

## Taxonomic Study of Some Selected Species in Family Fabaceae

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### Abstract

A preliminary study on eight species in the vicinity of Hinthada University was carried out from January to May in 2020. In the present report, eight selected species belonging to family Fabaceae were described. In the present research, morphological characters of eight species were presented. Habit and Inflorescences of those species were shown with color photographs. In this results, compare character data matrix of eight plant species were described. Cladogram of eight plant species were classified into two groups. Group one species (*Butea monosperma* (Lam.) Taub., *Sesbania grandiflora* (L.) Poir., *Senna alata* (L.) Roxb., *Psophocarpus tetragonolobus* (L.)DC.), advance character and Group II ( *Clitoria ternatea* L., *Samanea saman* (Jacq.) Merr., *Senna occidentalis* (L.) Link, *Tamarindus indica* (L.) primitive character were occurred.

**Keywords:** eight plant species and morphological characters, Cladogram

### Introduction

Fabaceae family includes 600 genera and 1200 species. The trees are often found in tropical region, while the herbaceous plants and shrubs are predominant outside the tropics (Website 1).

The family characters of Fabaceae are flowers, usually zygomorphic, calyx gamosepalous, 4 or 5, often unequal, petals mostly 5, free, imbricate, stamens 1- 60, free or connate, anther 2 celled, dorsifixed, ovary 1, style terminal, fruit dehiscent or indecent, leaves distichous, pinnate or bipinnate, erect or scandent herbs or shrubs or trees. (Backer, 1963)

The diagnostic characters of this family habits are annuals or perennials, stem herbaceous or woody, cylindrical, tendrils, climbers. Leaves alternate, compound of pinnate, stipulate, stipule maybe modified into leaves or thrones, parallel venation. Inflorescences are racemose or cymose, flower clusters in heads. Flowers pedicellate, actinomorphic or zygomorphic, pentamerous, hypogynous, slightly perigynous. The upper petal called the banner or standard, is large and envelope the rest of the petals in bud, often reflexing when the flower blooms. The two adjacent petals, the wings, surround the two bottom petals. The two bottom petals are fused together at the apex forming a boat like structure called the keel. The stamens are always ten in number, often in groups of nine stamens plus one separate stamen (Website 2).

Hinthada Township is located in the northern portion of Ayeyarwady Region. It is situated between Ayeyarwady River and Ngawun River. Hinthada Township lies between North latitudes 17° 26' and 17° 48' and also between East longitudes 95° 11' and 95° 33'. It is situated on the deltaic plain of Ayeyarwady Region and southern part of the Hinthada District (Department of Geography). A plant system involves relationships between plant and evolution, especially in higher levels, whereas plant taxonomy deals with actual handling of plant specimens (Website 3)

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A phylogeny is commonly represented in the form of cladogram, or phylogenetic trees, a branching diagram that conceptually represents the best estimate of phylogeny. The lines of the cladogram are known as lineages or clades. (Simpson, *et.al.*, 2006). The present study, the eight selected species are *Butea monosperma* (Lam.) Taub.(Pauk), *Clitoria ternatea* L. (Aung me nyo) *Samanea saman* (Jacq.) Merr. Thinbaw kokko, *Sesbania grandiflora* (L.) Poir. (Pauk-pan-phyu) *Senna alata* (L.) Roxb. (Pwe-gaing). *Tamarindus indica* L. (Ma gyi), *Senna occidentalis* (L.) Link kazaw-bok,

*Psophocarpus tetragonolobus* (L.) DC. (Pe zaung ya) species were thoroughly studied and identified according to the literature. The aims and objectives are to know some species of Fabaceae family, to identify scientific name, Myanmar name, English name, flowering and fruiting periods of eight species, to study the morphological character of the eight plant species.

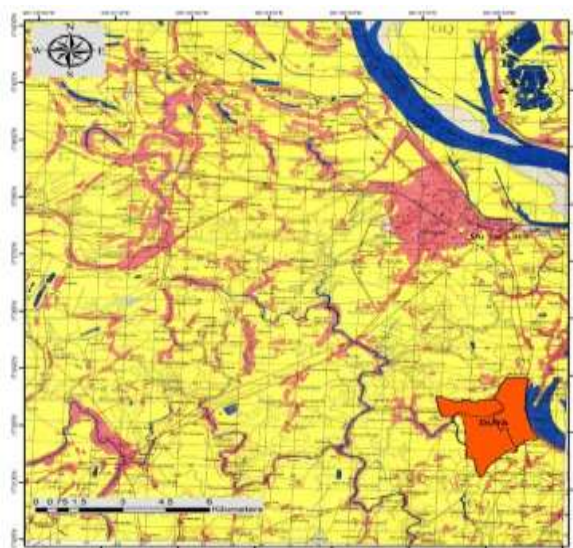


Figure (1) Location map of study area in Hinthada District

### Materials and Methods

During the research work, the eight selected species belonging to family Fabaceae were collected at Hinthada University and its surrounding area, from January to May in 2020. Identification of eight collected species was done by referring to Backer 1963-68, Dassanayake (1980-1999) and websites. All the plant species collected in this area were pressed, dried, and mounted on herbarium sheet by standard method. The eight selected plant species of morphological characters were described. Habits and inflorescences of these selected species were shown with color photographs. Besides this plant species comparable taxa and character data matrix are calculated to draw the cladogram of the eight selected plant species linked together were described.

### Results

In the present study, eight selected species belonging to family Fabaceae were found in Hinthada Township. Taxonomic characters of these species were described.

Table (1) Eight different species of Fabaceae Family

No.	Family	Scientific Name	Myanmar Name	English Name
1.	Fabaceae	<i>Butea monosperma</i> (Lam.) Taub.	Pauk	Flame of the forest
2.	Fabaceae	<i>Clitoria ternatea</i> L.	Aung me nyo	Butter fly
3.	Fabaceae	<i>Samanea saman</i> (Jacq.) Merr.	Thinbaw kokko	Rain tree
4.	Fabaceae	<i>Sesbania grandiflora</i> (L.) Poir.	Pauk-pan-phyu	Corkwood tree or Agathi
5.	Fabaceae	<i>Senna alata</i> (L.) Roxb.	Pwe-gaing	Candle bush
6.	Fabaceae	<i>Senna occidentalis</i> (L.) Link	kazaw-bok,	Coffee senna
7.	Fabaceae	<i>Tamarindus indica</i> L.	Magyi	Tamarind
8.	Fabaceae	<i>Psophocarpus tetragonolobus</i> (L.) DC.	Pe zaung ya	Winged bean

- Scientific name - *Butea monosperma* (Lam.) Taub.  
Myanmar name - Pauk  
English name - Flame of the forest  
Family - Fabaceae  
Flowering period - February to April

#### Taxonomic characters

Perennial tree; woody. Leaf compound trifoliate, exstipulate, petiolate, entire margin. Inflorescences terminal or axillary raceme; Flower bracteate, pedicellate, bracteolate, bisexual, zygomorphic, pentamerous, hypogynous. Sepals (5), synsepalous, campanulate valvate, sepeloid, persistent, inferior. Petals 5, apopetalous, papilionaceous, standard ovate – oblong, semilunar, the wings and keels as long as standard, wings elliptic, oblong, (bright, orange) petaloid, inferior. Stamens 1+(9), diadelphous, filament long, anther ditheous, introrse, dorsifixed, longitudinal dehiscence, inferior. Carpel 1, monocarpellary, marginal placentation, one ovule in each locule, style long, curved, gynophore present, stigma terminal, ovary superior. Pods flat, oblong, stipitate, tomentose, indehiscent, 2 - 5 seeds.



(a)



(b)

Figure (2) (a) Habit of *Butea monosperma* (Lam.) Taub.  
(b) Inflorescence of *Butea monosperma* (Lam.) Taub.

2. Scientific name - *Clitoria ternatea* L.  
 Family - Fabaceae  
 Myanmar Name - Aung me nyo  
 English name - Butter fly  
 Flowering Period - May to November

### Taxonomic characters

Annual, twining or scandent herbs; stems and branches pubescent. Leaves unipinnately compound, imparipinnate, alternate; stipules linear-lanceolate, pulvinus; leaflets ovate to oblong, obtuse at the base entire along the margin, pubescent on both surfaces. Inflorescences axillary and solitary cymes. Flowers bracteate, pedicellate, ebracteolate, bisexual, zygomorphic, pentamerous, irregular, hypogynous, bright violet or blue. Sepals (2+3), synsepalous tubular-campanulate, lobes subequal, lanceolate inferiors. Petals 5 apopetalous, papilionaceaeous; standard broadly ovate, violet-blue or whitish-blue with a pale yellow and white blotch centre, reflexed, puberulous, wings oblong, long-clowed; blue at the upper, pale yellow at the lower, keel small, hyaline, pale yellow, united, inferiors. Stamens 5+5 diadelphous, filaments free, filiform, anthers ditheous, longitudinal dehiscent, basifixed, uniform, inferiors. Ovary superior, oblong, monocarpellary, unilocular with few ovules on the marginal placentaion, style filiform, flattened curved, stigma glabose, hairy at the below. Fruit pods linear, flattened, dehiscent, brown. Seeds ovioid-oblong, compressed, black.



(a)



(b)

Figure (3) (a) Habit of *Clitoria ternatea* L.

(b) Inflorescence of *Clitoria ternatea* L.

3. Scientific name - *Samanea saman* (Jacq.) Merr.  
 Myanmar name - Thinbaw kokko  
 English name - Rain tree  
 Family - Fabaceae  
 Flowering period - March to June

### Taxonomic characters

Perennial tree, Leaf tripinneately compound, opposite and distichous, exstipulate, petiolate, entire margin, above, acute tip. Inflorescences umbel-shaped racemes, many flowered. Flowers bracteate, pedicel short, bracteolate, bisexual, actinomorphic, pentamerous, hypogynous. Sepals (5), synsepalous, imbricate, campanulate, (pale green)

sepaloid, persistent, inferior. Petals (5), synpetalous, corolla lobes curved, tubular, (pink) petaloid, inferior. Stamens numerous, monadelphous, filament long, anther ditheous, extrose, dorsifixed, longitudinal dehiscence, inferior. Carpels one, monocarpellary, unilocular, marginal placentation, one ovule in each locule, style long stigma simple, ovary superior. Pod indehiscent, oblong, smooth, black, separate many seeds.



Figure (4) (a) Habit of *Samanea saman* (Jacq.) Merr.  
(b) Inflorescence of *Samanea saman* (Jacq.) Merr.

4. Scientific name - *Sesbania grandiflora* (L.) Poir.

Myanmar name - Pauk-pan-phyu

English name - Corkwood tree or Agathi

Family - Fabaceae

Flowering period - June to January

**Taxonomic characters**

Small tree; Leaf alternate, paripinnately compound, exstipulate, petiolate, entire margin, oblong. Inflorescence axillary dichasial raceme, pendulous; Flower bracteate, pedicellate, bract and bracteolate linear oblong, bisexual, zygomorphic, pentamerous, hypogynous. Sepals (5), synsepalous, valvate, sepaloid, persistent, inferior. Petals 1+2+(2), apopetalous, papilionaceous, unequal, standard elliptical, wings obliquely lanceolate, keels beaked inwards, imbricate, (white) petaloid, inferior. Stamens 1+(9), diadelphous, curved, filament long, anther ditheous, introrse, dorsifixed, longitudinal dehiscence, inferior. -Carpel 1, monocarpellary, marginal placentation, ten ovules in each locule, style slender, stigma capitate, ovary superior. Fruit, linear cylindrical tetragamous, compressed slightly long pubercent. Seeds oblongoid to subreniform, brown glabrous.



Figure (5) (a) Habit of *Sesbania grandiflora* (L.) Poir.  
(b) Inflorescence of *Sesbania grandiflora* (L.) Poir.

5. Scientific name - *Senna alata* (L.) Roxb.

Myanmar name - Pwe-gaing

English name - Candle bush

Family - Fabaceae

Flowering period - December to March

#### Taxonomic characters

Deciduous shrub; Leaf paripinnately compound, alternate, acuminate at apex, stipulate, petiolate, entire margin, obovate, base rounded. Inflorescences axillary and terminal, racemes, many flowers. Flowers bracteate, pedicellate, ebracteolate, bisexual, actinomorphic, pentamerous, hypogynous. Sepals 5, aposepalous, curved, (orange colored) petaloid, unequal persistent, inferior. Petals 5, apopetalous, curved, (bright yellow colored) petaloid, inferior. Stamens 10, apostemonous, two large, 5 medium, 3 small, filament stout, anther ditheous, introrse, basifixed, longitudinal dehiscence, inferior. - Carpel one, monocarpellary, marginal placentation, one ovule in each locule, style curved, stigma simple, ovary superior. Pods sharply tetragonal, indehiscent, black, winged, many seeds.



(a)



(b)

Figure (6) (a) Habit of *Senna alata* (L.) Roxb

(b) Inflorescence of *Senna alata* (L.) Roxb

6. Scientific name - *Senna occidentalis* (L.) Link

Myanmar name - kazaw-bok

English name - Coffee senna

Family - Fabaceae

Flowering period - Throughout the year

#### Taxonomic characters

Shrub, stem erect, glabrous. Leaf paripinnately compound, alternate, rachis, base rounded, apex acute, leaflets 3-6 pairs, stipules caducous, petiolate, entire margin. Inflorescences terminal or axillary corymbose panicles; Flower bracteate, pedicellate, ebracteolate, bisexual, zygomorphic, pentamerous, hypogynous. Sepals 5, aposepalous, twisted, curved, unequal, sepeloid, persistent, inferior. Petals 5, apopetalous, imbricate, oblong-ovate, yellow petaloid, inferior. Stamens 10, apostemonous, unequal, two stamens longer than others, 3 small, filament short, anther ditheous, introrse, basifixed, porous dehiscence, inferior. Carpel 1, monocarpellary, marginal placentation, many ovules in each

locule, gynophore present, style long, stigma, simple, curved, ovary tomentose superior. Pods round or slightly flattened relatively thick.



Figure (7) (a) Habit of *Senna occidentalis* (L.) Link  
(b) Inflorescence of *Senna occidentalis* (L.) Link

7. Scientific Name - *Tamarindus indica* L.

English Name - Tamarind

Myanmar Name - Magyi

Family - Fabaceae

Flowering Period - May to July

#### **Taxonomic characters**

Perennial treeswoody, aerial, erect, cylindrical, branched. Leaves unipinnately paripinnate compound, alternate, stipule linear, caduous, petioles distinct, leaf base pulvinus, leaflets oblong, small, 10 -16 paired, glands absent. Inflorescences axillary or terminal raceme, few-flowered, flower bisexual, zygomorphic, pentamerous hypogynous. Sepals 5 lobed, valvate; Petals 5, free, yellowish green, unequal, the inner most one folded inward, 2 lateral larger, the outermost 2 reduces to scales; Stamens 10, monodelphous, fertile stamens 3, 4 staminodes reduce to scales; Ovary superior, monocarpellary unilocular, with numerous ovules on the marginal placentation. Pods oblong, Terete, indesicent brown, separate between the seeds, exocarp brittle, mesocarp pulpy fibrous, endocarp touch, 3-6 seeds.

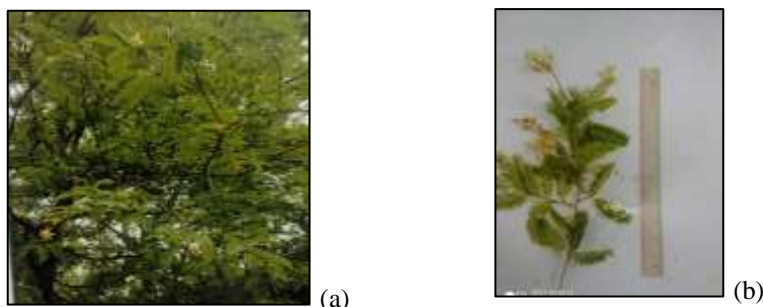


Figure (8) (a) Habit of *Tamarindus indica* L.  
(b) Inflorescence of *Tamarindus indica* L

8. Scientific Name - *Psophocarpus tetragonolobus* (L.) DC.  
 English Name - Winged bean  
 Myanmar Name - Pe zaung ya  
 Family - Fabaceae  
 Flowering Period - December to March

### Taxonomic characters

Twinning herb, perennial; leaves alternate, pinnately trifoliolate compound, exstipulate leaflet ovate, truncate at the base, acute the apex, glabrous in both surface: inflorescences axillary racemes; flowers bracteates, bracteolate, pedicellate, bisexual, irregular, zygomorphic, pentamerous, hypogynous. Sepal (5), synsepalous, campanulate, cyclic, inferior; petals (5), papilionaceous, standard orbicular, wings adhering to the keel, ovate, purple; stamens 1+(9), diadelphous, filament free and filiform, anther ditheous, dorsifixed, longitudinal dehiscence; carpel 1, monocarpellary, many ovule in each locule, marginal placentation, gynophore present, style filiform and curved, stigma globose, disc absent, superior. Pods linear oblong, green glabrous. Seeds globular or ovoid, white or pale green, smooth and shining.

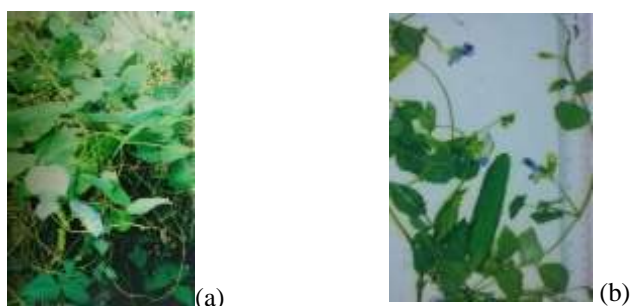


Figure (9) (a) Habit of *Psophocarpus tetragonolobus* (L.)DC.  
 (b) Inflorescence of *Psophocarpus tetragonolobus* (L.)DC.

### Cladogram analysis

The eight selected plants species are compared to describe character data matrix and cladogram are drawn to link this plant species grouping.

Table (2) Comparable taxa & character data matrix of eight plants species in fab

Taxa	Habit	Leaf arrangement	Stipule	Inflorescence	Flower symmetry	Sepals	Petal color	Stamens
<i>Butea</i> (A)	Tree	trifoliolate compound	absent	raceme	Zygomorphic	Valvate	orange	di-adelphous
<i>Clitoria</i> (B)	Herbs	unipinnately compound	present	cyme	Zygomorphic	tubular	blue	di-adelphous
<i>Samanea</i> (C)	Trees	tripinnate compound	absent	raceme	Actinomorphic	imbricate	pink	mo-adelphous
<i>Sesbania</i> (D)	small Tree	paripinnate	absent	raceme	Zygomorphic	Valvate	white	di-adelphous
<i>Senna</i> (E)	Shrubs	paripinnate	present	raceme	Actinomorphic	unequal	yellow	unequal
<i>Senna</i> (F)	Shrubs	paripinnate	present	corymbiose	Zygomorphic	twisted	yellow	unequal
<i>Tamarindus</i> (G)	Tree	Unipennate compound	present	raceme	Zygomorphic	Valvate	yellow green	mo-adelphous
<i>Psophocarpus</i> (H)	Herbs	trifoliolate compound	absent	raceme	Zygomorphic	cyclic	purple	di-adelphous

Tree, Unipennate compound, absent, raceme, Actinomorphic, unequal, white, mo-adelphous,

character = primitive(0)

Other character = advance (1)



Table (3) Taxa-number data matrix

Taxa	A	B	C	D	E	F	G	H
<i>Butea</i> (A)	0	1	0	0	1	1	1	1
<i>Clitoria</i> (B)	1	0	1	1	1	1	1	1
<i>Samanea</i> (C)	0	1	0	0	1	1	1	0
<i>Sesbania</i> (D)	0	1	0	0	1	1	0	1
<i>Senna</i> (E)	1	1	1	0	0	0	1	1
<i>Senna</i> (F)	1	1	1	1	1	0	1	1
<i>Tamarindus</i> (G)	0	0	1	0	1	1	1	0
<i>Psophocarpus</i> (H)	1	1	0	0	1	1	1	1

Table (4) Matching coefficient data matrix

Taxa	A	B	C	D	E	F	G	H
A								
B	0.4	-	-	-	-	-	-	-
C	0.7	0.3	-	-	-	-	-	-
D	0.7	0.3	0.6	-	-	-	-	-
E	0.4	0.4	0.3	0.3	-	-	-	-
F	0.4	0.6	0.3	0.3	0.6	-	-	-
G	0.5	0.5	0.6	0.4	0.3	0.3	-	-
H	0.7	0.5	0.6	0.6	0.5	0.5	0.4	-

primitive character = 0, advance character = 1

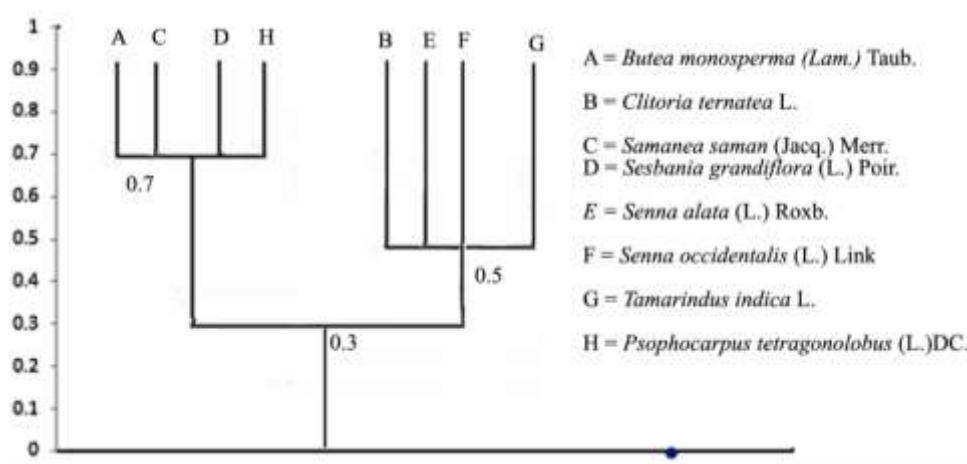


Figure (10) Cladogram of eight selected plant species

### Discussion and Conclusion

This paper presents eight species belonging to family Fabaceae which were collected in Hinthada University Campus and its environs. Fabaceae family includes 600 genera and 1200 species. It is regarded as the second largest family of dicotyledons. The family divided into 3 sub families based upon the flora character. (Website,1)

The eight selected species, *Butea monosperma* (Lam.) Taub. (pauk) (A), *Clitoria ternatea* L.(Aung me nyo) (B), *Samanea saman* (Jacq.) Merr. (Thinbaw kokko) (C), *Sesbania grandiflora* (L.) Poir.( Pauk-pan-phyu) (D), *Senna alata* (L.) Roxb (Pwe-gaing), *Senna occidentalis* (L.) Link (kazaw-bok) (F), *Tamarindus indica* L. (Magyi) (G), *Psophocarpus tetragonolobus* (L.)DC. (Pe zaung ya) (H) were described. *Butea monosperma* (Lam.) *Tamarindus indica* L. (Magyi), *Samanea saman* (Jacq.) Merr. perennial trees, pinnate trifoliolate, compound, unipinnate or paripinnate compound, marginal placentation, zygomorphic flower. *Clitoria ternatea* L. species is annual herbs, unipinnately compound. These characters agree with those mentioned (Basu, 1956 & Dassanayake).

Species (D), (E),(F) are Leaf paripinnately compound, sepals (5), petals (5), marginal placentation. These characters agree with those mention (Hooker, 1875 & Kirtikar and Basu,1956)

In the case of flower, the color of corolla is bright orange in *Butea monosperma* (Lam.), bright yellow in *Senna alata* (L.) Roxb, yellow in *Senna occidentalis* (L.), bright blue

or violet in *Clitoria ternatea* L. purple in *Psophocarpus tetragonolobus* (L.) DC. (Pe zaung ya) yellow green in *Tamarindus indica* L., pink in *Samanea saman* (Jacq.) Merr. white in *Sesbania grandiflora* (L.) Poir. were described. These characters agree with their reference (Hooker 1875, Lawrence 1961 Simon, 2007 & Dissanayake, 1991).

*Psophocarpus tetragonolobus* (L.) DC. is herbaceous, perennial, stamens diadelphous, pod linear oblong, seeds globular or ovoid. These characters agree with their reference (Kirtikar and Basu, 1956, Lawrence 1969)

Inflorescences of *Butea monosperma* (Lam.) Taub. (A), *Samanea saman* (Jacq.) Merr. (C), *Sesbania grandiflora* (L.) Poir. (D), *Senna alata* (L.) Roxb E, *Tamarindus indica* L. (G), *Psophocarpus tetragonolobus* (L.) DC. (H) were described. *Butea monosperma* (Lam.) *Tamarindus indica* L. (Magyi), *Samanea saman* (Jacq.) Merr. were found species racemose flower. This character agree with (Backer, 1963) Terminal or axillary corymbose panicles flower is found in *Senna occidentalis* (L.) Link. Inflorescences axillary and solitary cymes flower occur in *Clitoria ternatea* L. Flower characters are distinguished in the family Fabaceae because the corolla consists of standard wings, and keels. The characters of all eight species describe the equal family Fabaceae.

Cladogram represents an estimate of the pattern of evolutionary descent. Phylogenetic relationship that refers to the pathways of evolution. We present it in the form of a tree or dendrogram called a cladogram. (Simpson *et.al*, 2006). In this result, compare character data matrix of eight plant species were described. Cladogram of eight plant species were classed into two groups. Group I taxa (A, C, D, H) showed advance characters and group II (B, E, F, G) primitive characters. Two groups linked evolutionary trends a little separately. This species was contained in family Fabaceae. It is concluded that this paper gives the knowledge and information to local people and botany students applying to the survey of how these resource plants are valuable and other research paper fields were observed.

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