MORPHOLOGICAL AND HISTOLOGICAL CHARACTERS OF *DOLICHANDRONE SPATHACEA* (L.F.) K. SCHUM.

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Abstract

Myanmar traditional medicine is practically and widely well accepted to many local people. *Dolichandrone spathacea* (L.f.) K. Schum. was utilized effectively for hepatitis and liver cancer. As such morphological and histological studies of this plant were investigated to certain it identification. The specimen was collected from Hta Ma Kan village, Aung Lan Township, Magway Region in july, 2018. The collected plant was identified according to standard procedures. The morphological and histological studies were also carried out by using available literatures at Department of Botany, West Yangon University. *Dolichandrone spathacea* (L.f.) K. Schum., locally known as Tha-kut belongs to the family Bignoniaceae. In Morphological study, this plant was a tree with unipinnately compound leaves, exstipulate. Inflorescences were terminal, corymbose. Flowers were white, fragrant. The fruits were capsule. Seeds were rectangular, membranous winged testa, nonendospermic. In histological study, epidermal cells of both surfaces were polygonal in shape with slightly wavy anticlinal walls. Stomata were found only on lower surface and anisocytic type. Calcium oxalate crystals were present in leaves. Simple unicellular trichomes and glandular peltate trichomes were present on the surfaces of leaves and stems. The powdered samples have been investigated and presented as diagnostic characters for the standardization of powdered drugs.

Keywords: *Dolichandrone spathacea* (L.f.) K. Schum., peltate trichomes

Introduction

Myanmar is well known for its wealth of natural plant resources for there are still many valuable plant materials to be searched. Among these, *Dolichandrone spathacea* (L.f.) K. Schum.is also included. It has enormous traditional uses against various diseases. This plant is deciduous tree, commonly known as Tha-kut. It is widely distributed all over Myanmar. The medicinal plant, *Dolichandrone spathacea* (L.f.) K. Schum. belongs to the family Bignoniaceae. There are five species of genus *Dolichandrone* in Myanmar (Kress *et al.* (2003).

According to the Ashin Nargathiein (1978), this plant is used for bronchitis, asthma and diarrhea caused by spleen disorder. In Philippines, it is used to treat nervous diseases and flatulence (Wiart, 2006). In Indonesia, the leaves are used to treat thrush (Kartikar and Basu, 1975).

Rural people in Amarapura Township, Mandalay region, bark paste is applied to cure the relief of snake bite, scorpion bite and chemical pesticide poisoning. The decoction of leaves and barks are used as a traditional medicine for toothache (PyaePyae Win, 2017). The flowers are eaten as vegetable. In Magway Region, the barks have been utilized effectively by local people for hepatitis and liver cancer. The decoctions of barks were used mostly as an oral medicine. Thus *Dolichandrone spathacea* (L.f.) K. Schum. was investigated in this research to find out the valuable information of this plant.

The aim of this research is to study histological characters of *Dolichandrone spathacea* (L.f.) K. Schum. and the objectives are to verify the morphological characters of *Dolichandronespathacea* (L.f.) K. Schum and to examine the powdered samples of leaves, barks and flowers that can be used for standardization in traditional medicine.

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Materials and Methods

Collection, Classification and Identification of Plants

The plant materials were collected from Hta Ma Kan village, Aung Lan Townships, Magway Region in July, 2017. The collected specimen was identified by using Hooker (1885), Backer and Brink (1965), Kirtikar and Basu (1975), Dassanayake and Fosbery (1981). Myanmar name was referred to Hundley and Chit KoKo (1987) and Kress *et.al.* (2003).

The leaves, barks and flowers were washed with water and then cut into small pieces and air dried at room temperature for three weeks. When constant weight was obtained, the dried samples were pulverized by grinding machine and stored in air tight bottles for further use.

Histological examination of different plant parts and powders of *Dolichandrone spathacea* (L.f.) K. Schum.

The fresh specimens were examined by cutting free hand sections and studied under the microscope. The microchemical tests for the presence of lignin, starch and tannin were made according to the methods and reagents given in Metcalfe and Chalk (1950), Esau (1953), Pandey (1993) and Trease and Evans (1978, 2000) and B.P (1968)

Results

Morphological characters of *Dolichandrone spathacea* (L.f.) K. Schum.

Deciduous trees, 10-20 m in height, stem woody, young shoots puberulous. **Bark** grayish brown to dark brown, fissured in older tree. **Leaves** opposite and decussate, unipinnately compound, imparipinnate, exstipulate; petioles 6.0-8.5 cm long,dark green, puberulous, pulvinate; rachis 17.5-19.0 cm long, green, puberulous; leaflets 1-3 pairs; petiolules 0.8-2.8cm long, green, puberulous; leaflet blades ovate-lanceolate, 9.0-12.5cm x 3.8-6.0 cm, the base oblique obtuse, the margin entire or sometimes wavy, the apex acuminate, dark gren above, pale green beneth, upper surfaces and midveins of lower surface puberulous, fleshy gland on either side of the midrib.**Inflorescences**: terminal, corymbs, peduncles stout, 1-1.3 cm long, grayish green, with distinct scars of shedding flowers, 2 to 6 flowered, fragrant.**Flowers**: ebracts and bracteolate, minute, pale green; pedicels 1.5-2.5 cm long, green, slightly curved, glabrous, complete, bisexual, zygomorphic, penta-merous, hypogynous. **Calyx:** spathaceous, split down one side to the base, oblong with uncinate tip, 5.0-6.0 cm x 2.8-3.2 cm, pale green, two ridges near the middle of outer surface, two grooves inside near the middle, leathery, gland dotted on the outer surface near the apex of calyx, persistent, inferior. **Corolla**: (5), sympetalous, imbricate, infundibuliform, 12.0 -16.5 cm x 7.0-8.0 cm, cylindrical basal tube of 7-8cm long, pale green, tube widened toward the throat to a funnel of 7.0-7.5 cm long, the lobes subequal, 2.0-2.5cm x 2.0-2.5cm, broad and rounded with crenate margin, wart-like gland on the outside of upper part, white, glabrous, inferior. **Androecium:** $4+1^{st}$, epipetalous, didynamous, filaments 4.0-4.5 cm long, inserted, slightly curved, white, slightly yellow at the base, staminode 0.7-1cm long, anthers dithecous, 6-8mm x 1.5-2.0 mm, oblongoid, pale yellow, divergent, introrse, dorsifixed, longitudinal dehiscence, inferior. **Gynoecium**: (2), bicarpellary, syncarpous, ovary linear oblong, about 1.2 cm long, yellowish green, bilocular, placentation axile, many ovules in each locule, style 11-13cm long, slightly curved, greenish yellow, inserted, stigma 2-lobed, ellipsoid, 4-5mm long, white, disc annular, green, superior. **Fruits**: capsule, long-linear, compressed and quadrangular, straight or sickle-shaped, 25-60cm x 1.5-2.3cm, dark green, tuberculate, obscurely ribbed; false septum flat; seeds numerous, rectangular, 12-18 mm x 6-8mm, light brown, wing hyaline (figure 1-8). The results were shown in Figure1-8.

Flowering Period : March to July

Figure 1 Habit

Figure 2 Leaves

Figure 3 Inflorescences

Figure 4 Flower

Figure 5 L.S of flower

Figure 6 T.S of ovary

Figure 7 Fruits

Figure 8 Seeds

Histological characters of leaves, stems and roots of *Dolichandrone spathacea* (L.f.) K.Schum.

Lamina

In surface view, the cuticle is smooth on both surfaces. The epidermal cells of both surfaces are polygonal in shape with with slightly wavy anticlinal wall. The anticlinal walls in lower surface are much wavy than those in upper surface. Anisocytic type of stomata occurred abundantly only on the lower surface. Simpleunicellular trichomes and glandular peltatetrichomes are present on both surfaces. Glandular peltatetrichomes are discoid with entire margin, 8 cells on one plane.

In transverse section, the cuticles are present on both surfaces. Epidermal cells are one layered thick and barrel shaped. The mesophyll tissues are differentiated into palisade and spongy parenchyma. Palisade layer is composed of compactly arranged columnar-shaped cells. They are 1-2 layers thick. The spongy layer is composed of 3-4 layers, closely packed rounded to oval shaped parenchyma cells. Mesophyll cells contain abundant chloroplasts. Calcium oxalate crystals are present in the mesophyll cells. Glandular peltatetrichomes are shortly stalked depressed in the surface and multicellular head with radiating cells. Vascular bundles are closed and collateral type. Each bundle is surrounded by a sheath of large parenchyma cells. Xylem lies towards the upper epidermis and phloem lies towards the lower epidermis (Figure 9-12).

Midrib

In surface view, the epidermal cells are rectangular to polygonal in shape, thin-walled, parenchymatous. Simpleunicellular trichomes are present only on upper surface and glandular peltatetrichomes are present on both surfaces.

In transverse section, the cuticle layer is thin. The upper epidermal cells are barrel-shaped and the lower epidermal cells are oval or rounded in shape. Collenchyma occurs immediately below the epidermis, 3-5 layered, rounded to polygonal in shape. Below the collenchymas, 5-7 layers of rounded or oval parenchymatous cells are present. Sclerenchymatous cells occurred as fiber sheath at the phloem side. Vascular bundles are collateral type. Calcium oxalate crystals are present in the cortical region (Figure 13).

Petiole

In surface view, the epidermal cells of both surfaces are thin-walled and rectangular or polygonal in shape parenchymatous cells. Simpleunicellular trichomes and glandular peltatetrichomes of petiole are similar to those of lamina and midrib.

In transverse section, the petioles are shield shaped in outline and covered with cuticle. Epidermal cells are one layer thick, thin wall, barrel shape. In cortical region, collenchymas cells are foundtowards the peripheral region and parenchyma cells towards the vascular bundle. Collenchymatous cells are 3-5 layers, isodiametric in shape. The parenchymatous cells are 7-9 layers and rounded to oval in shape. Sclerenchymatous patches are present. Vascular bundles are rounded in outline and collateral type. A large main vascular bundle and two small accessory bundles are present. Calcium oxalate crystals are present in the cortical region (Figure 14).

Stem

In surface view, the epidermal cells are thin-walled parenchymatous and rectangular to polygonal in shape. Simple, unicellular trichomes and glandular peltatetrichomes are present.

In transverse section, the stem is oval in outline. Epidermal cells are composed of single layer, barrel-shaped parenchyma and compactly arranged. It bears simple unicellular and glandular peltate trichomes. The cortical region consists of 3-4 layers of collenchymatous cells and 6-7 layers of parenchymatous cells. Collenchymatous cells are isodiametric in shape and parenchymatous cells are rounded to oval in shape. Endodermis is not distinct. Pericycle present as patches and compose of sclerenchymatous cells. Vascular bundles are arranged in the form of a ring, collateral and open type. Cambium cells are 4-6 layers thick, rectangular in shape, radial arrange. Pith composed of thin walled and rounded parenchyma cells (Figure 15-16).

Root

In surface view, the epiblema cells are thin-walled, parenchymatous, rectangular to polygonal in shape and compactly arranged. Root hairs are present.

In transverse section, the root is circular in outline. In young root the outermost layer is made up of single layer of epiblema cells and internal to the epiblema is cortex. It is made up of several layers of thin walled spherical or oval shaped parenchymatous cells. At maturity the epiblema cells become the periderm. The outermost region of root is phellem or cork. The inner region of phellem is phellogen or cork cambium. Innermost region of periderm is phelloderm. Endodermis is not clearly distinguished. Pericycle composed of sclerenchymatous cells as ring. It is discontinuous. Vascular bundles are radial, hexarch and are found within the pericycle at primary stage. The xylem and phloem are arranged in concentric amphicribal ring in mature root (Figure 17-18).

Diagnostic characters of powdered leaves, barks and flowers of *Dolichandrone spathacea* (L.f.) K. Schum.

In powdered leaves, barks and flowers, fragment of mesophyll cells, unicellular and glandular peltate trichomes, calcium oxalate crystal, cork cells, vessels with annular, spiral thickening, papilose and pollen were observed (Figure 19-30).

Table 1 Sensory characters of powdered of *Dolichandrone spathacea* (L.f.) K. Schum.

Sample / Sensory character	Leaves 	Barks 	Flowers 
Colour	Bright green	Brown	Pale brown
Odour	Pungent	Odourless	Pungent
Taste	Slightly bitter	Tasteless	Slightly bitter
Texture	Fibrous	Fibrous	Fibrous

Histological characters of *Dolichandrone spathacea* (L.f.) K. Schum.

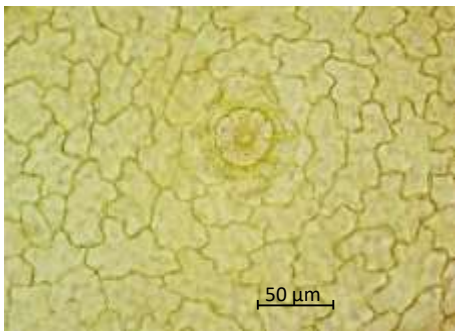

Figure 9 Surface view of upper epidermis

Figure 10 Surface view of lower epidermis with anisocytic stomata

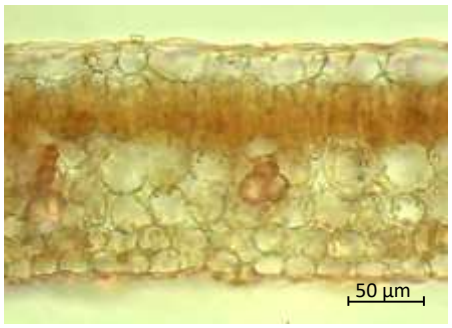

Figure 11 T.S of Laminar

Figure 12 T.S of Peltate trichome

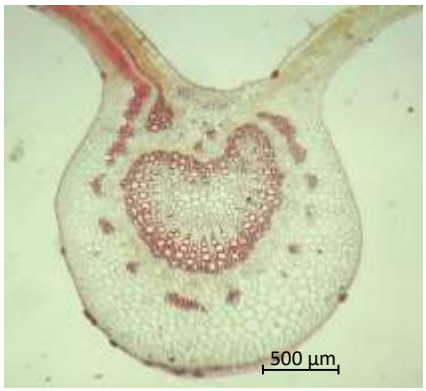

Figure 13 T.S of midrib

Figure 14 T.S of petiole

Figure 15 T.S of young stem

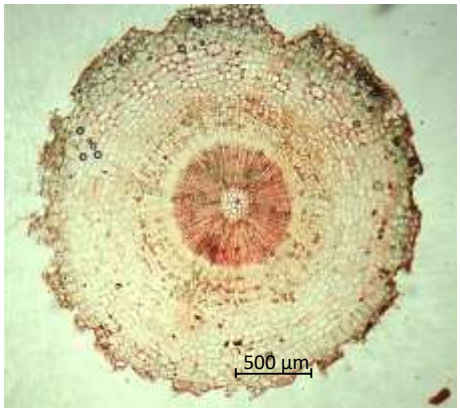

Figure 16 T.S of mature stem

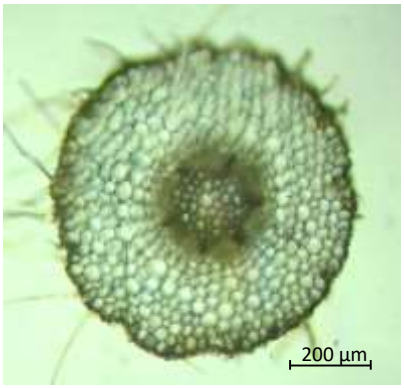

Figure 17 T.S of young root

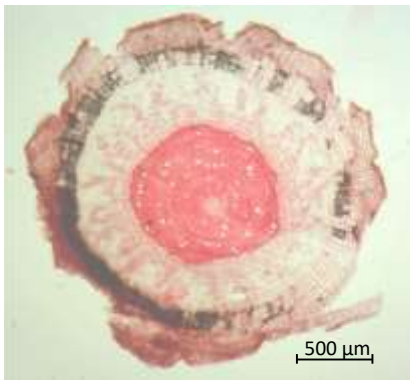

Figure 18 T.S of mature root

Diagnostic characters of Powdered Leaves of *Dolichandrone spathacea* (L.f.)K. Schum.

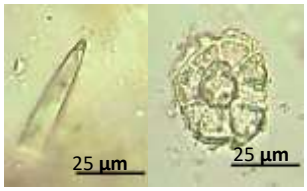

Figure 19 Trichomes

Figure 20 Mesophyll cells

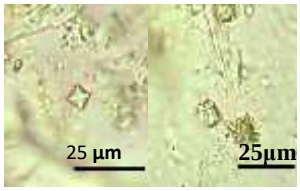

Figure 21 crystals

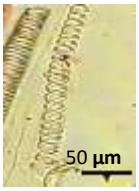

Figure 22 Vessel

Diagnostic characters of Powdered Barks of *Dolichandrone spathacea* (L.f.)K. Schum.

Figure 23 Sclereids

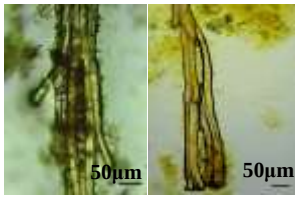

Figure 24 Uniseriate ray

Figure 25 Cork cells

Figure 26 Crystal

Diagnostic characters of Powdered Flowers of *Dolichandrone spathacea* (L.f.)K. Schum.

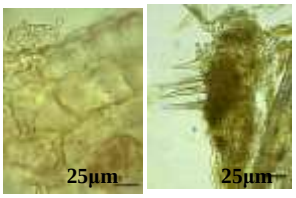

Figure 27 Trichome

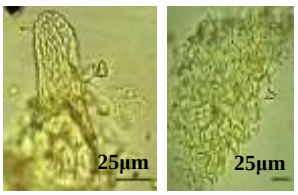

Figure 28 Papilose

Figure 29 Pollen

Figure 30 Vessel

Discussion and Conclusion

In this research, the morphological and histological characters of *Dolichandronespathacea* (L.f.) K. Schum. are presented.

In morphological study, *Dolichandrone spathacea* (L.f.) K. Schum.is deciduous tree. The leaves are unipinnate compound, exstipulate. Inflorescences are terminal corymbs. The flowers are showy, white, and fragrant. The calyxes are spathaceous. The corollas are infundibuliform. The stamens are 4, didynamous with staminode. The pistils are 2 carpelled, syncarpous, placentation axile.The fruits are capsule. Seeds are rectangular with wings. The morphological characters given in this research are in accordance with the characters given by Hooker (1885), Kirtikar and Basu (1975), Dassanayake and Fosbery (1981) and Wiart (2006).

In histological study, epidermal cells of both surfaces are polygonal in shape with slightly wavy anticlinal walls. Stomata are found only on lower surface and anisocytic type. Calcium oxalate crystals are present in leaves. The characters of leaves are in agreement with those given in Metcalfe and Chalk (1950). Cronquist (1981) also revealed that small crystals of calcium oxalate often are present in some of the cell of parenchymatous tissues.

Simple, unicellular trichomes and glandular peltatetrichomes are present on the surfaces of leaves and stem. Glandular peltatetrichomes are the diagnostic characters of this species. Metcalfe and Chalk (1950) described that non-glandular form are simple, unicellular or uniseriate and glandular hairs shortly stalked and scale like in *Dolichandrone*.

In transverse section of petiole, the vascular bundles are one large bundle with small accessory bundles. The petiolule and rachis are characteristically the same in that the microscopical characters of petiole. The anatomical characters of lamina, midrib and petiole observed in this research are similar with Cho ChoNaing (1995).

In stem, vascular bundles are collateral and opened, sclerenchymatous patches present. In roots, vascular bundles are radial and hexarch at primary stage. The xylem and phloem are arranged in concentric amphicribal ring in mature root. The stem and root characters are in agreement with those given in PyaePyae Win (2017). The anatomical characters of leaf and young stem are in agreement with those of the family Bignoniaceae recorded by Metcalfe and Chalk (1950).

The diagnostic characters of powdered leaves, barks and flowers are cork cells, unicellular and glandular peltatetrichomes, calcium oxalate crystal, and vessels with annular, spiral thickening. This combination of sensory and histological characters would assist the identification of powdered drugs of *Dolichandrone spathacea* (L.f.) K. Schum.

In conclusion, the scientific research has helped to promote the development of traditional medicine by revealing the morphological and anatomical characters of *Dolichandronespathacea* (L.f.) K. Schum. Traditionally, the classification of plants is mainly based on morphological and anatomical aspects. Leaf anatomical studies have been proven to be useful for species identification and it has been of great taxonomic significance. Glandular trichomes play a major role in the

characterization of the Bignoniaceae. Characteristics of present study are the valuable evidence for identification on this plant. The sensory characters and diagnostic characters of powdered leaves, barks and flowers would assist the identification and evaluation of powdered drugs of *Dolichandrone spathacea* (L.f.) K. Schum.

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