TAXONOMIC STUDY ON TWENTY-THREE SPECIES OF FAMILY ASTERACEAE FROM KANBALU AND KATHA DISTRICTS*

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Abstract

The taxonomic studies on the family Asteraceae from Kanbalu and Katha Districts in Sagaing Region were undertaken. In the present study, 23 species belonging to 15 genera of family Asteraceae were collected, studied and identified during December 2019 to October 2020. One species each from the genera *Acilepis, Cosmos, Dichrocephala, Elephantopus, Gnaphalium, Parthenium, Tithonia, Sonchus,* two species from genera *Acmella, Blumea, Conyza, Pseudognaphalium, Sphaeranthus* and *Youmgia,* three species from the genus *Emilia* were collected. From various habitats. Homogamous discoid capitula are found in 8 species. Heterogamous capitula are found in 15 species. Among them, 10 species possess disciform capitula and 5 species were radiate capitula. The characteristics of the family and detail descriptions of individual species are described with relevant photographs.

Keywords: Asteraceae, discoid, disciform, radiate, Capitulas.

Introduction

Asteraceae or Compositae (commonly referred to as the aster, daisy, composite or sunflower family) is a very large and widespread family of flowering plants. Asteraceae is an important economical, horticultural and ornamental family. The family Asteraceae has many distinct characters such as various shapes of leaves, capitula, anthers, achenes and pappus.

The Asteraceae is known by the aggregated flowers often occurring at the ends of branches or stems. Aggregation of flowers occurs on usually flat surface called receptacle. It is also referred to as the banner of the family Asteraceae. Useful characters about the receptacle may be derived by studying texture, shape (flat, convex, conical, color), presence/ absence of bracts these often observed by removing a few florets, bract size, shape, pubesence and sometimes color (Tadesse 2015).

Parthenium hysterophorus L. commonly called as congress grass is among the top ten worst weeds of the world. It is widely occurring and occupied almost all the parts of world such as in Asia, Africa, Australia and the Pacific (Monika 2014).

There are very few research paper concerning the family Asteraceae in Sagaing Region. Therefore, research on the morphological characters of this family from Sagaing Region was carried out.

The aim is to fulfill the information of taxonomical distinct characters found in Asteraceae for future research works. The objectives of the present study are to classify and identify the members of Asteraceae from Kanbalu and Katha Districts, to examine and record the differences between morphological characters of collected species.

Materials and Methods

Some species of Asteraceae were collected from Kanbalu and Katha Districts during December 2019 to October 2020. Plant parts including leaves, inflorescence, flowers and fruits

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were collected and recorded in field notes. Habit and distinctive parts of the specimens were recorded by photographs and the specimens were kept immediately into the plastic bags for further study.

Identification of genera and species were carried out by referring to Backer (1965), Dassanayake (1980), Hooker (1881), Jeffery and Kadereit (2007), Qi-ming and De-hin (2009), Wu *et al.* (2013), Monika (2014), Titiek *et al.* (2015). Myanmar names were checked by Hundley and Chit Ko Ko (1987) and Kress *et al.* (2003).

All the collected specimens were identified and described with their characters. The tribe, genera and species of Asteraceae are arranged according to Jeffery and Kadereit (2007).

The present research work deals with the taxonomic study on Asteraceae growing in Sagaing Region. The species were collected from Kanbalu and Katha Districts during December 2019 to October 2020 and 23 species belonging to 15 genera of family Asteraceae were recorded. Kanbalu District is located between 23° 12' 0" North Latitudes and 95° 30' 0" East longitude. Katha District is extended between N 24° 10' 56" North Latitudes and 96°19' 50" East longitude.

The collected species of this family were classified and identified according to the type of capitula, shape of involucres, phyllaries, receptacles, type of florets and stamens. The genera and species of this family Asteraceae have been arranged tribes.

Results

In this present study, 23 species belonging to 15 genera of the family Asteraceae have been recorded, studied and identified.

1. Taxonomic Description

1.1 ***Elephantopus scaber*** L., Sp.Pl.2: 814. 1753. (Figure 1)

E. cernuus Vell., Fl. Flum.8: t. 148. 1825.

Myanmar name : Sae ta pin, sin ta zi

English name : Unknown

Flowering period : September to December

Perennial erect herbs densely hirsute stems from woody rootstock, dichotomously branched at the upper portion. Leaves simple, alternate, petiolate; lower leaves in a radical rosette, blades oblong-obovate, cauline leaves sessile, attenuate at the base, crenate- serrulate along the margin, obtuse or rounded at the apex. Inflorescence cluster of heads, axillary or terminal, all stalks surrounded by 3 broadly ovate bracts or 4 leaf- like bracts. Capitula homogamous, discoid, purple, sessile; involucre cylindric- oblong, 2 seriate, green. Receptacle flat, epaleaceous. Florets all tubular, about 4 florets per capitulum, bisexual, corolla linear- lanceolate, 5- lobed; pale purple. Stamens 5, exserted; anthers pale yellow, Ovary oblong- conical, whitish spreading hairs, style exserted; stylar arms linear with obtuse tip. Achenes oblanceolate, ribbed, brown. Pappus 5 or 6, dirty- white, dilated and scaly at base, persistent.

1.2 ***Acilepis squarrosa*** D. Don, Prodr. Fl. Nepal.169.1825. (Figure 2)

Vernonia squarrosa (D. Don) Less., Linnaea 6:627.1831.

Myanmar name : Pan ta tae

English name : Unknown

Flowering period : December to March

Perennial erect herbs; stems terete, hardly, branched, tough. Leaves simple, alternate, petiolate, blades linear- oblong, attenuate at the base, serrate to serrulate along the margin, gradually acuminate at the apex, vines prominent. Inflorescence in the terminal solitary. Capitula terminal, homogamous, discoid, light purple, sessile; involucre many seriates, light green. Receptacle flat, epaleaceous. All florets, many florets per capitula, bisexual, 5 lobed, corolla tube infundibuliform, of peripheral florets curved outside, pale purple. Stamens 5, exserted; anthers whitish, Ovary cylindrical, distinctly ribbed; style exserted, pubescent; stylar arms branches elongate curved with acute tip. Achenes oblong with basal acute end, ribbed, brown. Pappus many, dirty white, bristle.

1.3 *Youngia conjunctiva* Babc. & Stebbins Publ.Carnegie.Inst.Wash.484:37.1937. (Figure 3)

Lactuca erythrocarpa Vaniot, Bull. Acad. Int. Geogr. Bot. 12:319. 1903.

Myanmar name : Unknown

English name : Unknown

Flowering period : February to August

Annual erect herbs; stem leaves none or few, similar to rosette leaves, branched apically or from near base. Leaves simple, basal leaves oblanceolate, base attenuate into a petiole- like portion, lateral lobes 1 to 3 pairs, blades lyrate pinnatisect; 4 lobes, obtuse at the base, dentate along the margin, acute at the apex. Inflorescence terminal paniculiform corymbose. Capitula homogamous, ligulate, yellow, pedunculate; involucre cylindric to campanulate, 2- seriate, green; outer phyllaries triangular, inner phyllaries 6 to 8, linear, dark to blackish green, apex acute. Receptacle small flat, epaleaceous. All ligulate, bisexual, ligules 4 lobed, yellow; style exserted. Stamens 5, exserted; anthers brown. Ovary ovoid, stylar arms linear, hairy, yellow. Achenes fusiform, slightly compressed, brown. Pappus few, white.

1.4 *Youngia japonica* (L.) DC., Prodr.7(1):194.1838. (Figure 4)

Lactuca erythrocarpa Vaniot, Bull. Acad. Int. Geogr. Bot. 12:319. 1903.

Myanmar name : Unknown

English name : Unknown

Flowering period : February to August

Annual erect herbs; stem terete, solitary, and branched from base. Leaves simple, basal leaves oblanceolate, base attenuate into a petiole- like portion, lateral lobes 1 to 3 pairs, elliptic to narrowly elliptic, upper lobe largest, blades lyrate pinnatisect; 4-5 lobes, obtuse at the base, dentate along the margin, acute at the apex. Inflorescence terminal paniculiform corymbose. Capitula homogamous, ligulate, yellow, pedunculate; involucre cylindric, 2-seriate, pale green; outer phyllaries triangular- ovate, inner phyllaries 6 to 8, linear, thickened at the base, green. Receptacle small flat, epaleaceous. All ligulate, bisexual, ligules, 5 lobed, yellow, style exserted, stylar arms with acute tip. Stamens 5, exserted; anthers brown. Ovary ovoid; style exserted, pubescent; stylar arms linear, hairy, yellow. Achenes fusiform, ribbed, slightly compressed, brown. Pappus few, white.

1.5 *Sonchus arvensis* L., Sp.Pl. 2: 793.1753**.** (Figure 5)

S. wightianus DC. Prodr.187. 1753.

Myanmar name : Unknown

English name : Unknown

Flowering period : June to December

Annual, erect herbs; stem erect and branched above, terete, hairs, hollow, milky latex present. Leaves simple, alternate, sessile, lower leaves runcinate-spinous- toothed cauline with a large terminal lobe, upper leaves all oblong, sagittate the base, acutely shortly dentate along the margin, acuminate at the apex. Inflorescence terminal, combined into widely branched corymbs. Capitula homogamous, ligulate, yellow, pedunculate; involucres campanulate, many seriate. Receptacle slightly concave, epaleaceous. Florets all ligulate bisexual; corolla liguliform, 4 lobed, yellow. Stamens 5, exserted, anther yellow, Ovary oblong, style exserted, stylar arms curved with acute tip, white. Achene oblong, 5-ribbed. Pappus numerous, white.

1.6 ***Emilia fosbergii*** Nicolson. Phytologia 32:34. 1975. (Figure 6)

Myanmar name : Unknown
English name : Unknown
Flowering period : November to March

Annual, erect ascending herbs; stem and no branches, terete. Leaves simple, alternate, petiolate; blade broadly ovate to oblanceolate, upper leaves smaller, elliptic- oblong, sessile, cordate at the base, dentate or entire along the margin, obtuse at the apex. Inflorescence terminal, few capitula, branched with 2-3 capitula. Capitula homogamous, discoid, pedunculate, purple; involucre linear or cylindrical; bracts 1 seriate, green. Receptacle concave, epaleaceous. Floret tubular, bisexual, corolla tube narrowly, filiform-funnel shaped, 5 lobed, purple. Stamens 5, inserted, anther pale yellow without the top purple. Ovary oblong, style, inserted, stylar arms linear with obtuse tip. Achene oblong, 5 ribbed, the ribs grooved, brown. Pappus many, white, capillary hairs.

1.7 ***Emilia prenanthoidea*** DC. Prodr. 6. 303; (1837) (Figure 7)

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

Annual, erect ascending herbs; stem, terete, slender and no branches. Leaves simple, alternate, sessile; blade broadly ovate to oblanceolate, upper leaves smaller, linear- oblong, sessile, broadly auricled at the base, entire along the margin, obtuse or acute at the apex. Inflorescence terminal, few capitula, branched with 1-2 capitula. Capitula homogamous, discoid, pedunculate; purple; involucre linear or cylindrical; bracts 1 seriate, green. Receptacle concave, epaleaceous. Floret tubular, bisexual, corolla tube narrowly, filiform-funnel shaped, lower half filiform, upper half gradually widen, 5 lobed, purple. Stamens 5, inserted, anther pale white, with the top purple. Ovary oblong; style, inserted, stylar arms linear with obtuse tip. Achene oblong, 5 ribbed, the ribs grooved, brown. Pappus many, white, capillary hairs.

1.8 ***Emilia sonchifolia*** (L.) DC., var. Scabras, Hook. f. 3:336.1881. (Figure 8)

E. scabra DC. Prodr. (A.P.de Candolle) 6 303: 1838.

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

Annual, erect herbs; stem, terete, slender. Leaves simple, alternate, sessile, blade lyrate-pinnatifid, upper leaves smaller, elliptic- oblong, lower leaves all radical scaberulous, basal lobed 2 to 4 irregular pairs, forming winged petiole, cordate at the base, dentate or entire along the margin, obtuse at the apex. Inflorescence terminal, few capitula, branched with 3-4 capitula.

Capitula homogamous, discoid, cylindrical, pedunculate; purple; involucre campanulate, 1 seriate, green. Receptacle flat, epaleaceous. Floret tubular, bisexual, corolla tube narrowly, filiform-funnel shaped, 5 lobed, purple. Stamens 5, inserted, anther white with a purple top. Ovary oblong, style, inserted, stylar arms linear with obtuse tip. Achenes prismatic, 5 ribbed, the ribs grooved. Pappus many, white, soft.

1.9 *Gnaphalium pulvinatum* Delile, Descr. Egypte, Hist. Nat.266, Pl. 44, f. 1. 1813. (Figure 9)

Filago prostrata DC. in Wight, Contrib.22.1837.

Myanmar name : Unknown

English name : Unknown

Flowering period : December to March

Annual decumbent herbs, woolly; stem very many spreading from the root and branches, terete, glandular whitish pubescent. Leaves simple, alternate, sessile; blades oblanceolate, attenuate at the base, entire along the margin, acute at the apex. Inflorescence axillary or terminal cyme. Capitula very small, globose, in the terminal short spike or sessile, heterogamous, disciform, immersed in wool, yellow; involucre campanulate, 2 seriate, green. Receptacle convex, epaleaceous. The outer florets, numerous, female, filiform, yellow; ovary oblong, style exserted, stylar arms with obtuse tip, yellow. Disc florets, few, bisexual, corolla narrowly infundibuliform, 5-lobed; yellow. Stamens 5, inserted; anthers yellow, Ovary elliptic, style exserted, stylar arms short and flat with truncate tip. Achenes elliptic, brown, minutely curved hairy. Pappus few, denticulate.

1.10 *Pseudognaphalium hypoleucum* (DC.) Hilliard & B.L. Burtt, Bot. J. Linn. Soc. 82(3):205.1981. (Figure 10)

Gnaphalium hypoleucum DC., Contr. Bot. India 21. 1834.

Myanmar name : Unknown

English name : Unknown

Flowering period : December to March

Annual decumbent herbs, woolly; stem and branches, terete. Leaves simple, alternate, sessile; blades linear to oblong, auriculate at the base, entire along the margin, acute at the apex. Inflorescence numerous in dense terminal corymbose clusters. Capitula very small, globose, in the terminal short spike or sessile, heterogamous, disciform, immersed in wool, yellow; involucre campanulate, 3-4 seriate, green. Receptacle convex, epaleaceous. The outer florets, numerous, female, filiform, yellow. Disc florets, few, bisexual, corolla narrowly infundibuliform, 5- lobed; yellow. Stamens 5, inserted; anthers yellow. Ovary oblong; style inserted, stylar arms short and flat with truncate tip. Achene oblong, yellowish brown, minutely curved hairy. Pappus few, denticulate, pale yellow.

1.11 *Pseudognaphalium biolettii* Anderb., Opera Bot. 104:147.1991**.** (Figure 11)

Dichrocephala latiflolia DC.in Guill., Archiv. Bot. 2: 518. Et. Prod.5: 372. 1836.

Myanmar name : Unknown

English name : Unknown

Flowering period : January to May

Perennial erect herbs; stem woody near base and usually stout branched, terete, spreading finely whitish pubescent. Leaves simple, alternate, sessile and widely clasping the stem at the base with ear-shaped appendages; blades lanceolate-oblong, clasping at the base, crisped along the

margins, acute at the apex. Inflorescence corymbs on terminal branchlets. Capitula small, terminal panicles, heterogamous, disciform, globose, immersed in wool, sessile, white; involucre bell-shaped, 4-5 seriate, white. Receptacle convex, epaleaceous. The outer florets, numerous, female, filiform, yellow. Disc florets, bisexual, corolla tubular funnel-shaped, 5 lobed; green or greenish-yellow. Stamens 5, inserted; anthers yellow, Ovary oblong, pale brown; style inserted, stylar arms linear. Achene oblong, pale yellow. Pappus many, fine, hairs.

1.12 ***Dichrocephala bicolor*** Schltdl., Linnaea 25(4):209. 1853. (Figure 12)

Dichrocephala latiflolia DC.in Guill., Archiv. Bot. 2: 518. Et. Prod.5: 372. 1836

Myanmar name : Unknown

English name : Unknown

Flowering period : February to July

Annual erect herbs; stem and usually branched, terete, creeping at the base. Leaves simple, alternate, petiolate, with narrowly winged, blades lyrate- pinnatifid, attenuate at the base, irregularly serrate or crenate-dentate along the margins, acute at the apex. Inflorescence axillary or terminal solitary. Capitula small, in terminal panicles, heterogamous, disciform, globose, pedunculate; involucre campanulate, 2 seriate, green. Receptacle obconical, elevate and flattened at the apex, epaleaceous. The outer florets, numerous, female, corolla tube curved with 3 lobed, greyish- white. Disc florets, few, bisexual, corolla tubular funnel-shaped, 4 lobed; green or greenish-yellow. Stamens 4, inserted; anthers yellow, Ovary obovate, pale brown; style exserted, stylar arms linear. Achenes obovate pale brown. Pappus lacking or bearing 2minute hairs.

1.13 ***Conyza adenocarpa*** Dalzell. & A. Gibson., Bombay. Fl. 125. 1861. (Figure 13)

Conyza adnata HBK., Nov. Gen.et Sp.4: 74. Mexic. 1832.

Myanmar name : Unknown

English name : Unknown

Flowering period : December to February

Annual erect aromatic herbs, stem sometime woody below and no branched, terete. Leaves simple, alternate, sessile; blades oblong, ovate-spatulate, semi-amplexicaul at the base, irregularly serrate and spinescent along the margin, acute or apiculate at the apex. Inflorescence axillary or terminal solitary. Capitula arranged in corymbose cymes at terminal or in upper leaf- axils, heterogamous, disciform, pedunculate; yellow; involucre campanulate, 3-4 seriate. Receptacle convex, epaleaceous. The outer florets, numerous, female, filiform, 2- 3 lobed, yellow. Disc florets, bisexual, corolla narrowly infundibuliform, 5 lobed, yellow. Stamens 5, exserted; anthers yellow. Ovary obovate, style exserted, stylar arms linear, yellow. Achene obovate, brown. Pappus white, deciduous.

1.14 ***Conyza japonica*** (Thunb.) Less. Prod.5:383.1386. (Figure 14)

Erigeron japonica Thunb. 754.1784.

Myanmar name : Unknown

English name : Unknown

Flowering period : December to February

Annual erect herbs; stems usually branched at the very base, terete, spreading finely whitish pubescent. Leaves simple, alternate, sessile; blades oblong- ovate, petiolate, attenuate at the base, crenate- dentate along the margin, obtuse and apiculate at the apex, dark green above, pale green below. Inflorescence terminal cyme. Capitula few together in shortly compactly corymbose

terminal cyme, heterogamous, disciform, purple; pedunculate; involucre urceolate, 2- 3 seriate, green. Receptacle flat, epaleaceous. The outer florets, numerous, female, filiform, pale purple. Disc florets, 5 to 15 florets per capitulum, bisexual, corolla tubular narrowly infundibuliform, 5 lobed; pale purple. Stamens 5, inserted; anthers pale yellow. Ovary oblaceolate, white; style inserted, stylar arms linear, yellow. Achene oblanceolate, with few white hairs, pale brown. Pappus few, white.

1.15 ***Blumea junghuhniana*** (Miq.) Boerl. Handl. Fl. Ned. Ind. 2(1):2391891 (Figure 15)

Blumea balsamifera DC. var. macrocephala Kitam. 344. 1941.

Myanmar name : Unknown

English name : Unknown

Flowering period : December to February

Annual erect subshrub; stem woody at base and upper branches of panicles sparsely, terete. Leaves simple, alternate, more or less petiolate; blades oblong -ovate to oblong- lanceolate, pinnatifid- lobed, attenuate at the base, coarsely dentate along the margin, apiculate at the apex. Inflorescence in dense terminal pyramidal panicles. Capitula aggregated in axil or at branch terminal, heterogamous, disciform, pale purple, pedunculate; involucre campanulate, 5 seriate, pale green. Receptacle flat, except the center slightly concave, epaleaceous, glabrous. The outer florets, tubular, female, corolla tube filiform, 2-3 lobed, yellow. Disc florets, few, bisexual, corolla narrowly funnel-shaped, 5 lobed, yellow. Stamens 5, exserted; anthers pale yellow. Ovary oblong, pale white; style exserted, stylar arms linear, yellow. Achenes oblongoid, brown. Pappus hair numerous, white.

1.16 ***Blumea paniculata*** (Wall.) M. R. Almeida. Fl. Maharashta 3A:83 2001. (Figure 16)

Conyza paniculata Wall. 200 1831.

Myanmar name : Unknown

English name : Unknown

Flowering period : February to April

Annual erect herbs; stem and no branches, slender, terete. Leaves simple, alternate, petiolate; blades oblong-elliptic or ovate, attenuate or decurrent at the base, dentate along the margin, acute or obtuse at the apex, upper leaves and inflorescence bracts smaller, broadly ovate. Inflorescence large, loose, axillary or terminal panicle. Capitula aggregated in axil or at branch terminal, heterogamous, disciform, white, pedunculate; involucre campanulate, 5 seriate, green. Receptacle flat or slightly convex, epaleaceous, glabrous. The outer florets, numerous, filiform, female, corolla slender tubular, 3 lobed, yellow. Disc florets, bisexual, corolla infundibuliform, 5 lobed, yellow. Stamens 5, inserted; anthers yellow. Ovary oblong style exserted, stylar arms long, linear, bifid, white. Achene oblong, brown. Pappus numerous, whitish.

1.17 ***Sphaeranthus indicus*** L., Sp.Pl. 2: 927. 1753; Moon, Cat. 59. 1824. (Figure 17)

Sphaeranthus hirtus Willd., Sp. 3: 2395. 1804.

Myanmar name : Da- naung

English name : Unknown

Flowering period : September to March

Annual erect aromatic herbs; stem and divaricately branches, strongly scented with 4 winged. Leaves simple, alternate, sessile; blades obovate-oblong, attenuate at the base, coarsely serrate- dentate along the margin, acute at the apex. Inflorescence ellipsoid, axillary or terminal

solitary. Capitula ovoid- globose, heterogamous, disciform, pedunculate; with deeply crenate 3 wings; each capitulum sessile, purple; involucre lanceolate, 2 seriate. Receptacle solid conical, paleaceous, flat. The outer florets, female, corolla tubular filiform, 2 lobed, pale yellow. Disc florets bisexual, corolla infundibuliform, 5 lobed; yellow. Stamens 5, exserted; anthers pale yellow. Ovary oblong, brown; style exserted, stylar arms linear, purple. Achene oblong or elliptic- oblong, pale brown. Pappus absent.

1.18 ***Sphaeranthus peguensis*** Kurz ex C.B. Clarke, Compos., Ind. 97. 1876. (Figure 18)

Myanmar name : Kadu
English name : Unknown
Flowering period : October to March

Annual erect aromatic herbs; stem and branches winged. Leaves simple, alternate, sessile; blades linear- oblong, decurrent at the base, dentate obtuse coarsely serrate along the margin, acute at the apex. Inflorescence axillary or terminal solitary. Capitula clusters of broadly ovoid- globose, heterogamous, disciform, pedunculate; purple; involucre campanulate, 2-3 seriate. Receptacle conical, fistular, paleaceous, flat. The outer florets, female, corolla tubular filiform, 3 lobed, pale yellow. Disc florets bisexual, corolla infundibuliform, 5 lobed, yellow. Stamens 5, exserted; anthers purple. Ovary oblong, pale yellow; style exserted, stylar arms linear, purple. Achene oblong, brown. Pappus absent.

1.19 ***Parthenium hysterophorus*** L. FI. Andhra Pradesh 2:533. 1997. (Figure 19)

Myanmar name : Unknown
English name : Unknown
Flowering period : June to October

Annual erect herbs; stem and branches angular. Leaves simple, alternate, pinnatifid, petiolate; blades oblong- lanceolate, decurrent at the base, entire along the margin, acute at the apex. Inflorescence axillary or terminal solitary. Capitula heterogamous, radiate, white or creamy white; involucre hemispheric, ovoid- oblong, 5 series, green; phyllaries oblong. Receptacle small, convex, paleaceous. Ray florets, female, tubular 2 lobed, white or creamy white. Disc florets, male, corolla narrowly tubular, 4 lobed, creamy white. Stamens 4, inserted; anthers white. Ovary oblong, white; style inserted, stylar arms curved, white. Achenes 2 spiny, oblong or elliptic-oblong, flattened, triangular and dark brown- black with two thin, white, spoon- shaped appendages, pale brown. Pappus pale brown, persistent.

1.20 ***Cosmos caudatus*** Kunth. Nov. Gen, Sp. (Folio ed.) 4: 188.1820. (Figure 20)

Cosmos bipinnatus auct. NonCav: Trimen, Handb. Fl. Ceylon 3:40.1895.

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

Annual erect herbs with long branches; stems and branches, sub-quadrangular. Leaves compound, opposite, petiolate; blade segments linear- elliptic at the base, lateral segments 2 or 3 pairs, entire along the margin, apiculate at the apex. Inflorescence axillary or terminal solitary on long penduncles. Capitula solitary, heterogamous, radiate, pale purple, pedunculate; involucre campanulate, 2 seriate, green. Receptacle convex, epaleaceous. Ray florets, neuter, ligulate, 3- lobed; purple. Disc florets many, bisexual, corolla tube infundibuliform, 5 lobed, yellow. Stamens 5, inserted; anthers black. Ovary linear; style exserted, pubescent; stylar slender arms

linear, thickened upwards, with hairy, yellow. Achenes linear fusiform, ribbed, with hairy, dark brown or black. Pappus awns 2, divergent, linear 3, green.

1.21 ***Tithonia diversifolia*** (Hemsl.) A. Gray, Proc. Amer. Acad. Arts 19:5.1883**.** (Figure 21)

Mirasolia diversifolia Hemsl., Bot. Centr. Amer. 2: 168, t.47. 1881.

Myanmar name : Taung nay kya; Nay kya yaing

English name : Unknown

Flowering period : November to January

Perennial erect, suffruticose herbs, large and shrub; stem and branches, striate. Leaves simple, alternate, petiolate; broadly winged almost to the base; blades 3-5 lobed, trinerved and cuneate at the base, crenate-serrate along the margin, acuminate at the apex. Inflorescence axillary or terminal solitary. Capitula on long peduncles, heterogamous, radiate, pedunculate; involucre broadly campanulate, 3-4 seriate, green. Receptacle conical, paleaceous. Ray florets, neuter, 2- 3 lobed, ligulate, bright yellow. Disc florets numerous, bisexual, corolla tube cylindrical, 5 lobed, yellow. Stamens 5, inserted; anthers brown with the top yellow. Ovary oblong; style exserted, stylar arms coiled, yellow. Achene oblong, dark brown. Pappus of ligulate florets minutely scaly, those of tubular florets, 2 awns with about 6 short broad scales connate ate the base, linear- lanceolate, white.

1.22 ***Acmella paniculata*** (Wall. ex DC.) R.K. Jansen, Syst. Bot. Monoger. 8.67.1985. (Figure 22)

Spilanthes acmella var. *paniculata* (Wall. ex DC.) C. B. Clarke ex Hook. f, Fl. Brit. Inda 3: 307. 1881.

Myanmar name : Japan ne gya

English name : Unknown

Flowering period : December to March

Annual erect herbs; stem and branches, erect or prostate, green or purple, rooting at the nodes. Leaves simple, opposite, subsessile or petiolate; blades broadly ovate to ovate- triangular, attenuate at the base, dentate to coarsely dentate along the margin, acute to acuminate at the apex. Inflorescence axillary or terminal solitary. Capitula solitary, terminal, heterogamous, radiate, pedunculate; involucre ovate or elliptic, 2 seriate. Receptacle oblong, paleaceous. Ray florets, neuter, 2 lobed, yellow. Disc florets many, bisexual, corolla funnel- shaped, 5 lobed; yellow. Stamens 5, inserted; anthers black. Ovary oblong, style exserted, stylar arms curved, yellow. Achene oblong, compressed with ciliate edges, black. Pappus consisting of 2 short hairs.

1.23 ***Acmella uliginosa*** (Sw.) Cass., Dict. Sci. Nat. (ed.2)24:331.1822 (Figure 23)

Spilanthes uliginosa Sw., Prodr. (Swartz) 110.1788.

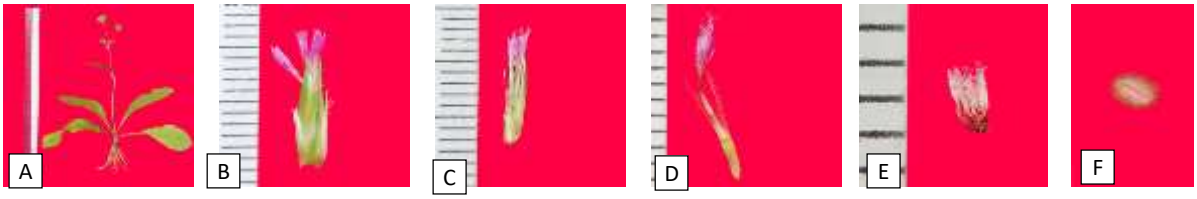
Myanmar name : Unknown

English name : Unknown

Flowering period : Throughout the year

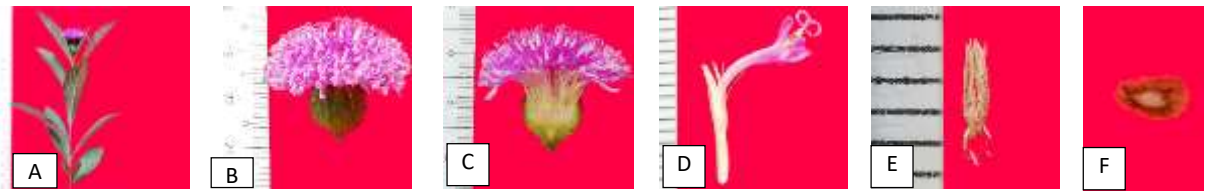
Perennial erect herbs; stems erect or ascending bright green, branches, usually decumbent and rooting from the lower nodes, terete. Leaves simple, opposite, subsessile or shortly petiolate; blades narrowly ovate or elliptic, with long petiole, attenuate cuneate at the base, subentire or undulate along the margin, obtuse or subacute at the apex, vines prominent. Inflorescence axillary or terminal solitary. Capitula terminal or subterminal, heterogamous, radiate, pedunculate; involucre broadly campanulate, 1 seriate, green. Receptacle highly conical, paleaceous. Ray florets, neuter, 3 lobed, yellow. Disc florets many, bisexual, corolla funnel- shaped, 4 lobed;

yellow. Stamens 5, inserted; anthers black. Ovary ovate, style exserted, pubescent; stylar arms, curved, broader, hairy, yellow. Achene oblong- ovate, densely ciliate on margins, no ribbed, black. Pappus 2-4 very short fine bristles from marginal cilia, pale brown.



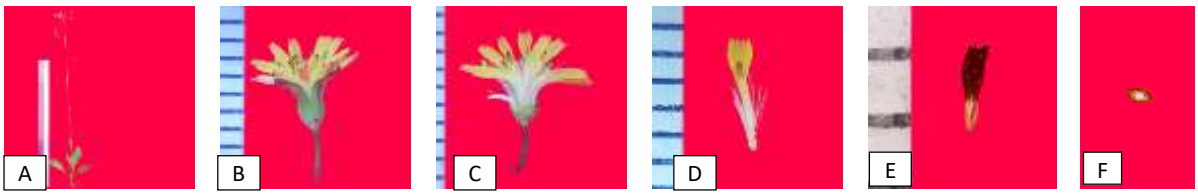
A. Inflorescence B. Capitulum C. L.S of capitulum D. Disc floret E. Stamens F. T.S of ovary

Figure 1 *Elephantopus scaber* L.



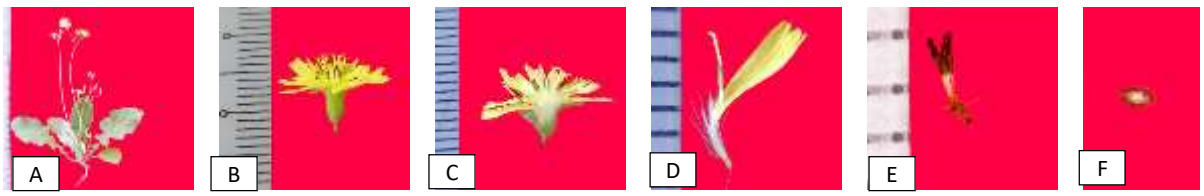
A. Inflorescence B. Capitulum C. L.S of capitulum D. Disc floret E. Stamens F. T.S of ovary

Figure 2 *Acilepis squarrosa* D. Don**.**



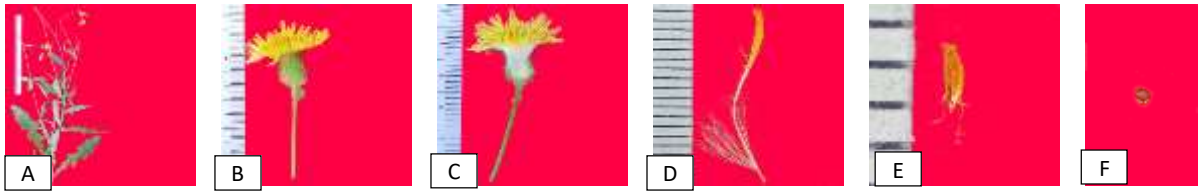
A. Inflorescence B. Capitulum C. L.S of capitulum D. Ligulate floret E. Stamens F. T.S of ovary

Figure 3 *Youngia conjunctiva* Babc. & Stebbins



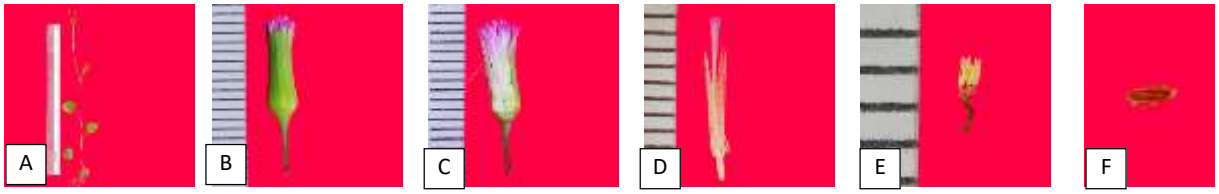
A. Inflorescence B. Capitulum C. L.S of capitulum D. Ligulate floret E. Stamens F. T.S of ovary

Figure 4 *Youngia japonica* (L.) DC.



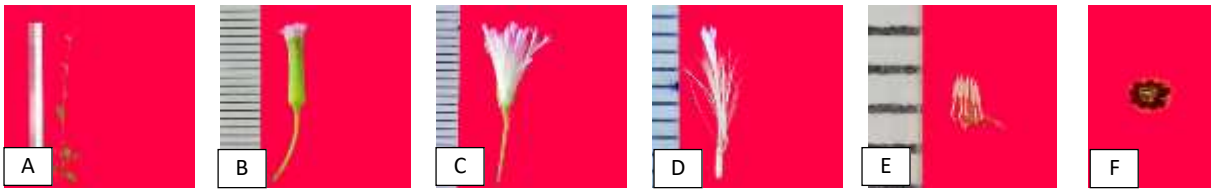
A. Inflorescence B. Capitulum C. L.S of capitulum D. Ligulate floret E. Stamens F. T.S of ovary

Figure 5 *Sonchus arvensis* L.



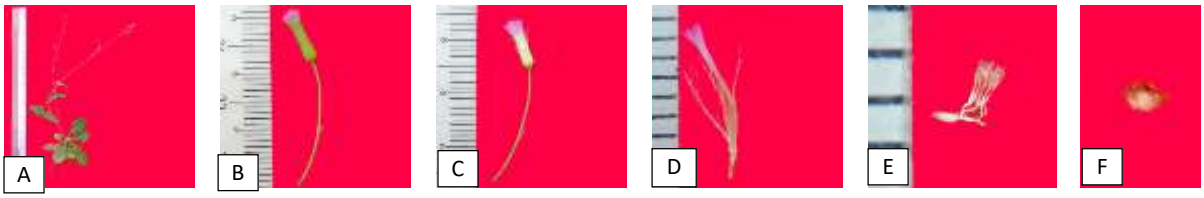
A. Inflorescence B. Capitulum C. L.S of capitulum D. Disc floret E. Stamens F. T.S of ovary

Figure 6 *Emilia fosbergii* Nicolson



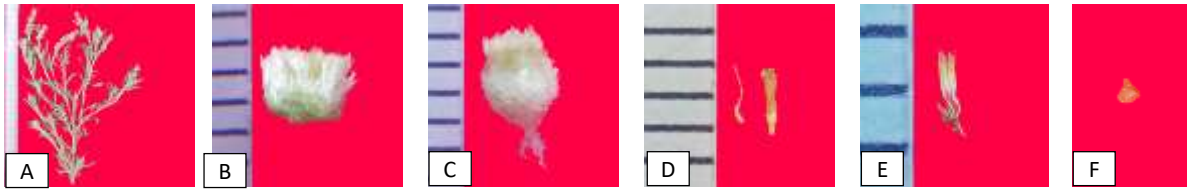
A. Inflorescence B. Capitulum C. L.S of capitulum D. Disc floret E. Stamens F. T.S of ovary

Figure 7 *Emilia prenanthoidea* DC.



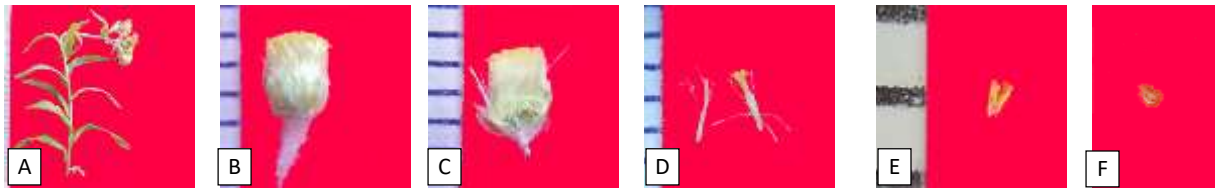
A. Inflorescence B. Capitulum C. L.S of capitulum D. Disc floret E. Stamens F. T.S of ovary

Figure 8 *Emilia sonchifolia* (L.) DC. var. Scabra



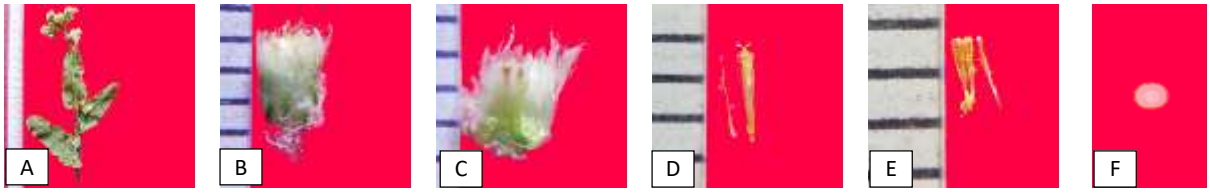
A. Inflorescence B. Capitulum C. L.S of capitulum D. Filiform & Disc floret E. Stamens F. T.S of ovary

Figure 9 *Gnaphalium pulvinatum* Delile.



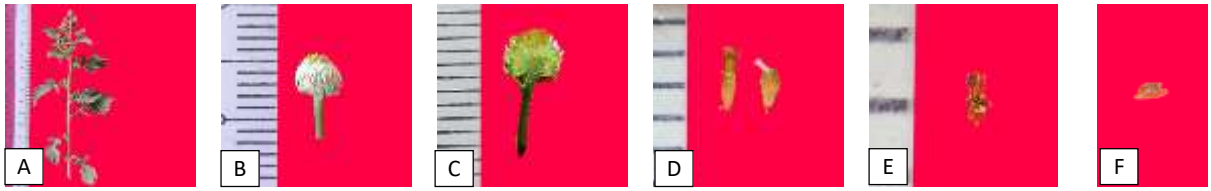
A. Inflorescence B. Capitulum C. L.S of capitulum D. Filiform & Disc floret E. Stamens F. T.S of ovary

Figure 10 *Pseudognaphalium hypoleucum* (DC.) Hilliard & B.L. Burtt.



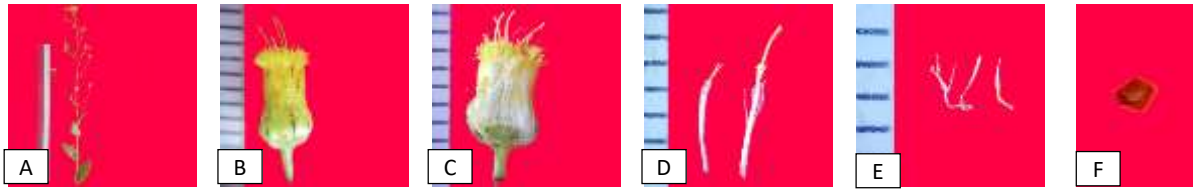
A. Inflorescence B. Capitulum C. L.S of capitulum D. Filiform & Disc floret E. Stamens F. T.S of ovary

Figure 11 *Pseudognaphalium biolettii* Anderb.



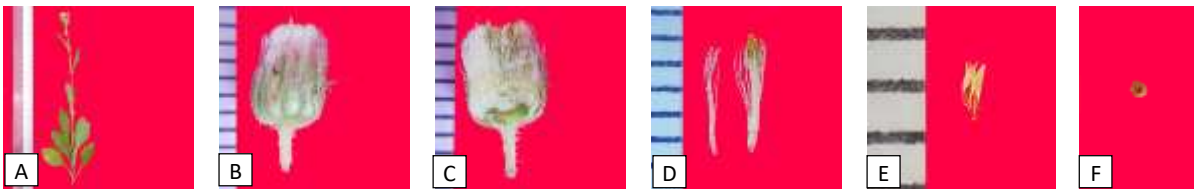
A. Inflorescence B. Capitulum C. L.S of capitulum D. Disc & Filiform floret E. Stamens F. T.S of ovary

Figure 12 *Dichrocephala bicolor* Schltdl



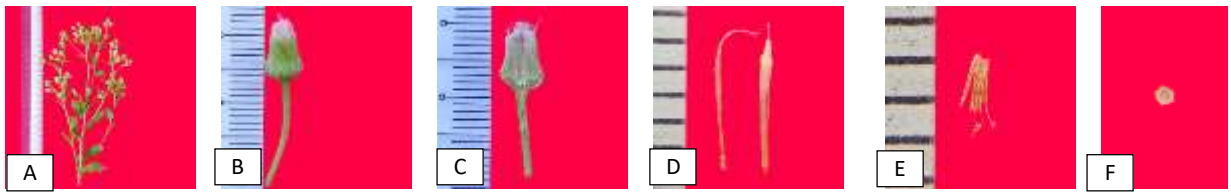
A. Inflorescence B. Capitulum C. L.S of capitulum D. Filiform & Disc floret E. Stamens F. T.S of ovary

Figure 13 *Conyza adenocarpa* Dalzell & A. Gibson.



A. Inflorescence B. Capitulum C. L.S of capitulum D. Filiform & Disc floret E. Stamens F. T.S of ovary

Figure 14 *Conyza japonica* (Thunb.) Less.

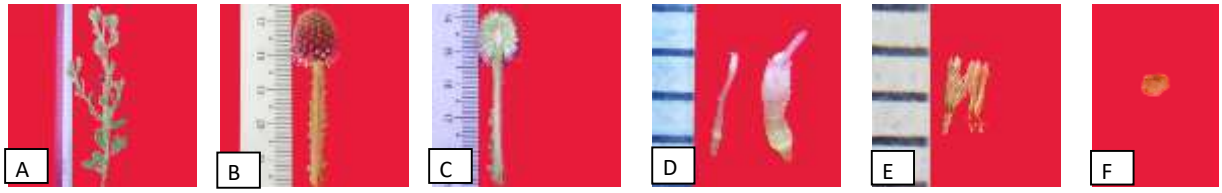


A. Inflorescence B. Capitulum C. L.S of capitulum D. Filiform & Disc floret E. Stamens F. T.S of ovary

Figure 15 *Blumea junghuhniana* (Miq.) Boerl.

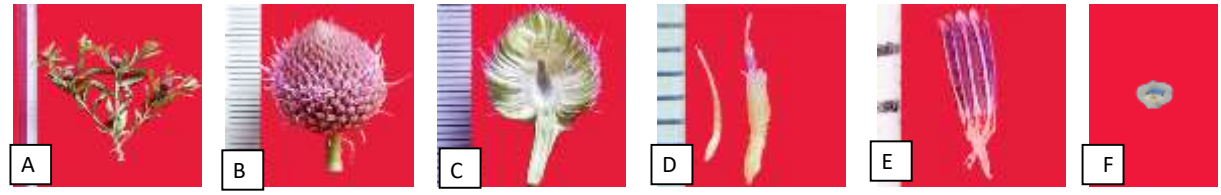
A. Inflorescence B. Capitulum C. L.S of capitulum D. Filiform & Disc floret E. Stamens F. T.S of ovary

Figure 16 *Blumea paniculata* (Wall.) M. R. Almeida.



A. Inflorescence B. Capitulum C. L.S of capitulum D. Filiform & Disc floret E. Stamens F. T.S of ovary

Figure 17 *Sphaeranthus indicus* L.

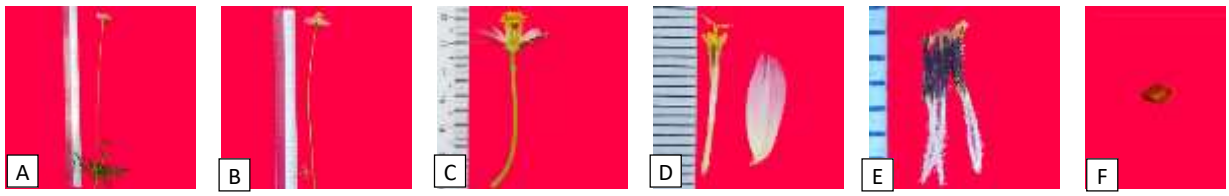


A. Inflorescence B. Capitulum C. L.S of capitulum D. Filiform & Disc floret E. Stamens F. T.S of ovary

Figure 18 *Sphaeranthus peguensis* Kurz ex C. B. Clarke

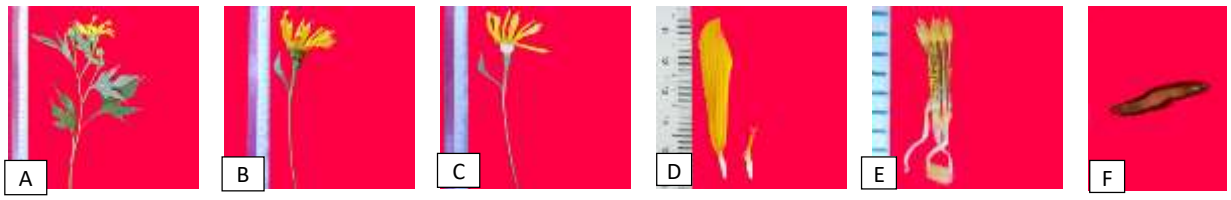
A. Inflorescence B. Capitulum C. L.S of capitulum D. Ray & Disc floret E. Stamens F. T.S of ovary

Figure 19 *Parthenium hysterophorus* L.



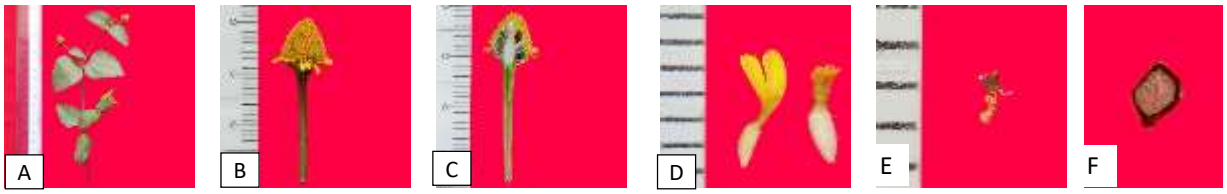
A. Inflorescence B. Capitulum C. L.S of capitulum D. Disc & Ray floret E. Stamens F. T.S of ovary

Figure 20 *Cosmos caudatus* Kunth.



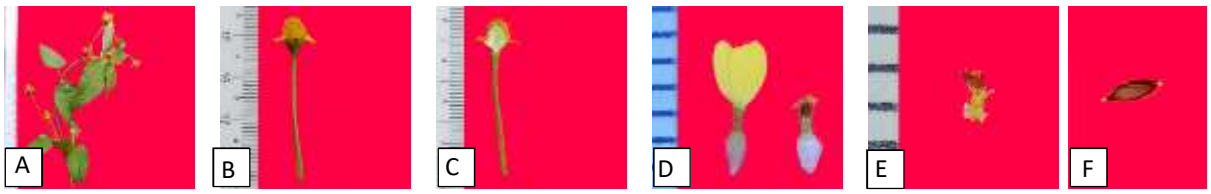
A. Inflorescence B. Capitulum C. L.S of capitulum D. Ray & Disc floret E. Stamens F. T.S of ovary

Figure 21 *Tithonia diversifolia* (Hemsl.) A. Gray



A. Inflorescence B. Capitulum C. L.S of capitulum D. Ray & Disc floret E. Stamens F. T.S of ovary

Figure 22 *Acmella paniculata* (Wall.ex.DC.) R. K. Jansen



A. Inflorescence B. Capitulum C. L.S of capitulum D. Ray & Disc floret E. Stamens F. T.S of ovary

Figure 23 *Acmella uliginosa* (Sw.) Cass.

An artificial key to the studied species

1. Capitula having male and female florets in the same capitula, white ---------- 19. *Parthenium hysterophorus*

1. Capitula having bisexual and female florets in the same capitula, purple, yellow ----------2

2. Capitula homogamous ----------3

2. Capitula heterogamous ----------10

3. Florets yellow color ----------4

3. Florets purple color----------6

4. Involucre bright many seriate, stamen yellow----------5. *Sonchus arvensis*

4. Involucre bright 2 seriate, stamen black ----------5

5. The outer phyllaries triangular, dark to blackish green ----------3. *Youngia conjunctiva*

5. The outer phyllaries triangular-ovate, green ----------4. *Youngia japonica*

6. Leaves without lobes ----------7

6. Leaves with lobes ----------8

7. Leaves base cordate; anther pale yellow without the top purple----------6. *Emilia fosbergii*

7. Leaves base obtuse; anther pale white with the top purple----------7. *Emilia prenanthoidea*

8. Leaves blade lyrate; capitula pedunculate----------8. *Emilia sonchifolia*

8. Leaves blade ovate to oblanceolate, linear-oblong; capitula sessile----------9

9. Leaves in a radical rosette; 4 florets per capitula ----------1. *Elephantopus scaber*

9. Leaves alternate; many florets per capitula ----------2. *Acilepis squarrosa*

10. Capitula radiate----------11

10. Capitula disciform ----------14

11. Leaves compound; capitula pale purple ----------20. *Cosmos caudatus*

11. Leaves simple; capitula pale yellow ----------12

12. Leaf with lobes; receptacle convex ----------21. *Tithonia diversifolia*

12. Leaf without lobes; receptacle conical ----------13

13. Annual; leaves blade broadly ovate to ovate-triangular ----------22. *Acmella paniculata*

13. Perennial; leaves blade narrowly ovate or elliptic----------23. *Acmella uliginosa*

14. Receptacle obconical; stamen 4----------12. *Dichrocephala bicolor*

14. Receptacle convex, concave or flat; stamen 5----------15

15. Capitula sessile----------16

15. Capitula pedunculate ----------18

16. Inflorescence axillary or terminal, involucre 2 seriate---------- ----------9. *Gnaphalium pulvinatum*

16. Inflorescence terminal, involucre 3-5 seriate----------17

17. Annual; leaves blade linear to oblong ----------10. *Pseudognaphalium hypoleucum*

17. Perennial; leaves blade lanceolate-oblong ----------11. *Pseudognaphalium biolettii*

18. Leaves sessile----------19

18. Leaves petiolate ----------22

19. Capitula yellow color ----------13. *Conyza adenocarpa*

19. Capitula purple color ----------20

20. Receptacle flat, capitula terminal ----------14. *Conyza japonica*

20. Receptacle conical, capitula axillary or terminal ----------21

21. Peduncle with wing; receptacle solid conical; anther yellow--------17. *Spharanthus indicus*

21. Peduncle without wing; receptacle fistular conical; anther purple----------18. *Spharanthus peguensis*

22. Stem branched; capitula purple color ----------15. *Blumea junghuhniana*

22. Stem no branched; capitula yellow color----------16. *Blumea paniculata*

Discussion and Conclusion

Homogamous capitula are found in 8 species. Among 8 species, 5 species have discoid capitula and 3 species possessed ligulate capitula. Heterogamous capitula are found in 15 species. Heterogamous type can also be subdivided into disciform and radiate capitula. Among them, 10 species possess disciform capitula and 4 species have radiate capitula.

Sphaeranthus indicus L. has stems with strongly scented 4 winged, the peduncule with deeply crenate 3 wings and yellow anther. The conical receptacle of *Sphaeranthus indicus* L. are absent fistular. These characters were in agreement with previous findings.

The leaves of *Emilia prenanthoidea* DC. and *E. fosbergii* Nicolson. were absent lobes and those of *E. sonchifolia* (L.) DC. var. Scabra were present lobes. The different characters were in agreement with Hooker (1881), Backer (1965) and Dassanayake (1980) Jeffery (2007).

In this study, the three genera were found different characters of leaves shape, anther and capitula color. The leaves of *Acmella paniculata* (Wall. ex DC.) R.K. Jansen were broadly ovate to ovate-triangular and then the stems of this species were green or purple in color. The leaves of *Acmella uliginosa* (Sw.) Cass. were found narrowly ovate or elliptic and the stems of this species were bright green. The distinct characters were agreed to those mentioned by Dassanayake (1980), Jeffery (2007), Titiek (2015) and Wilson (2015).

The capitula of *Conyza adenocarpa* Dalzell & Gibson were arranged in corymbose cymes at terminal or in upper leaf-axils and yellow color. The capitula of *Conyza japonica* (Thunb.) Less. were arranged few together in shortly compactly corymbose terminal cymes and purple color. The characters of two species including tribe Asteraceae were similar to Hooker (1881), Backer (1965), Qi-ming (2009).

Sphaeranthus peguensis Kurz. ex C.B Clarke. included tribe Inuleae has the peduncle without wings and yellow florets and purple anthers. The conical receptacle of this species is present fistular. The characters of *Sphaeranthus peguensis* Kurz ex C.B Clarke were in agreement with Naidu (2012) and Aye Aye Thin. (2017).

Parthenium hysterophorus L. have female ray florets and male disc florets, achene having spoon-shaped appendages. The species that possess these characters are similar to Naidu (2012).

The involucres of *Youngia conjunctiva* Babc. & Stebbins. were found 2 seriate and then the outer bracts of this species were triangular and dark to brackish green. The outer bracts having involucres of *Y. japonica* (L.) DC. were triangular-ovate and green in color. The characters of these two species were agreed with those mentioned by Dassanayake (1980), Wu *et al.* (2013).

The species of family Asteraceae are seed dispersal, they grow rapidly and distribute enormously. According to the field studies, members of the family Asteraceae can grow on the climate of the research from the present study. The present study can give valuable information about some member of the family Asteraceae.

Acknowledgements

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