

Morphological and Microscopical Characters from Leaves of *Thunbergia laurifolia* Lindl.

Shwe Tin¹, Yin Yin Khing²

Abstract

Thunbergia laurifolia Lindl. was locally known as Kyini –nwe and belonging to the family Acanthaceae has been undertaken. The plant was collected from Dagon University Campus, East Dagon Township, Yangon Region during February to June 2022. *Thunbergia laurifolia* Lindl. has been chosen in this research because which is important medicinal plant. In this study, morphological and microscopical character of fresh leaves. Identification of collected plant was carried out according to the literatures. In morphological study, the plant was perennial, leaves, simple, opposite and decussate. Inflorescences were terminal racemose. Flowers were bisexual, irregular, zygomorphic, pentamerous, hypogynous, bicarpellary, syncarpous, axile placentation. In microscopical study, the upper and lower epidermal cells of leaves were wavy in shape. Stomata were present on lower surface and diacytic type. Calcium oxalate crystal were present in petiole. In addition, the diagnostic characters of powder of leaves were investigated for their standardization used in medicine.

Key words: *Thunbergia laurifolia* Lindl., Morphological, microscopical characters leaves

Introduction

Thunbergia laurifolia Lindl. belonging to the family Acanthaceae which consists of 250 genera, over 2,500 species predominantly of tropical and subtropical forests; less frequently in Southern Europe, the Mediterranean region and United States (Lawrence, 1964 and Dissanayake, 1998).

The family Acanthaceae consist of about 250 genera and 2500 species, widespread in tropical regions, with only a few species in temperate climate. Members of the Acanthaceae are distributed from the tropics to the temperate regions. Economic importance includes several cultivated ornamentals. The Acanthaceae are distinctive in having simple, opposite leaves with zygomorphic, bracteates, usually bilabiate flowers (Cronquist, 1921 and Simpson, 2006).

Leaves are ovate, lower leaves broad at base and often toothed, upper ones narrower and entire, 3-5 nerved at the base, 7-12 cm long; flowers in terminal racemes; calyx is a mere rim; corolla-tube, limb dark blue Native to S.E. Asia, sometimes cultivate. Leaf blades are oblong, oblong- lanceolate or lanceolate, sub-leathery, base rounded or broadly apex acuminate, or caudate, margin entire, glabrous, palmately 3-veined (Husan Keng, 1990, Kirtikar and Basu, 1935 and Qi-ming, *et al*, 2009).

The lower leaf surface of *Thunbergia laurifolia* Lindl. showing sessile glandular trichome with head and diacytic stomata. The internal mesophyll layer of the leaves contained many calcium oxalate crystals. The leaves are opposite and

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decussate, simple, without stipule, and often have cystoliths which show up as streaks on the lamina (Taylor, 1956 and Franceschi, *et al.*, 2005).

Leaves are simple, opposite, decussate and exstipulate. Inflorescence are cymose. Flowers are borne on pendulous inflorescences bisexual, usually irregular or two-lipped zygomorphic and hypogynous. The corolla is pale blue in color, one larger the others. Stamens are 2-4, epipetalous. Ovary is superior, bicarpellary, syncarpous and bilocular, with ovules on axile placenta (Cronquist, 1921, Taylor, 1956, Backer, 1965, Dassyanake, 1998, Rajan, 2000, Cullen, 2006 and Simpson, 2006).

The variation in the structure of pollen grains provides feature of diagnostic value. One of the most outstanding anatomical features is the widespread occurrence of variously shaped cystoliths, which are found in both stem and leaf. The hairs comprise an assortment of both glandular and non-glandular types. Stomata, which occur on both surface or are confined to the lower side. Bundles of bodies which are usually described as a circular fiber, but which resemble large raphides. Calcium oxalate crystals are secreted the in the form of prisms, needles, and in other shapes and Leaves are often prominently marked with cystoliths (Metcalf and Chalk, 1950 and Cullen, 2006).

Acanthaceae family is commonly consumed in the form of herbal tea and widely used by Thai folk medicine which is considered important for public health. Fresh and dried forms of this plant as leaves, barks and roots are mainly used as an antidote for insecticide, drug, arsenic, strychnine, alcohol, treating food poisoning and chemical toxic (Thongsaard and Marsden *et al.*, 2002 and Caedo, *et al.*, 2014).

The leaves are commonly used against snakebite. The petiole are removed and the juice of 30 to 50g of pounded fresh leaves is used to massage the site of the snakebite from the top downwards, the residue is applied topically (Prajapati *et al.*, 2003).

Thunbergia laurifolia Lindl. possesses anti-inflammatory, antioxidant and hepatoprotective effects. In Malaysia, juice from crushed leaves of *Thunbergia laurifolia* Lindl. are taken for menorrhagia, placed in to the ear for deafness, and applied for poulticing cuts and boils. In Thailand, leaves are used as an antipyretic, as well as for detoxifying poisons. It is locally known as akar tuau in Malaysia and Thailand. Several Thai herbal companies have started producing and exporting rang jeud tea (Wonkchalee *et al.*, 2012).

The herb is a bitter tonic, febrifuge, antiperiodic, stomachic, alternative and anthelmintic; a strong infusion or decoction of dried roots and stalks in convalescence after fevers, malarial fevers, dysentery, dyspepsia and liver disorders. The juice of leaf is a household remedy for flatulence, loss of appetite, bowl complaints of children, diarrhoea, dysentery, dyspepsia and general debility and give aromatic (Dastur,1970).

The plant may be cultivated and processed in the country of origin into formulation of a herbal medicine sold in western countries and it may provide a lead compound for a pharmaceutical product. These systems of medicine are complementary in health care and can in no way substitute one another (Balick, *et. al.*, 1996 and Padua, *et. al.*, 1999).

In this research, morphological and microscopical of fresh specimens. The aim and objectives of this research are to identify and classify the morphological characters of *Thunbergia*., to examine the microscopical character of leaves to investigate the diagnostic characters of powder sample of leaves for standardization of traditional medicine.

Materials and Methods

The plants of *Thunbergia laurifolia* Lindl. Were collected from Dagon University Campus, East Dagon Township, Yangon Region during the month of February to June 2022. These collected specimens were made careful notes and recorded by taking photographs to study, classify and identify it systematically. The morphological study of plant was undertaken with help of available literatures (Backer, 1965; Lawrence, 1964; Dassanayake, 1998).

For microscopical study, the samples were thoroughly washed with water and were cut by free hand section and to examine under electron microscope. The sections of each samples were usually cleared with chloral hydrate solution. The powdered were cleared in chloral hydrate solution on a glass slide and discovered under electron microscope. The characters of powdered leaves and stems were also photographed. For microscopical studies, the fresh specimens, according to the methods of Metcalfe and Chalk (1950), Esau (1593), Pandey (1993), and Tandon (2011).

Results

Morphological characters of *Thunbergia laurifolia* Lindl.

Scientific name	-	<i>Thunbergia laurifolia</i> Lindl.
Myanmar	-	Kyini –nwe
English name	-	Blue trumpet vine
Family name	-	Acanthaceace
Part used	-	Leaves and stems
Flowering period	-	Throughout the year

Perennial large climbers, shrubs; stems and branches quadrangular. Leaves simple, opposite and decussate, exstipulate; petiolate; blades elliptic or oblong, rounded at the base, glabrous on both surfaces, serrate along the margin, acuminate at the apex. Inflorescences, terminal and axillary racemes. Flowers are bisexual, zygomorphic, hypogynous, pentamerous, purple, bracteates, bracteolate. Sepals (2), sympetalous, bowl-shaped, glabrous on both surfaces. Petals (5), sympetalous, infundibuliform. Stamens 4, free, didynamous, filaments flattened, unequal, inserted near the base of corolla tube, anther ditheous, basifixed, longitudinally dehiscent. Carpels (2), united; ovary superior, bilocular, two ovules in each locule on the axile placenta; style filiform, the stigma bifid. Fruit capsule, many – seeded. Seeds ovoid, brownish, non-endospermic.



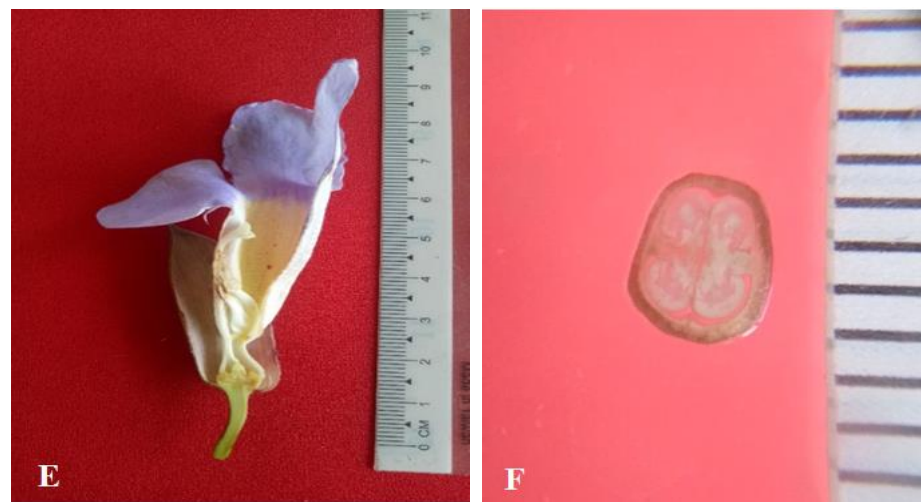
(A) Habit

(B) Leaves



(C) Inflorescence

(D) Flower



(E) L.S of flower

(F) T.S of ovary

Figure (1) Morphological characters of *Thunbergia laurifolia* Lindl.

Microscopical characters of Leaves of *Thunbergia laurifolia* Lindl.

Petiole

In surface view, a single layer of the epidermal cells, thin-walled and mostly rectangular to polygonal shaped and along the length of petiole.

In transverse section, the petiole was deeply concave in outline. the cuticle layer was thick. Trichomes were present. The epidermal cell were parenchymatous, rounded to oval in shaped. Below the epidermis, the cortex was made up of two different types of tissues, outer collenchymatous and inner parenchymatous tissues. The outer collenchymatous cells below the epidermis consisted of 5-7 layers on the upper surface and 6-8 layers thickness on the lower surface. The parenchymatous tissue composed of 8-9 layers in thickness above the vascular bundle and 7-9 layers thickness below the vascular bundles. Calcium oxalate crystals and trichomes were present.

Vascular bundle was oval in outline and embedded in the parenchymatous tissue. Vascular bundle was ring and closed type. The phloem cells were thin walled and consisted of sieve tubes and companion cells, phloem fiber and phloem parenchyma. The xylem composed of vessels, tracheid, xylem fiber and xylem parenchymatous cells.

Lamina

In surface view, the upper and lower epidermal cells were parenchymatous, rectangular in shape, thin-walled and completely arranged. Trichomes were present on both surfaces. Stomata were abundantly present on lower surface. The type of stomata was diacytic. Stomata elliptic in shape, guard cells were reniform.

In transverse section of the lamina, thick cuticle, the epidermal cells were made one layer on both sides, the upper epidermal cells were barrel-shaped. The mesophyll layer consisted of hypodermis, palisade and spongy parenchyma. The hypodermis was made up of single layer. Palisade mesophyll was found on upper side. and 1-2 layers, the cells vertically erect, compact, chloroplast abundant. The spongy mesophyll consisted of 4-5 layers of cells loosely or oblong, large intercellular spaces.

The vascular bundles of lateral vein were embedded in mesophyll cells. The phloem cells were very small. The xylem tissue composed of vessel, tracheid, xylem fibers and xylem parenchyma cells. The phloem tissues consisted of sieve tube, companion cells, phloem fiber and phloem parenchyma cells.


Midrib

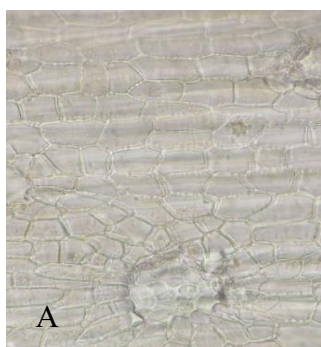
In surface view, the epidermal cells rectangular. Stomata were not observed. Unicellular trichomes were present.

In transvers section of midrib, concave in outline and both the epidermal cells were made up of thick walled parenchymatous cells. They were rectangular in shape, elongated along the length of the midrib. Below the epidermis, the cortex was differentiated into collenchyma and thin wall parenchyma cells. The collenchymatous cells were 4-7 layers in thickness toward the upper surface and 3-4 layers in thickness towards the lower surface. The parenchyma cells were 4-8 layers in thickness above the vascular bundle and 5-8 layers in below the vascular bundle.

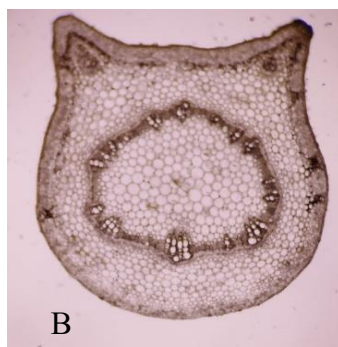
The vascular bundles were oval in outline and embedded in the cortex. The vascular bundle was crescent shaped, discontinuous collateral and closed type. The phloem cells were consisted sieved tube elements and companion cells, phloem fiber and phloem parenchyma. Xylem cells were composed of vessel, tracheid, xylem fibers, xylem parenchyma.

Table (1). Sensory characters of powdered leaves of *Thunbergia laurifolia* Lindl.

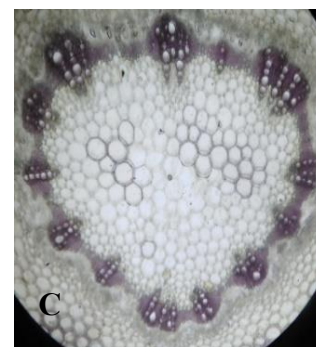
Sample	 Leaves	
Sensory Characters		
Colour		Pale green
Odour		Aromatic
Taste		Little salty
Texture	Fibrous	



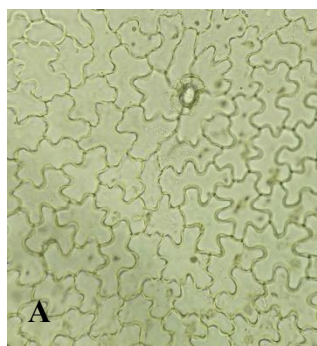
(A) Surface view of petiole



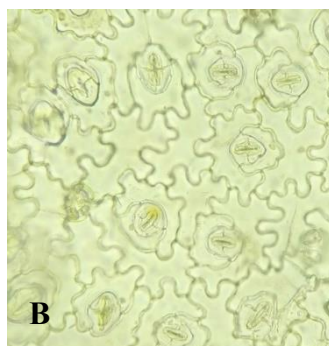
(B) T.S of petiole



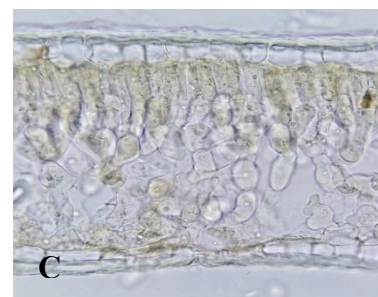
(C) T.S of petiole close up view of vascular bundle

Figure (2) Microscopical characters of petiole of *Thunbergia laurifolia* Lindl.

(A) Surface view of upper diacytic stomata

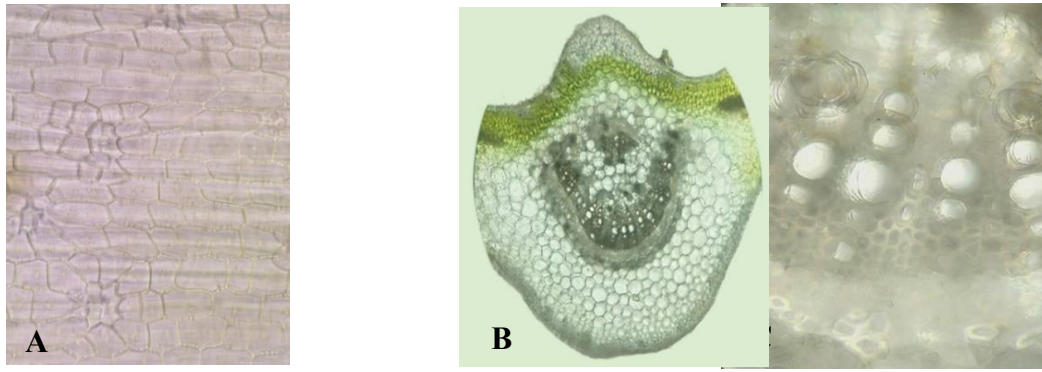


(B) Surface view of lower diacytic stomata



(C) T.S of lamina close up view of vascular bundle

Figure (3) Microscopical Character of lamina of *Thunbergia laurifolia* Lindl.



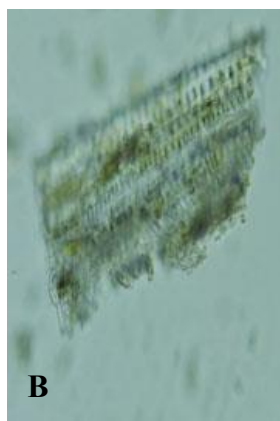
(A) Surface view of midrib

(B) T.S of midrib

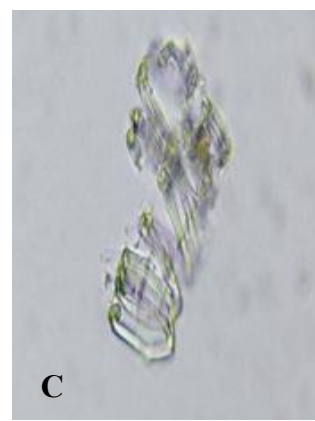
(C) T.S of close up view of vascular bundle

Figure (4) Microscopical Characters of midrib of *Thunbergia laurifolia* Lindl.

(A) Pitted vessel element



(B) Scalariform vessel element



(C) Spiral vessel element



(D) Tracheid element



(E) Fiber



(F) Trichome

Figure (5) Diagnostic characters of powdered leaves of *Thunbergia laurifolia* Lindl.

Discussion and conclusion

In this paper, the morphological study on both vegetative and reproductive parts of the plants and microscopical character and powder of leaves.

In morphological study, The plant of *Thunbergia laurifolia* Lindl. is perennial climbers. Leaves are simple, opposite and decussate, glabrous, 3-veined. Inflorescences are racemose. The flowers are pedicellate, bisexual, irregular, zygomorphic, bracteate and bracteolate, hypogynous, stamen 4, didynamous, petalostemonous, ovary superior, syncarpous, bicarpellary, bilocular, style long, stigma bifid, axile placentation. These characters are agreements with those reported by Backer (1965); Husan Keng (1990); Dassanayake (1998); Rajan (2000); Simpson (2006); Cullen (2006) and Qi-ming, *et. al.*, (2009).

In the microscopical study, in transverse section of petiole deeply concave in outline, the vascular bundles were arranged as a ring, collateral, closed types. In surface view, trichomes were present on both surfaces of the leaves. Stomata were present on lower surface and diacytic type. In transverse section of the lamina, hypodermis cells were present below the epidermis. In transverse section of midrib, the vascular bundles were crescent shaped, collateral closed types. Pitted vessel, scalariform vessels, tracheid, fibers, fiber-tracheid were observed in powdered leaves. These characters were in agreement with those stated by Metcalfe and Chalk (1950 and Franceschi, *et. al.*, (2005).

The sensory characters of powdered leaves of *Thunbergia laurifolia* Lindl. described pale green in colour, the odour was aromatic, the taste was little salty and texture was fibrous.

In conclusion, the morphological and microscopical studies of leaves can give valuable information of family Acanthaceae. The species of *Thunbergia laurifolia* Lindl. contained numerous biologically active compounds which are helpful in improving the human life.

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