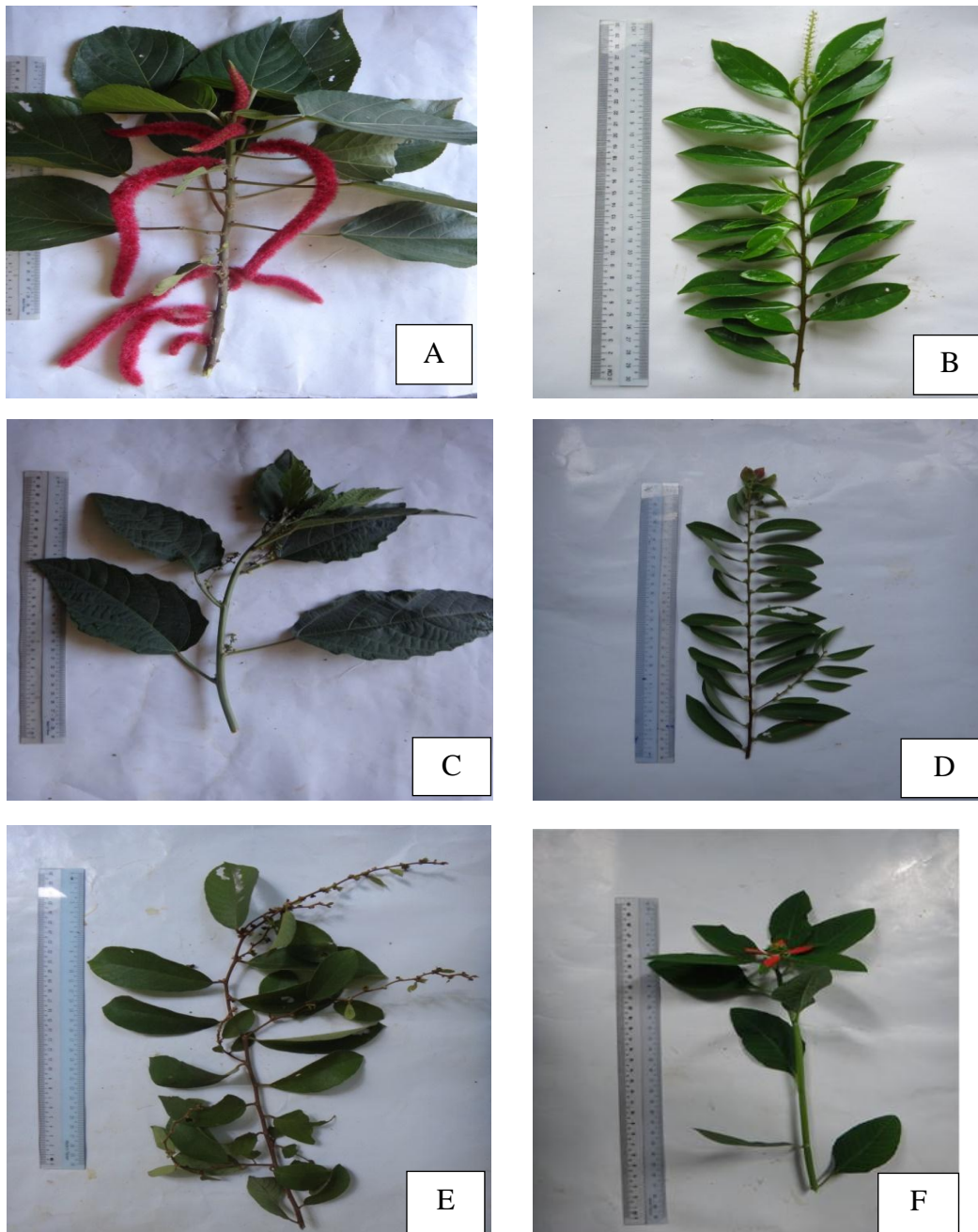


Figure 1 A. *Acalypha hispida* Burm.f.
 B. *Antidesma diandrum* Roth
 C. *Balispermum montanum* (Willd.) Muell.
 D. *Bridelia moonii* Thw.
 E. *Bridelia retusa* (L.) Spreng.
 F. *Euphorbia heterophylla* L.

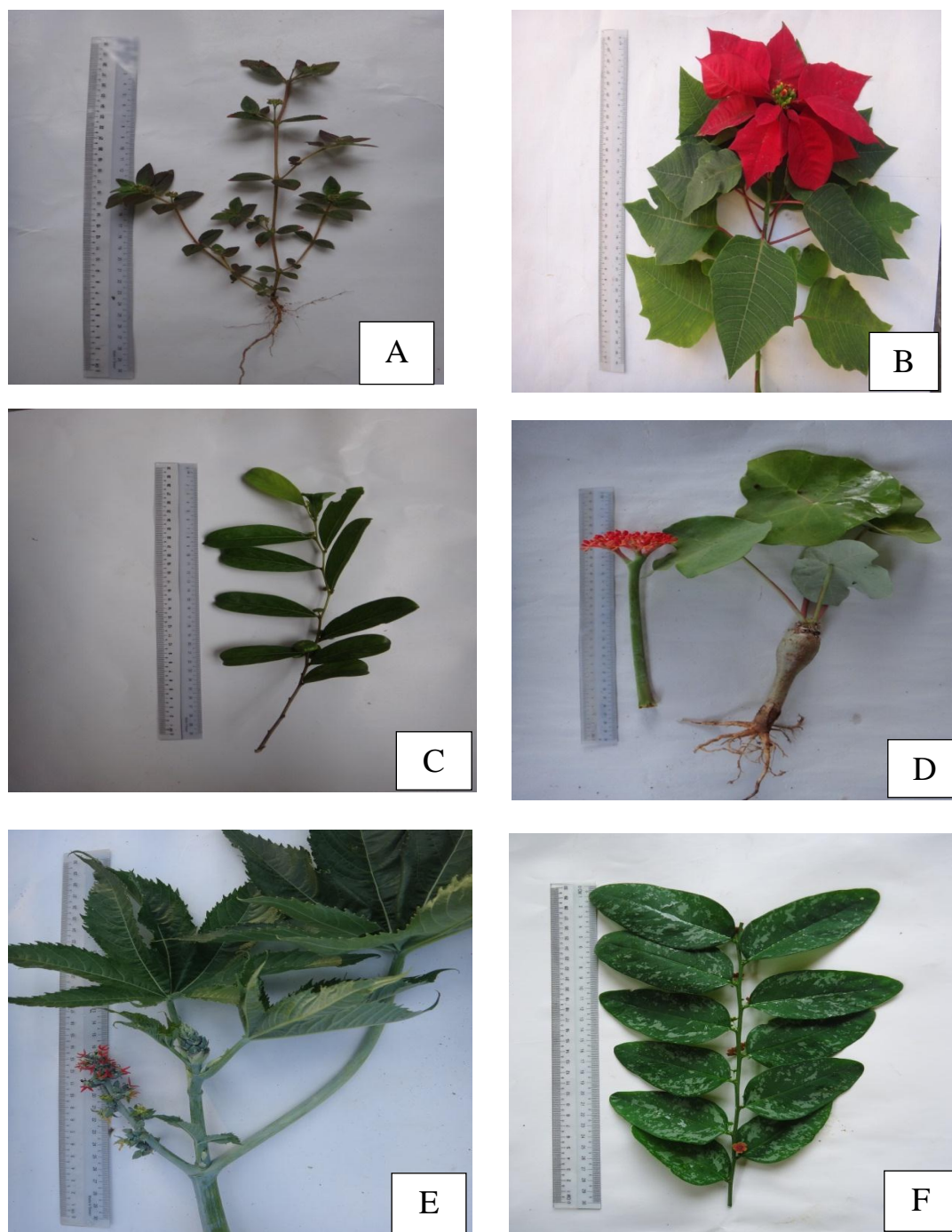


Figure 2

- A. *Euphorbia hirta* L.
B. *Euphorbia pulcherrima* Will.
C. *Glochidion stellatum* (Retz.) Bedd.
D. *Jatropha podagrica* Hook.
E. *Ricinus communis* L.,
F. *Sauropus assimilis* Thw.

Discussion and conclusion

In the present research work deals with some species of Euphorbiaceae from Banmaw Area, Banmaw Township. Systematic botany in its restricted sense treats the classification, identification, and naming of plants (Lawrence 1969). Altogether 12 species belonging to 9 genera of family euphorbiacea were collected and identified. Locationally, the studied area is situated altitude between 293.3 m and 496.8 m above sea level. The climate is one of the major factors of natural vegetation, however, the nature of topography, slope gradient, precipitation and types of soil also influence the growth of natural vegetations.

Euphorbiaceae family occurs mainly in the tropics with the majority of the species. A large variety occurs in tropical Africa, but they are not as abundant or as varied as in the two other tropical regions. The genera in tribe Euphorbiaceae, subtribe Euphorbiinae (Euphorbia and close relatives) show a highly specialized form of pseudanthium (flase flower made up of several true flowers) called a cyathium. A cyathium (plural: cyathia) is one of the specialized pseudanthia (flase flowers) forming the inflorescence of plants in the genus Euphorbia.

The diagnostic features of this family are the presences of inflorescences types. Cyathium is usually a small, cup-like involucre consisting of fused together bracts and peripheral nectary glands, surrounding a ring of male flowers, each a single stamen. In the middle of the cyathium stands a female flowers a single pistil with branched stigmas. This whole arrangement resembles a single flower. The family contains a lare variety of phytotoxins (toxic substances produced by plants), mainly diterpene esters, alkaloids glycosides, and ricin-types toxins.

Among the studied species, some species such as *Antidesma diandrum* Roth, *Bridelia moonii* Thw., *Bridelia retusa* (L.) Spreng., are used for timber production and fuel, other species such as *Acalypha hispida* Burm.f., *Euphorbia heterophylla* L., *Euphorbia pulcherrima* Willd., are used for ornamental and another species such as *Acalypha hispida* Burm.f., *Euphorbia heterophylla* L., *Euphorbia hirta* L., *Jatropha podagrica* Hook., *Ricinus communis* L. and *Sauropus assimilis* Thw. are used for the treatment of constipation, bronchitis, laxative, diuretic, expectorant (for asthma) and in the treatment of leprosy and kidney ailment. The barks, flowers and roots of *Acalypha hispida* Burm.f., is used to create medicines for the relief of asthma symptoms. The species of *Antidesma diandrum* Roth is used for vegetables.

In conclusion, it is believed that which can be used in advanced studies such as the conservation of water and forest, soil, natural environment and animal life resources.

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References

- Backer, C.A. & Bakhuizen Van Den Brink, R.C. (1963). Flora of Java, Vol 1 to 3. Rijksherbarium, Leyden, N.V.P. Noordhoff.
- Brandis, D. (1906). Indian Trees, Assisted by Indian Foresters, Archibald Constable Co.Ltd. 16 James Street Haymarket S.W. London.
- Dassanayake, M.D. (1980 – 2001). A Revised Handbook to the flora of Ceylon, vol. 1 to 14, University of Peradeniya, Department of Agriculture, Peradeniya, Sri Lanka
- Heywood, V.H. (1978). Flowering Plants of the World. Oxford University press, London.
- Heywood, V. H., B. K. Brumitt, A. Culham and O. Seberg. (2007). Flowering Plant Families of the World. Firefly Books Ltd.
- Hong Kong Herbarium & South China Botanical Garden (2007). Flora of Hong Kong Vol. I, II. Agriculture, Fisheries and Conservation Department.
- Hooker, J.D. and Jackson, B.D. (1895). Index Kewensis. Vol. 1, Vol. 2 and Supplements. Clarendon press. London, Oxford.
- Hundley, H.G. and Chit Ko Ko, (1987). List of Trees, Shrubs, Herbs and Principal Climbers, etc. Fourth Revised Edition Shwe Daw Oo Press, Mayangon, Yangon, Myanmar.
- Hutchinson, J. (1967). Key to the Families of Flowering Plants of the World. Clarendon press Oxford, London.
- Htar Lwin, (2010). Florestic Study on Angiospermae in Kalay Township. PhD Dissertation, University of Mandalay.
- John Kress., W. and Shirley Sherwood. (2009). The Art of Plant Evolution. Royal Botanic Garden, Kew, (2009).
- Kress, J., Hibinw Robert, A., Defilipps Ellen Farr & Daw Yin Yin Kyi, (2003). A Checklist of the trees, Shrubs, Herbs and Principal Climbers of Myanmar. Department of Systematic Biology-Botany. National Museum of Natural History, Washington DC. USA.
- Lawrence, George H.M. (1961). Taxonomy of vascular plants, The Macmillan Company. New York. Michael G. Simpson (2006), Plant Systematic, Elsevier Academic Press, Burlington. USA.

Anatomical and Phytochemical Study of *Eclipta alba* (L.) Hassk.

Myat Ei Khet¹, Dr San San Aye²

Abstract

In this research, the specimen of *Eclipta alba* (L.) Hassk (Kyeik-hman) belonging to Asteraceae were collected from the campus of Banmaw University in Banmaw Township of Kachin State. These plants grow wild abundantly in this area. This plant is known to have various pharmacological activities and is traditionally used in treatment diseases. In this study, morphological, anatomical and phytochemical test were undertaken. The identification of the plant was carried out by referring to Hooker (1885) and Dassanayake (1980). The morphological and anatomy characteristics of the leaves, stems and roots were studied, identified, described, discussed and their photographs and photomicrographs were also presented. In anatomical study, anomocytic type of stomata was observed on both surface of the leaf surface. Non-glandular and multicellular trichomes were observed in the entire plant parts. In lamina, palisade parenchyma was one-layered and spongy parenchyma was 5-6 layered. Vascular tissue of midrib and petiole were crescent-shaped. Collateral type of vascular tissue system is found in leaves and stem. These characters can be used in identification of flowering plants. The preliminary photochemical examination showed the presence of all tested compounds.

Keyword: *Eclipta alba*, anatomical characters, phytochemical tests.

Introduction

Eclipta alba (L.) Hassk., the most commonly occurring species, is an herbaceous, erect or prostrate, much branched, strigosely hirsute, of 30 cm to 50 cm in high. It had seen along the road side, waste land of Banmaw University campus. Commonly known as “Trailing eclipta”, it is referred to “kyeik-hman” *Eclipta alba* (L.) Hassk., kyeik-hman in Myanmar, belong to the family Asteraceae, (formely known as compositae) is growing wild and widely distributed in Myanmar. The *Eclipta alba* (L.) Hassk., could be used as very powerful liver tonic in skin disorders and promotes hair growth. It is also good for the disease of the spleen, stomatitis and toothache (Neerja, 2012). According to Cronquist (1981), the family Asteraceae consists of more than 1100 genera and perhaps as many as 20,000 species, cosmopolitan in distribution. This family is widely distributed in Myanmar and 98 genera and 256 species were recorded (Hundely and Chit Ko Ko 1987). In Checklist of the Trees, Shrubs, Herbs and Climbers of Myanmar, Kress *et al.*, (2003) recorded 309 species of 128 genera in Myanmar.

The importance of the Asteraceae is incalculable and largely indirect based on its contribution to the biodiversity of drier vegetation types throughout temperate zones, subtropics and tropics, often approaching 10 to 15% of floras. There are also a few species that contribute to food sources, sunflower (*Helianthus*), artichoke (*Cynara*), and lettuce (*Lactuca*).

1 Demonstrator, Department of Botany, Banmaw University

2 Dr, Associate Professor, Department of Botany, Shwebo University

There are also many members that are cultivated as ornamentals including marigolds, zinnins, chrysanthemums, dahlias etc (Funk *et.al.*, 2005).

The *Eclipta alba* (L.) Hassk. of the leaf juice is used as tonic for jaundice and leaf paste is applied on the affected area for toothache. It is also good for diseases of the spleen, stomatitis, toothache, hemicranias, fever, pain in the liver. It is juice in combination with honey that is administered for catarrh. Anti HIV-I in activity provides support for the beneficial effect of using this plant in AIDS treatment (Chopra, 1996). The medicinal properties of this plant includes anti-inflammatory, antioxidant, hepatoprotective, immunomodulatory, hair growth and wound healing activities were summarized by Throat *et al.*, (2010) Neeraja and Margart (2012) reported ethno medical uses of *Eclipta*.

Anatomical characters provide differentiate of plant species. So, its values are importance for plant classification. In present research emphasizes on preliminary phytochemical constituents of alcoholic and aqueous extracts of the whole plant and anatomy characters on the leaves, stem and roots including maceration of plant parts were investigated in *Eclipta alba* (L.) Hassk. The present research work describes preliminary phytochemical constituents, morphological and anatomical characters of *Eclipta alba* (L.) Hassk.

The aim of this study is to supplement some information regarding correct identification and standardization, to provide information of morphology, anatomy characters and phytochemical constituents and to give the important medicinal uses parts of *Eclipta alba* (L.) Hassk.

Materials and Methods

Botanical studies

The plant specimens of *Eclipta alba* (L.) Hassk., growing wild were collected from Banmaw University campus, Kachin State for this research. These species were growing wild in this area abundantly. The collected specimens were immediately studied, measured and recorded in detailed for taxonomic description. The collected specimens were also recorded by a digital camera. After collection, the fresh specimens were identified at the Department of Botany, Banmaw University by the help of the literature of Hooker (1885) and Dassanayake (1980).

Anatomical studies

For anatomical study, some of the fresh petiole, middle portion of the midrib, stems and roots were cut into thin sections by using razor blades. The free hand sections were cleaned in chloralhydrate solution on a glass slide and stained with safranin solution, and temporarily mounted in diluted glycerin solution and observed under a light microscope.

A small amount of pieces of the leaves, petioles, stems and roots were macerated separately by warming in two parts of hydrogen peroxide solution and one part of glacial acetic acid solution according to modified Franklyn's glacial method stated by Berlyn and Miksche (1976). Then, the macerated elements were washed with water and stored in 50% ethyl alcohol solution with a few drops a safranin. The thin sections of the specimens and macerated elements were studied under a light microscope and recorded by a digital camera and photographs, and photomicrographs of these specimens were presented.

Phytochemical studies

The plant entire materials were firstly cleaned with water and air-dried in the shade. Then, the sample were crushed into small pieces, grinding into powder and store in airtight containers. For investigation of phytochemical test, the air dried powder of the entire plant were tested for Alkaloid, Glycoside, Reducing sugar, Saponin, Tannin, Carbohydrate, Terpenoid, Steroid, α -amino acid, Starch, protein, Flavonoid and Phenol. The preliminary phytochemical test was carried out according to the methods of British Pharmacopoeia (1968) and Trease and Evans (1978). This test was carried out at the University of Yangon.

Morphological studies

Eclipta alba (L.) Hassk., Pl. Java. Rar. 528.1848

Synonym : *Eclipta prostrata* (L.) L., Mant.2: 286. 1771

Family : Asteraceae

Local name : Kyeik-hman

Common name : False daisy

Flowering period : Throughout the year

Annual, erect or prostrate herbs, 70cm - 74cm high, sometimes much branched; stem and branches terete, reddish-brown or pale-brown; node tumid, internode 4.5cm -12.5cm in length. Leaves simple, opposite and decussate, exstipulate; subsessile; blades oblong-lanceolate or linear-oblong, 0.6cm - 1.3cm by 3.0cm - 7.0cm, strigose on both surface, attenuate at the base, entire near the base and serrate at the margin towards the apex, greenish above, pale green beneath; midribs more distinct at the lower surface bearing 5 to 13 lateral nerves. Head 2 or 3 in the axillary position, heterogamous radiate, 50 to 80 ray florets and 40 to 60 disc floret per head, white; peduncles slender, strigose, pale green or pale brown, 4 mm to 11 mm long. Involucre campanulate 4mm to 12 mm in diameter; bracts 2 seriates, 5 in each seriate, ovate, glabrous above, strigose beneath, truncate at the base, entire at the margin, acuminate at the apex, green. Receptacles convex, paleaceous. Paleae of both florets narrowly linear, acuminate at the apex, pilose, pale green, persistent. Ray-floret (outer flower) 1 or 2 seriates, pistillate, fertile, zygomorphic; tube 2mm - 3mm long, ligule 2mm - 3mm long, white; limb not toothed or entire at the apex. Papillose without. Disc floret numerous, white, bisexual, fertile, actinomorphic; tube 2mm - 3mm long; limb 4- toothed, filiform, glabrous. Stamens 5, epipetalous, inserted; anthers syngenesious, ditheous, introrse, mostly oblong, obtuse at the base, basifixed; filament filiform, short, glabrous. Ovary inferior, unilocular with solitary basal ovule in the locule; style linear, stylar arm exerted in ray floret, flattened. Achene obovate, laterally subcompressed with a narrow wing, black.

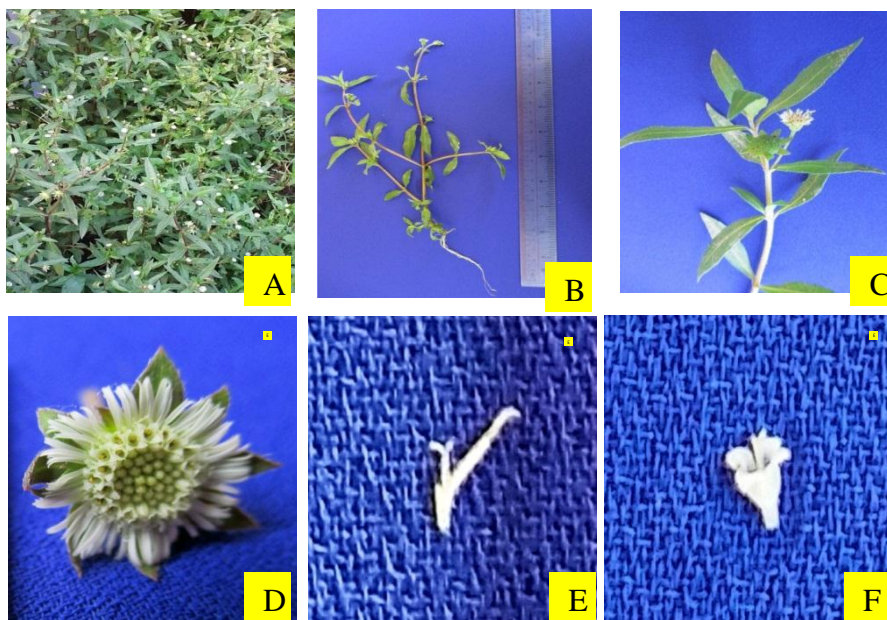


Figure 1. Habit of *Eclipta alba* (L.) Hassk. ■ ■

- | | |
|----------------------------|-----------------------------------|
| A. Plants in natural habit | B. The whole plant |
| C. An inflorescence | D. Close up view of inflorescence |
| E. Ray floret | F. Disc floret |

Anatomical studies

Microscopical characters of the leaves of *Eclipta alba* (L.) Hassk.

Lamina of *Eclipta alba* (L.) Hassk.

In transverse section, the lamina of *Eclipta alba* (L.) Hassk., study is typically dorsiventral type with reticulate venation. Distinguishable into dermal, ground and vascular tissue system. The dermal tissue system is composed of epidermal cells, guard cells of stomata and trichome. In surface view, the upper epidermal cells were slightly wavy and the lower epidermal cells were deeply wavy. Both surfaces of epidermal cells are parenchymatous cell and irregularly arranged. Stomata are present on both surfaces, but more abundant on lower surface. Stomata are anomocytic type. In transverse section, the upper and lower epidermal cells were covered by smooth and thin cuticle. Both upper and lower epidermis composed of 1-layered, compactly arranged, barrel or rectangular shaped, anticlinal walls straight; non-glandular trichomes multicellular.

The ground tissue system (mesophyll) is differentiated into palisade and spongy parenchyma. Palisade parenchyma cells found below the upper epidermis and composed of 1-layered, compactly arranged and vertically elongated in shape. It is abundant in chloroplast and cell walls are thin and straight. Spongy parenchyma cells are present under the palisade cells and composed of 5-6 layered, oval or rounded in shape with intercellular space small.

The types of vascular bundle are collateral type. The shape of vascular bundles are rounded or oval shape in outlines, and embedded in the ground tissue. Xylem lies at the adaxial

side. It is composed of 1- to 2 radial rows, 2- or 3 cells per row and polygonal in shape. Xylem consists of vessel, tracheids, xylem fibers and xylem parenchyma. Vessel elements thick-walled, lateral walls straight or wavy, thickening spiral and scalariform; tracheids thick-walled, lateral walls straight, end walls oblique, thickening spiral and scalariform; fibers thick-walled, lumen narrow, xylem parenchyma cells oval or rectangular in shape, thin walled. Phloem lies on the abaxial side. It is composed of 3- to 7- layers. It consists of sieve-tubes, companion cells, phloem parenchyma and phloem fibers. Bundle sheath is distinct, composed of 1-layered, barrel or rounded shape parenchymatous cells.

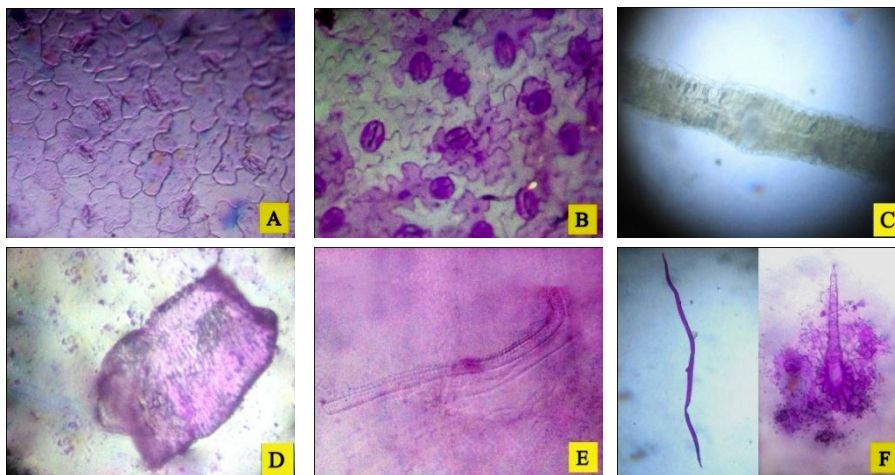


Figure 2. Internal structure and macerated elements of lamina, *Eclipta alba* (L.) Hassk.

- A. Upper surface layer showing stomata B. Lower surface layer showing stomata
 C. T.S of a portion of lamina showing D. A vessel element and esophyll
 E. A terminal portion of tracheid with trichrome F. A fiber, non-glandular spiral thickening

Midrib of *Eclipta alba* (L.) Hassk.

In transverse section, the midrib of *Eclipta alba* (L.) Hassk., studied is semicircular at the abaxial side and crescent-shaped at the adaxial side; distinguishable into dermal, ground and vascular tissue system.

The dermal tissue system is epidermal parenchymatous cells and non-glandular trichomes. In transverse section, both upper and lower epidermal cells are composed of 1-layered, compactly arranged, the cells rounded or barrel shape, anticlinal wall straight; cuticle thin; non-glandular trichomes elongated and multicellular.

The ground tissues are composed of outer collenchymatous cells and inner parenchymatous cells as main mass of ground tissue. Below the upper epidermis, the outer collenchymatous cells are 2- to 3- layers and above the lower epidermis, the outer collenchymatous cells are 1- to 2- layered. The cells are polygonal in shape. Internal to the collenchyma, adaxial side 3- to 7-layered and abaxial side 6- to 9- layered of parenchymatous

cells are found. The cells are oval or rounded in shape and resin canals are present in near the vascular bundle.

Vascular tissue system consists of phloem and xylem of collateral types. The vascular bundles are round-shaped in outline and embedded in the ground tissue. Xylem is lying at adaxial side and phloem is lied at abaxial side. Xylem is made up of 1-to 7 rows, 3- to 6 cells in each row; composed of vessel, tracheid, xylem parenchyma and xylem fibres. Vessel elements thick-walled, lateral walls straight, thickening spiral and scalariform; tracheid thick walled, lateral straight, end walls actue, spiral thickening; fibers thick wall, lumen narrow, lateral walls straight, xylem panenchyma cell thin-walled, oval or rectangular in shape. Phloem is made up of 3- to 5- layered and cells polygonal in shape. It consists of sieve tube, companion cells, phloem parenchyma and phloem fibres.

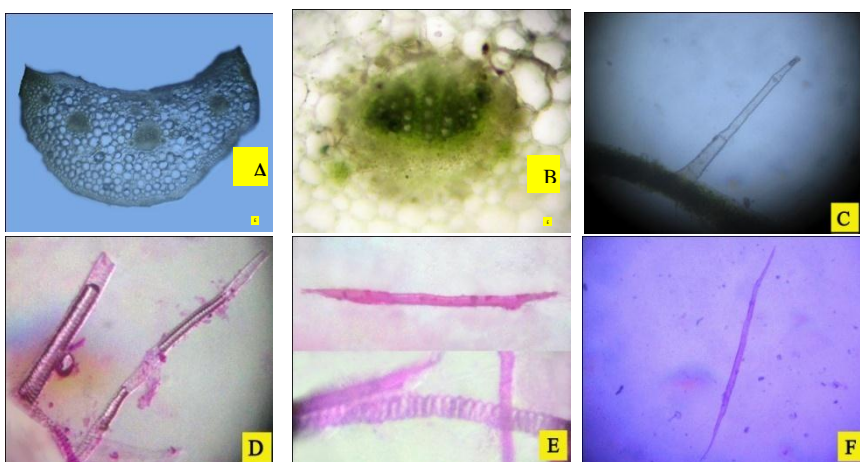


Figure 3. Internal structure and macerated elements of midrib of *Eclipta alba* (L.) Hassk

- A. T.S of a midrib showing tissue system B. T.S of a portion of midrib showing vascular bundle
- C. T.S of a portion of midrib showing a D. A vessel element multicellular trichome
- E. A terminal portion of tracheid with E. A fiber spiral thickening

Petiole of *Eclipta alba* (L.) Hassk.

In transverse section, the petiole studied is semicircular at the abaxial side and crescent-shaped at the adaxial side, slightly concave at the adaxial side in outline. Distinguishable into dermal, ground and vascular tissue systems.

The dermal tissue system is composed of epidermal cells and non-glandular trichomes. In surface view, the upper epidermal cells are parenchymatous, anticlinal wall straight and cuticle thin; non-glandular trichomes are elongated and multicellular; stomata absent; lower epidermal cells are as seen in upper epidermis.

In transverse section, the upper epidermal cells are covered by smooth and thin cuticle; non-glandular trichomes are multicellular. The upper epidermis consists of 1-layered, compactly arranged, parenchymatous cells, oval or barrel shaped, thin-walled. The lower epidermis is as seen in upper epidermis.

The ground tissue systems are composed of outer collenchymatous cells and inner parenchymatous cells as the main mass of ground tissue. Below upper the epidermis, the collenchymatous cells are 1 to 2 layered and above the lower epidermis, the collenchymatous cells are 1 to 2 layered and polygonal in shape. Internal to the collenchyma, parenchymatous cells are 5 to 7 layered, polygonal in shape and intercellular space in large and resin canal is present in vascular bundle at adaxial side. At abaxial side, cells are 5 to 8 layered and polygonal in shape, intercellular space small or large.

Vascular tissue system consists of collateral type and their arrangements are 3-sperated bundles open towards the adaxial side of the petiole; middle bundle are large and peripheral bundles are small. Xylem is composed of 3 to 7 rows and 1 to 5 celled in each row; polygonal in shape. It consists of vessels, tracheids, xylem parenchyma and xylem fibres. Vessel elements thick-wlled, lateral walls straight or wavy, thickening spiral, end walls oblique or transverse; tracheids thick walls, end walls actue or oblique, thickening spiral; fibers thick-walled, lateral wall straight, end walls actue; xylem parenchyma rectrangular, thin- walled. Phloem is arranged in 2 to 5 layered and cells are polygonal in shape. It consists of sieve tube, companion cells, phloem parenchyma and phloem fibres.

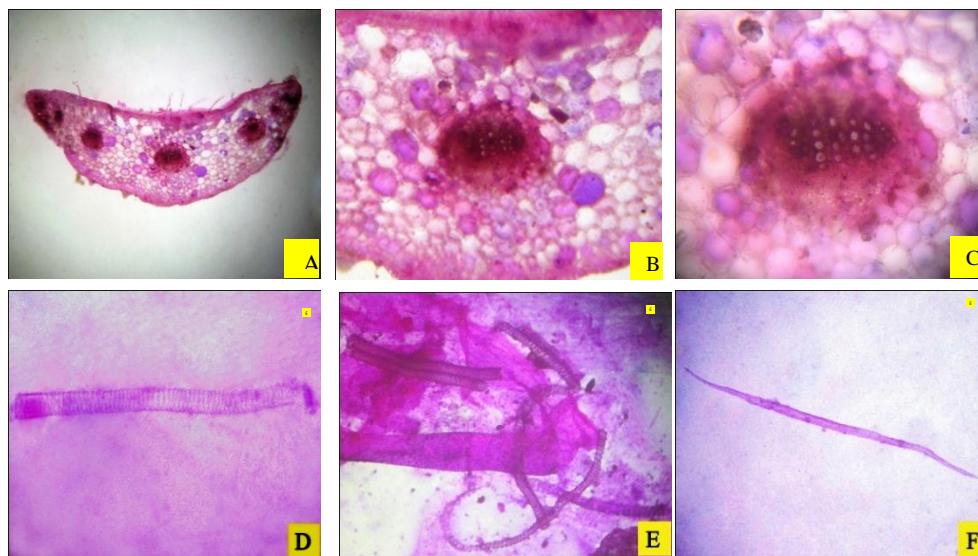


Figure 4. Internal structure and macerated elements of petiole of *Eclipta alba* (L.) Hassk.

- A. T.S of a petiole showing tissue system B. T.S of a portion of petiole showing vascular bundle
 C. Close up view of vascular bundle of D. A vessal element petiole
 E. A terminal portion of trachied with F. A fiber spiral thickening

Microscopical characters of the stems of *Eclipta alba* (L.) Hassk.

In transverse section, the stem of *Eclipta alba* (L.) Hassk., studied is circular in outline, distinguishable into dermal, ground and vascular tissue system.

The dermal tissue system is composed of epidermal parenchymatous cells and non-glandular trichomes. In transverse section, epidermis is 1-layered, compactly arranged, the

cells are barrel or irregular in shaped, thin-walled and covered with cuticle; non-glandular trichomes are multicellular.

The ground tissue systems composed of cortex, endodermis, pericycle and pith. Cortex lies below the epidermis. It is made up of outer collenchymatous cells and inner parenchymatous cells. Outer collenchymatous cells are composed of 2 or 3 layers and polygonal in shape. Inner parenchymatous cells occur 8 to 12 layers and polygonal or barrel shape with large air cavities present in cortex. Endodermis is single layered, composed of barrel-shaped and thin-walled parenchymatous cells. It is inner most layer of cortex. Pericycle lies beneath the endodermis. It is crescent-shape strand with sclerenchymatous cells. The central pith composed of 7- to 13- layered parenchymatous cells, oval or polygonal in shape with intercellular space small or absent.

The vascular bundles is a collateral type about 12-15 bundle forming a continuous in a circular ring, embedded in the inner ground tissue. Phloem present outer with 3- to 5- layered. It contains sieve tube, companion cells, phloem parenchyma and phloem fibres. Xylem present inner and arranged in about 3 rows and each row has 3- to 7 cells. Xylem consists of tracheids, vessels, xylem parenchyma and xylem fibres. Vessel elements thick-walled, lateral walls straight, thickening spiral, end walls oblique or transverse; tracheids thick-walled, lateral walls straight, end walls acute, thickening spiral; fibers thick-walled, lumen narrow, lateral walls straight or wavy, xylem parenchyma cell thin-walled, rectangular in shape.

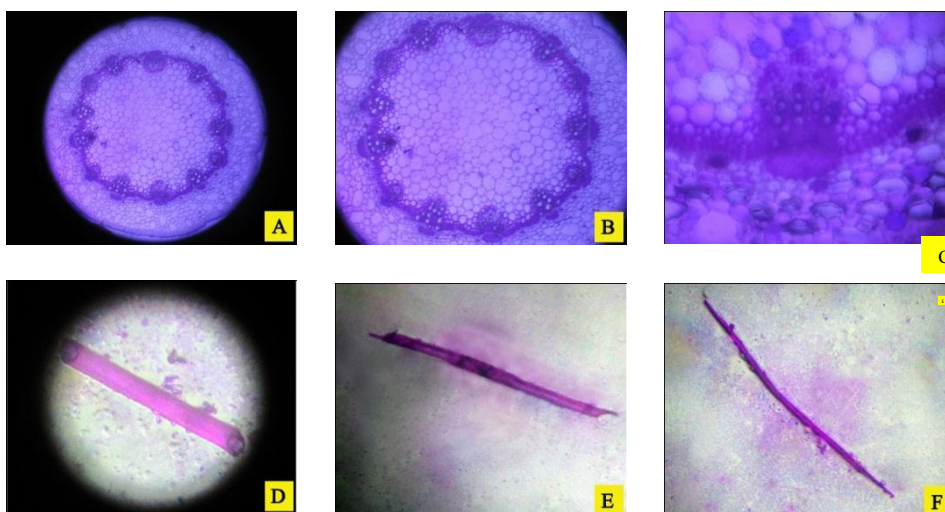


Figure 5. Internal structure and macerated elements of stem of *Eclipta alba* (L.) Hassk.

- | | |
|--|--|
| A. T.S of a stem showing tissue system | B. T.S of a stem showing tissue system |
| C. Close up view of vascular bundle | D. A vessel element of stem |
| E. A terminal portion of tracheid with | F. A fiber spiral thickening |

Microscopical characters of the roots of *Eclipta alba* (L.) Hassk.

In transverse section, the roots studied are circular in outline, distinguishable into dermal, ground and vascular tissue system. The dermal tissue system, epiblema has 1 layered in transverse section, compactly arranged, parenchymatous cells rectangular in shape.

The ground tissue system composed of cortex, endodermis, pericycle and pith. The cortex lying internal to the epiblema, consists of parenchymatous cell, 6 to 7 layered, arranged in radial rows associated with large air cavities, rounded, oval or irregular in shape. The endodermis has 1 layered, compactly arranged, barrel in shape and thin-walled parenchymatous cells. The pericycle occurs 1 layered, compactly arranged barrel or elongated in shape, thin-walled parenchymatous cells. Pith consists of 2 to 3 layered parenchymatous cell with intercellular space very small or absent.

The vascular tissue system, in transverse section, vascular cylinder polyarch. Phloem distributed near the periphery of the vascular cylinder beneath the pericycle; 3 to 7 layered. It is composed of sieve-tubes, companion cells, phloem parenchyma and phloem fibers. Xylem occurs toward the center with 2 to 5 layered. It is composed of vessel element, tracheids, xylem parenchyma and xylem fibers. Vessel elements thick-walled, lateral walls straight or wavy, thickening reticulate or scalariform, end walls transverse; tracheids thick-walled, lateral walls straight, end walls oblique, thickening reticulate; fibers thick-walled, lumen narrow, lateral walls straight, end walls acute.

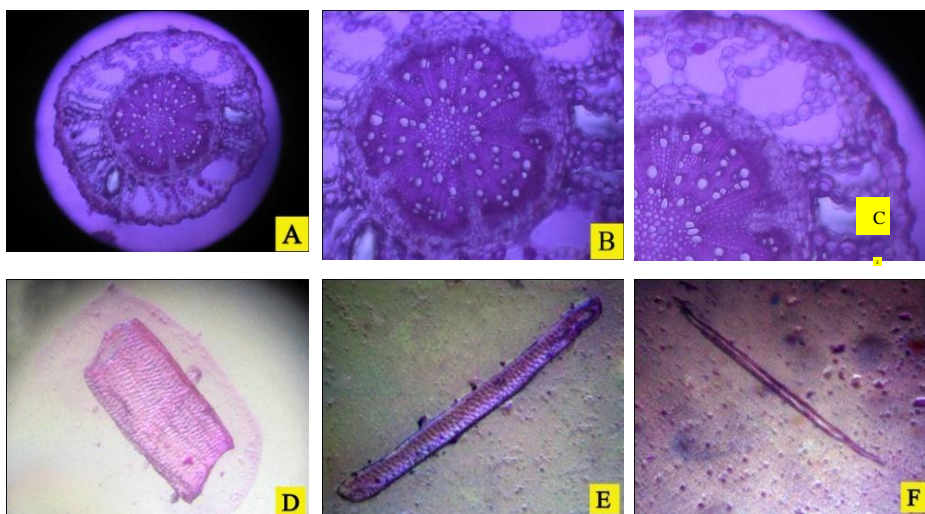


Figure 6. Internal structure and macerated elements of root of *Eclipta alba* (L.) Hassk.

- A. T.S of a root showing tissue system B. T.S of a portion young showing polyarch arrangement of vascular tissue
 C. T.S of portion of root showing large air D. A vessel element cavity in the cortex
 E. A trachied with reticulate thickening F. A fiber

Preliminary phytochemical test on entire plant

The preliminary phytochemical investigation was carried out on the powdered of the whole plant. The tests indicated that the whole plants contained alkaloid, reducing sugar, saponin, carbohydrate, terpenoid, steroids, tannin, α amino acid, starch, protein, flavonoid, glycoside and phenol were found to be presented. The result of phytochemical tests were shown in Table 1.

Table 1. Preliminary phytochemical test from the entire plant of *Eclipta alba* (L.) Hassk.

No.	Test	Extract	Test reagent	Observation	Result
1.	Alkaloid	2% HCl Acid + Et OH	Hager's Reagent Wagner's Reagent Mayar's Reagent	Yellow ppt Reddish brown ppt White ppt	+ + +
2.	Reducing Sugar	H ₂ O	Benedict solution and boiled for few minutes	brick red ppt	+
3.	Saponin	H ₂ O	shaken a few minutes	Frothing	+
4.	Carbohydrate	H ₂ O	H ₂ O and mixture equal part felling's A and B	brick red ppt	+
5.	Terpenoids	CHCl ₃	Acetic anhydrate and Conc: H ₂ SO ₄	Pink color	+
6.	Steroid	Pet-ether	Acetic anhydrate and Conc:H ₂ SO ₄	green color	+
7.	Tannins	H ₂ O	Few drops of 5% ferric chloride and dilute H ₂ SO ₄ Solution	Yellowish brown ppt	+
8.	α -amino acid	H ₂ O	Dry and spray with Ninhydrin reagent and kept in oven at 110°C	Pink spot	+
9.	Starch	H ₂ O	Add 2 drops of Iodine solution	bluish black color	+
10.	Flavonoid	Et OH	Small pieces of Mg few drops of HCl	Pink color	+
11.	Glycoside	Et OH	1ml of water and sodium hydroxide	Yellow color	+
12.	Phenolic compound	H ₂ O	2ml of water and a few drops of 10% Ferric chloride solution	Green color	+
13.	Protein	H ₂ O	A few drops of NaOH sol: + 3% of CuSO ₄ Sol:	violet color	+

(+) present ppt = precipitate Conc: = concentration

Discussion and Conclusion

In this research work, morphological and phytochemical constituents of *Eclipta alba* (L.) Hassk., belonging to family Asteraceae were studied and described. The studied area is Banmaw University Campus, Banmaw Township in Kachin State.

In the present study, the constituents of specimens were carried out on phytochemical screening of the entire plant of *Eclipta alba* (L.) Hassk., using alcoholic and aqueous extractants, a sequence of compounds like alkaloid, saponin, tannin, flavonoid, terpenoid and phenol have been observed. These findings are in agreement with Karthikumar *et al.*, (2007). Similar results were also concluded the presence of alkaloid, flavonoid, terpanoid, tannin and sugar in alcoholic and aqueous extract of the entire plant of *Eclipta alba* (L.) Hassk.(Peraman *et al.*, 2011).

In the present study, the morphological characters of this species are annual erect or prostrate herbs. The leaves are simple, opposite and decussate, exstipulate. Inflorescences are heads and heterogamous, contain ray florets at the periphery and disc florets inside. The ovaries are inferior, unilocular with solitary basal ovule and achene fruit.

In anatomical studies, the lamina of *Eclipta alba* (L.) Hassk., studied in this research were of dorsiventral types, stomata are anomocytic and usually present on both surfaces as had been stated by Min Htay Wai Lin (2015). The stomata usually occur more abundantly on the lower surface of lamina and can also found in petiole and midrib than on upper surface. In this work the trichomes are non-glandular trichomes and multicellular. This type of stomata and trichomes are agreed with that of Takhtajan (2009) and Metcalfe and Chalk (1950, 1979).

In transverse section, the shape of midribs was oval in outline with semicircular at the abaxial side and crescent-shape at adaxial side. The epidermal cell of midrib was one layered, outermost and parenchymatous. The ground tissue was composed of outer collenchymatous cells and inner parenchymatous. The vascular bundles of midrib were oval shaped and collateral type. This character agreed with Esau (1965).

In transverse section, the shape of petioles was semicircular shaped in outline. The ground tissue of petiole was differentiated into collenchymatous and parenchymatous. The vascular bundle was of collateral type. This character agreed with Esau (1960) and Metcalfe and Chalk (1950).

In this study, the transverse section of stem was circular in shape. Large air cavities were observed only in ground tissue. The ground tissue is composed of cortex, endodermis, pericycle and pith. Cortex is composed of outer collenchymatous and inner parenchymatous cells. Endodermis is the inner most layer of the cortex and composed of one layered of parenchymatous cell. Pericycle is composed of sclerenchymatous cells. The vascular bundles are arranged in ring and collateral. This observation agreed with that of Esau (1960) and Metcalfe and Chalk (1950).

In transverse section, the shape of root is circular. The cortex layer of root consists of only parenchymatous cortical cells arranged in radial rows associated with large air cavities, central pith surround by a core of xylem. This finding character agreed with Min Htay Wai Lin (2015).The morphological characters of *Eclipta alba* (L.) Hassk., studied in this work were useful in identification of the flowering plants and its anatomical characters and phytochemical constituents might also support in identification.

According to literature (Neerja, 2012), the *Eclipta alba* (L.) Hassk., of the leaf juice used as tonic for jaundice and leaf paste is applied on the affected area for toothache. It is also good for disease of the spleen, stomatitis, toothache, hemicranias, fever, pain in the liver. It is juice in combination with honey that is used for catarrh. Moreover, the medicinal properties of this plant include anti-inflammatory, antioxidant, hepatoprotective, immunomodulatory, hair growth and wound healing activities. Anti HIV-I in activity provides support for the beneficial effect of using this plant in AIDS treatment. The present research, the chemical constituents of studied plant was showed the presence of Alkaloid, Glycoside, Reducing sugar, Saponin, Tannin, Carbohydrate, Terpenoid, steroid, α -amino acid, Starch, protein, Flavonoid and Phenol.

So, in this present study, this paper was informed for further pharmacological and therapeutical evaluation along with the standardization of these plant materials. The future research of this plant should also be made in the field of detailed pharmacognosy.

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References

- Berlyn G.P. and J.P.Miksche. (1976): **Botanical microtechnique and Cytochemistry**. The Iowa State University. British Pharmacopoeia, (1968): **The Pharmaceutical Press**, London and Bradford.
- Cronquist, A., (1981): **An Integrated System of Classification of Flowering Plants**. Columbia University Press, New York.
- Chopra, R. N., Nayar, S. L., Chopra, I. C., In: **Glossary of Medicinal Plants**, (SIR, publication, New Dehli, (1996, P. 1004)
- Dassanayake, M. D. (1980): **A Revised Handbook to the flora of Ceylon**. Vol.I., sponsored jointly by the University of Peradeniya, Department of Agriculture, Peradeniya, Sri Lanka and the Smithsonian Institution, washington, D.C., U.S.A.
- Esau, K. (1960): **Anatomy of seed Plant**. John Wiley and sons, Inc. New York, London.
- Esau, K. (1965): **Plant anatomy**, 2nd ed. John Wiley and sons. Inc, New York, London.
- Funk, V. A, Susanna A, Stuessy TF and Bayer RJ (2009): **Systematics, Evolution, and Biogeography of Compositae** (International Association for Plant Taxonomy, Vienna, Austria).
- Hooker, J. D. (1885). **Flora of British India**. Vol. III L. Recve&Coltd. London.
- Hundley, H. G. & Chit KoKo, (1987): **List of trees, shrubs, herbs and principal climbers, etc**. Fourth the revised edition, ShweDawOo press, Mayargon, Rangoon, Burma.
- Karthikumar. S., Vigneswari, K and Jegatheesan, K, (2007): **Screening of antibacterial and antioxidant activities of Leaves of *Eclipta prostrata* (L.)**. Scientific Res. & Essay. 2 (4): 101-104.

- Kress and Yin YinKy, Daw, (2003): **A checklist of the trees, shrubs, herbs and climbers of Myanmar**, Department of Systematic Biologh-Botany, National Museum of Natural History Washington, DC.
- Metcalf, C. R and L. Chalk, (1950): **Anatomy of the Dicotyledons: Leaves, Stem and Wood in relation Taxonomy with notes on Economic uses**. The Clarendon press, Virginia.
- Metcalf, C. R & L. Chalk, (1979): **Anatomy of Dicotyledons**. Vol. I. Second Edition. Oxford University Press, New York.
- Min HtayWai Lin, (2015): **Morphological and Anatomical Characteristics of Tribe Heliantheae growing in Mandalay region**. PhD Thesis. Department of Botany, University of Mandalay.
- Neerja, P. V. and Maragaret, E.(2012): *Eclipta alba* Hassk. **A valuable medicinal herb**. Internal. J. Curr. Pharm. Rev & Res., 2 (4): 188-197.
- Peraman, M. K., Ramlingam, P. and Sai, J. (2011): **Anti-inflammatory and antimicrobial activities of the extracts of *Eclipta alba* leaves**. European J. EXP. Biol., 1 (2): 172-177.
- Takhtajan, A. (2009): **Flowering Plants**. 2nd ed. Springer Science and Business Media B. V. Germany.
- Throat, R. M., Jadhav, V. M., Gaikwad, D.D and Jadhav, S. L., (2010): **Phytochemical and pharmacological potential of *Eclipta alba*: A review**, Internal. Res. J. Pharm., 1 (1): 77-80.
- Trease and Evans, (1978): **Pharmacognosy**. 11th ed. Baillere Tindoll, London.