

## STUDY ON MORPHOLOGICAL AND HISTOLOGICAL CHARACTERS OF *FLEMINGIA STROBILIFERA* (L.) R. BR.

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### Abstract

*Flemingia strobilifera* (L.) R. Br. known as Goung- on- sa in Myanmar was collected. The morphological and histological characters were studied in flowering and fruiting period during 2014-2015. Morphological characters of *Flemingia strobilifera* (L.) R. Br. are shrub, cylindrical stem, unifoliolate leaves, axillary paniculate cymes are enclosed by concave bracts, two-seeded fruits and globoid seeds. In histological study, the leaves possess paracytic stomata on lower surface of lamina, uniseriate and glandular trichomes are present on both surfaces of lamina, midrib, petiole and stem. Vascular bundles are collateral type. Fragments of epidermal cells and stomata, trichomes, fibers, tracheids, pitted vessels, scalariformed vessels and calcium oxalate substances are found in the powdered leaves, stems and roots. Starch grains are abundantly found in roots.

**Keywords:** *Flemingia strobilifera* (L.) R. Br., Morphological and Histological characters

### Introduction

The plant *Flemingia strobilifera* (L.) R. Br. belongs to the family Fabaceae and subfamily Papilionaceae, which is known as Wild hops in English and Gaung-own-sar or Say-laik-pya or Pa-lan-phyu in Myanmar. This genus consists of 40 species in the World, 30 species in tropical Asia and Africa; 15 species in China and India and 14 species in Myanmar (Kress, 2003). *F. strobilifera* (L.) R. Br. is distributed from Bengal to south India, China, Indonesia, Laos, Malaysia, Myanmar, Philippines, Sri Lanka, Thailand, Ceylon and Vietnam (Chopra; 1956).

A decoction of the leaves is administered after childbirth and is used for bathing the body and rheumatism (Burkill, 1935). Leaves are used in the treatment of anthelmintic, tonic, rubefacient, tuberculosis and a postpartum medicine. Dried bracts are used for stuffing pillows and cushions. Roots are used in epilepsy, hysteria, to cure body pain, fever and indigestion.

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The Assamese take a small portion of the root in order to induce sleep (Chopra; 1956). In Nepal, root juice is used for diarrhoea and dysentery. In Trinidad and Tobago, it is used for kidney problem (Ghalot *et al.*, 2013). It is also against human leukemia cell line (Yuri, 2005).

In Myanmar, the roots are used to treat in epilepsy and insomnia (Ashin-nargathein, 1972).

### Materials and Methods

The specimens of *Flemingia strobilifera* (L.) R. Br. were collected from naturally growing plants in Bago Region during the flowering and fruiting period from July to March in 2014-2015. The collected fresh specimens of both vegetative and reproductive parts of the plant were identified by using Hooker (1879), Kirtikar and Basu (1975), Backer (1963), Key to the families of the flowering plants (1994) Dassanayake (1991) and Ren Sa and Michael (2010). Taxonomic descriptions were accompanied with the photograph of natural habitats, L.S of flower, T.S of ovary and parts of the plant with measurement. Herbarium specimens were also prepared and kept in the herbarium of the Department of Botany, University of Yangon.

Histological characters of leaves, stems and roots from *Flemingia strobilifera* (L.) R. Br. were examined by preparing free hand sections, the diagnostic characters of dried powdered of leaves, stems and roots have been examined and studied under microscope.

### Results

#### Morphological characters of *Flemingia strobilifera* (L.) R. Br.

Annual erect shrubs, about 3m high. Stems cylindrical. Leaves alternate, unifoliolate, stipulate, petiolate; stipules (0.4-0.9 x 0.1-0.2) cm; petiole cylindrical (0.9-1.3 x 0.1-0.4) cm; petiolule (0.2-0.3) cm long; the laminae ovate-lanceolate (4.5-8.9 x 1.9-3.2) cm, the upper surfaces rough, green, the lower surfaces smooth, pale-green, the base slightly cordate, the margins entire, the tips acute. Inflorescences axillary paniculate cymes, (6.8 x 10.5) cm. Flowers greenish yellow, papilionaceous, bracteates, bracteolate, pedicellate, complete, bisexual, irregular, zygomorphic, pentamerous, cyclic, hypogynous; bracts enveloped by large foliaceous, (2.3-4.2 x 0.5-2.3)cm, broadly rounded, shortly stalked, a short apical point, persistent: bracteole

minute, about 0.2 cm long, pedicel cylindrical, (0.1- 0.2) cm long, pale green, hairy; sepals (2+2+1), synsepalous, valvate, sepaloid, persistent, inferior; petals 1+2+(2), papilionaceous, the standard about (0.6x0.5) cm, the wing (0.3x0.4)cm, the keel (0.3x0.50) cm, imbricate; stamens 1+(9), diadelphous, stamina tube about (0.6x0.3) cm, pale green, the filaments equal, about (0.1) cm long, the anther ditheous, dorsifixed, longitudinal dehiscence; ovary superior, monocarpellary, unilocular, marginal placentation, two ovules in the locule, the styles terminal, about (0.5) cm long, pale green, the stigmas simple. Fruits two seeded capsule. Seeds globoid, dark-brown marble Fig (1-9).

**Morphological characters of *Flemingia strobilifera* (L.) R. Br.**



**Figure.1** Habit



**Figure.2** Ventral view of leaf



**Figure.3** Dorsal view of leaf



**Figure.4** Inflorescence



**Figure.5** Bract open out to show flower



**Figure.6** L.S of flower



**Figure.7** Fruit with 2-seeds



**Figure.8** Fruits



**Figure.9** Seeds

### **Histological Characters of Leaves, Stems and Roots of *Flemingia strobilifera* (L.) R. Br.**

#### **Leaves**

In surface view, the epidermal cells of both surfaces were thin-walled parenchymatous. The upper epidermal cells were polygonal and more or less rectangular in shape. The both surfaces were wavy. Stomata were not observed on the upper surface and abundant on lower surface only. They were paracytic types, oval in shaped. The guard cells were reniform in shaped and contained many chloroplasts. Uniseriate trichomes with a short basal cell and glandular trichomes were present on both surfaces. The transverse section of the leaves, the cuticles were present on both surfaces. Single layer of epidermal cells were thin-walled, parenchymatous, rectangular to oval in shaped. Epidermal cells of both surfaces were wavy. Palisade cells 1-2 layers thick, elongated, chloroplast present and spongy cells with arm 4-5 layers, irregular, intercellular spaces present, thin-walled parenchymatous cells. Vascular bundles were collateral type Fig (10-12).

#### **Midrib**

The lamina has a straight, strongly developed midrib and was convex in both surfaces. In surface view, the epidermal cells of both surfaces were thin-walled parenchymatous and elongated along the length of the midrib. In transverse section, the midrib was covered by smooth cuticle. Both upper and lower epidermal cells were barrel-shaped. Uniseriate and glandular trichomes

were located on both surfaces of the midrib. The bundles were collateral, about 7 -12 in numbers.

The xylem were arranged in rows. Each row consists of 3- large metaxylem vessels elements. The xylem were exarch. There is a large pith at the center of the vascular bundles, composing of large, thin-walled, isodiametric parenchymatous cells without intercellular spaces. There are 3-7 layers of parenchyma cells, above and below the vascular bundles. Under this about 3-5 layers of rounded or oval collenchymatous cells are found Fig (13).

### **Petiole**

In the surface view, the epidermal cells were thin-walled, rectangular to polygonal in shape and elongated along the axis. Stomata was absent. The trichomes present were similar to those found in the lamina and the midrib. They were unicellular trichomes with short basal cells and long tapering end.

In the transverse section of the petiole, 5-angle in outline. The thin cuticle, the epidermal cells one layer and barrel shaped. Collenchymatous cells 2-3 layered. Parenchymatous cells 3-5 layers. Sclerenchymatous bundle sheath 3-6 layered. Vascular bundles were 7-12 in number, phloem 4-7 layered, xylem arranged in 2-8 radial rows, each row had 2-5 cells and accessory bundles present in the ridges. The prismatic crystals were abundantly distributed throughout the cortex Fig (14-17).

### **Stem**

In the surface view, the thin cuticle, the epidermal cells were parenchymatous thin-walled and rectangular to polygonal in shaped and elongated along the length of the stem. Uniseriate and glandular trichomes were present.

In transverse section of the stem, young stem were more or less triangular or irregular in shaped. The epidermal cells were one layer, barrel-shaped, thin-walled. Collenchyma cells were 2-4 layers irregular in shaped and thin-walled. Parenchymatous cells were 2-5 layers. Sclerenchymatous cells were present as a bundle cap. Vascular bundles were collateral type Fig (18-20).

## Root

In the surface view of the epidermal cells were thin-walled and rectangular in shape. In transverse section of root, more or less circular in outline. Phellem 2-4 layers, thin-walled, tabular cells. Phellogen 8-12 layers and parenchymatous cells. Phelloderm 8-15 layers, thick-walled and lignified. Vascular bundles were radial type. Medullary rays were bi- multiseriate. Strach grains were present. Pith was absent. Prismatic calcium oxalate crystals were present Fig (21-24).

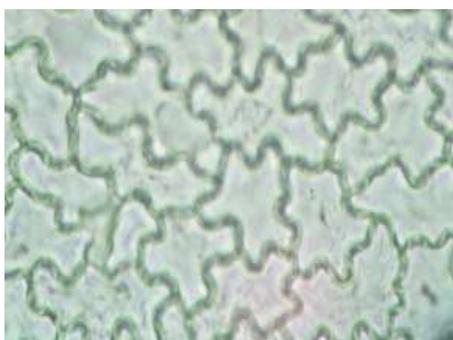
## Histological Examination of Powdered Leaves, Stems and Roots

Powdered leaves, stems and roots include fragments of epidermal cells and stomata, trichomes, fibers, tracheids, pitted vessels, scalariformed vessels and calcium oxalate crystals and starch grains Fig (25-38).

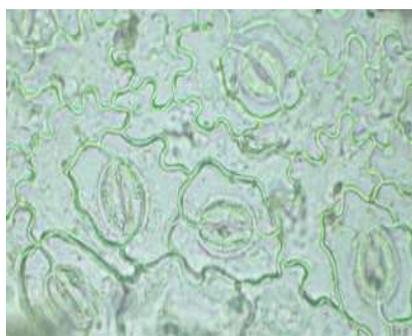
**Table (1)** Sensory Characters of Powdered Leaves, Stems and Roots

Sample Sensory characters	Leaves	Stems	Roots
Colour	Green	Light green	Light yellow
Odour	A little pungent	A little pungent	Pungent
Taste	Slightly bitter	Slightly bitter	Slightly bitter
Texture	Fibrous	Fibrous	Fibrous

## Histological Characters of *Flemingia strobilifera* (L.) R. Br.



**Figure.10** Surface view of upper epidermis (x400)



**Figure. 11** Surface view of lower epidermis (x400)



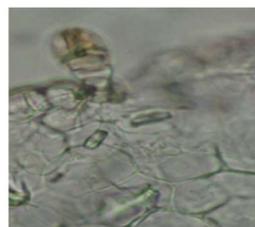
**Figure.12** Lamina (x100)



**Figure.13** T.S. of midrib (x100)



**Figure.14** Unicellular trichome of the petiole(x100)



**Figure.15** Petiole showing glandular trichome and prismatic crystals (x400)



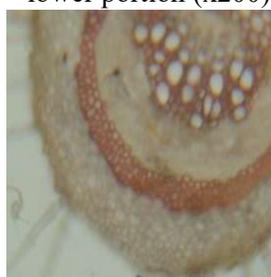
**Figure.16** Close up view of Petiole, upper portion (x200)



**Figure.17** Close up view of Petiole, lower portion (x200)



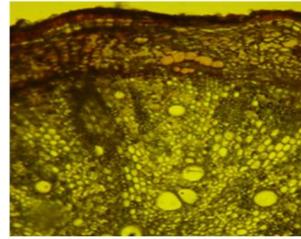
**Figure.18** T.S of stem(x100)



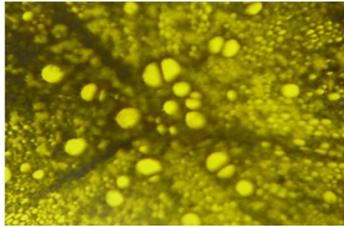
**Figure.19** Close up view Vascular bundle (x100)



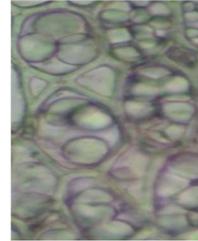
**Figure.20** T.S. of root (x100)



**Figure.21** Close up view of root (x400)

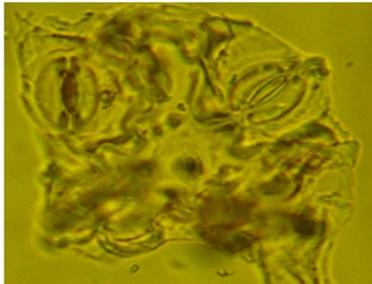


**Figure.22** Close up view of Root (central portion) (x400)

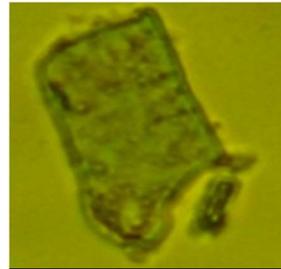


**Figure.23** Parenchyma cell with starch grains (x400)

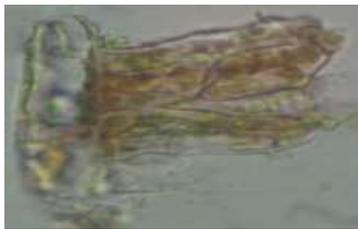
### Diagnostic Characters of Powdered Leaves, Stems and Roots



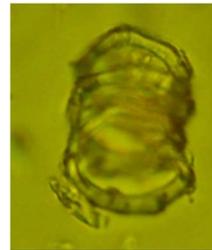
**Figure.24** Spongy cells(x400)



**Figure.25** Pitted vessels (x400)



**Figure.26** Fragment of upper epidermis and mesophyll (x400)



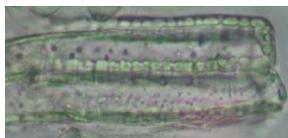
**Figure.27** Spiral vessels(x400)



**Figure.28** Parenchymatous cell (x400)



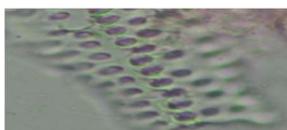
**Figure.29** Scalariform vessel(x400)



**Figure.30** Phloem (x400)



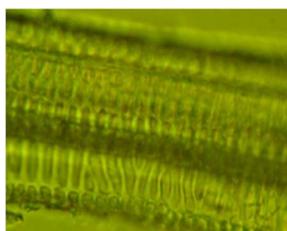
**Figure.31** Spiral vessel(x400)



**Figure.32** Pitted vessel(x400)



**Figure.33** Pitted parenchyma cell (x400)



**Figure.34** Scalariform vessel (x400)



**Figure.35** Spiral vessel (x400)



**Figure.36** Fibre (x400)



**Figure.37** Unicellular trichome

### Discussion and Conclusion

The medicinal plant *Flemingia strobilifera* (L.) R. Br. were collected from Bago region. In the present investigation, the morphological studied on both vegetative and reproductive parts of the plants were carried out. In the histological studied, the fresh and dried powdered of leaves, stems and roots had been undertaken.

In this research, the plant *Flemingia strobilifera* (L.) R. Br. is erect much branched shrub. The leaves are alternate and simple. This characters are agreed in those of Henderson (1949), Backer (1963), Kirtika and Basu (1975), Dassanayake (1991) and Ren Sa and Michael (2010). The inflorescences are 4-40 cymes (Backer, 1963) and branched racemes (Kirtika and Basu, 1975). However, the inflorescences are axillary and terminal, paniculate (Dassanayake, 1991). The bracts are broadly ovate, enclosing the inflorescence and persistent. This characters are agreed in those of Hooker (1879), Henderson (1949), Cooke (1958), Backer (1963) and Chopra (1975).

Pods are oblong, turgid with short beak. Seeds are two, dark-brown marble. This characters are agreed with those mentioned by Cooke (1958), Kirtika and Basu (1975) and Dassanayake (1991).

In histological study, the leaves of this plants are dorsiventral. In surface view, the cell walls of the epidermic are wavy. Paracytic type of stomata are present only on lower epidermis.

Uniseriate and glandular trichomes are found in petioles, lamina, midrib and stems. These characters are agreed with Metchalfe and Chalk, 1950. Prismatic calcium oxalate crystals are found in the surface view of midrib, petiole and stem. These characters are agreed with Betty (1974).

Starch grains are found abundantly in the roots of parenchymatous ray cells. These characters are agreed with Metchalfe and Chalk (1950), Pandey (1993) and Madan *et al.* (2013).

Fibers, pitted, spiral and scalariform vessels, fragments of cork, pieces of stomata and epidermal cells, trichomes, starch grains and calcium oxalate crystals are observed in powdered leaves, stems, roots of *Flemingia strobilifera* (L.) R. Br. (Betty and Snowdon, 1974).

In conclusion, morphological and histological characters of both fresh and dried powdered of leaves, stems and roots and their sensory characters and diagnostic characters would assist the identification and evaluation of powdered drugs of *Flemingia strobilifera* (L.) R. Br..

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