

MORPHOLOGICAL CHARACTERS, HISTOLOGICAL CHARACTERS AND NUTRITIONAL VALUES OF *POLYGONUM CHINENSE* L.

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Abstract

Polygonum chinense L. is a medicinal plant which was collected from Yangon area (Botanical garden, Yangon University, Kamayut Township and Yankin Township). The plant verification was carried out. The morphological characteristics such as Inverted “v” shaped deep purple spot present on the surface of the leaf, ochreate stipule, inflorescence of terminal paniculate corymbose cymes, elliptic bract, apetalous flower, eight fertile stamens, tri-fid style, tri-gonous ovary were apparently observed in the species. Microscopic characteristics of the leaves and powdered drug were examined. Microscopic study showed that stomata were anomocytic type which was abundant in lower surface of the leaf, calcium oxalate crystals and tannin occurred here and there in the leaf. Nutritional values of the leaves showed that carbohydrate was the main component followed by vitamin C while fat and vitamin B₁, were also found. The leaf parts are used for boiling leaves to eat with Ngapi and put that leaves in fish curry. This plant can be used for the disease of rheumatism. It also be used for future research investigation of a such kind of disease.

Keywords: Morphological characters, Histological characters, nutritional values of *Polygonum chinense* L.

Introduction

Traditional medicine has been practiced in Myanmar from time immemorial. Native people have used herbal medicine for their care system. Medicinal plants are important for pharmacological research and drug development. *Polygonum chinense* L. belonging to family Polygonaceae. The plant is commonly called Ma-har-gar-kyan-sit, Wetkyein or Bokhtaung in Myanmar (Hundley and Chit Ko Ko, 1961; Nagathein; (1972) and Kress et al, 2003) and Chinese knotweed in English (website 1).

Herbal medicine is a major remedy in traditional medicine system, which is largely based on the use of plant parts, Medicinal plants are

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important for pharmacological research and drug development. Traditional medicine is defined as the therapeutic practices that have been in existence, of ten for hundred of year, before the development and spread of modern are still continued to be an important therapeutic aid for alleviating ailment of humans.

Leaves are used for curing skin diseases and can be eaten as vegetables (Wealth of India, 1959), *P.chinense* L. has tonic, vulnerary and antiscorbutic properties (Kirtikar and Basu, 1975). It is also used for dysentery, gastroenteritis, laryngopharyngitis. Poultice of dried material for furuncle and abscesses, decoction as external wash for dermatitis, eczema, pruritus, poisonous snake bites, chronic gastritis, duodenal ulcers, wound, pain, hemorrhage and irregular menstruation (website 2).

Theoretically all plants may be used in traditional medicine. In practice, however, only the relatively small number of plant heal been recorded in Myanmar. In Myanmar, *Polygonum chinense* L. is not only used in food as salad, but also applied in treatments of skin diseases and inflammatory in traditional medicine.

Aims and objectives are to verify the morphological characters, histological characters of leaves of *Polygonum chinense* L. and to study the nutritional values.

Materials and Methods

Polygonum chinense L. was chosen in the present work and collected from the Botany garden, University of Yangon, Kamayut Township, and also from Yankin Township.

The morphological characters of this plants were identified with the help of available literatures (Backer *et al.* (1963); Hooker (1885) and Kirtikar and Basu (1975). The histological characters of samples were examined by preparing free hand section of fresh leaf. To prepare leaf powder, the leaves were cleaned and dried in shade for 14 days. The dried leaves were grind into fine powder. The powder was observed for sensory characters and cleaned in chloralhydrate solution on glass slide to observe the microscopical characters. The Concentrated: H₂SO₄ was used for the examination of calcium oxalate crystals.

Starch was tested by iodine reagent, tannin by 5% FeCl₃ and lignin by Phluroglucinol B.P followed by conc: HCl.Chloralhydrate and Sodium hypochloride solution were used for clearing and bleaching.The nutritional

values of powdered leaves of *Polygonum chinense* L. were measured by Slurometer and Phytoflurometer. Determination of vitamin contents was carried out according to British pharmacopoeia (1965). The experimental work for the nutritional values was carried out at National Nutrition Center, Department of Health, Ministry of Health.

Results

Morphological characters

Habit-perennial herbs, stems herbaceous, cylindrical. Leaves-alternate, simple, uncostate, laminae ovate, purple coloured patches present in the central portion of leaf blade, petioles glabrous, stipules ochreate, lanceolate towards at the upper portion and sheathing at the base. Inflorescences-terminal paniculate corymbose cymes, the peduncle cylindrical. Flowers-white, complete, actinomorphic, penta-merous, hypogynous; perianth 5-lobed, fused, ovoid, quincuncial calyx tubes glabrous, deciduous. Stamens 8, epiphyllous, filaments long, inserted, anthers ditheous, oblongoid, purple-coloured, dorsifixed, introrse, glabrous; Carpel (3), syncarpous, 1-loculed, one ovule in each locule, basal placentation, style tri-fid, stigma capitate. Fruits-nutlets, tri-lobed and conical shaped. Seeds-Black with thin testa (Fig. 1 to 15).



Figure.1 Habit of *Polygonum chinense* L.



Figure. 2 Leaves of *Polygonum chinense* L.



Figure. 3 Upper Leaf surface of *Polygonum chinense* L.



Figure. 4 Lower Leaf surface of *Polygonum chinense* L.



Figure. 5 Inflorescence



Figure.6 Close up view of Inflorescence



Figure. 7 Close up view of flower



Figure. 8 L.S of flower

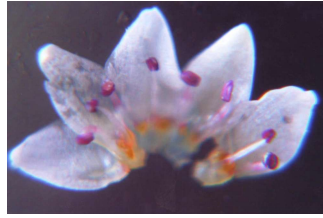


Figure. 9 Close up view of Androecium



Figure.10 Close up view of Gynoecium



Figure. 11 T.S of ovary



Figure. 12 Close up view of a fruit



Figure. 13 Close up view of a seed



Figure. 14 Fruits



Figure. 15 Seeds

Microscopical characters of leaves of *Polygonum chinense* L.

Lamina

In surface view, cuticle present on upper epidermal cells was striated. Epidermal cells of both surfaces were parenchymatous, thin-walled. Upper epidermal cells were polygonal in shape and lower epidermal cells were irregular. In the upper epidermal cells, were straight and in the lower epidermal cells, they were wavy. Stomata of upper surface are anomocytic type and a few in number, those of lower surfaces are abundant, similar to upper stomata in shape and type (Fig. 16 and 17).

In Transverse section of upper portion of lamina, cuticles are thick and slightly wavy on both surfaces. The epidermal cells of the upper surfaces are polygonal in shape and those of the lower surfaces are oval, upper epidermal cells are more larger than the lower ones, palisade cells below the upper epidermis is one layer thick, loosely arranged, intercellular spaces present, vertically erect, elongated in shape with numerous chloroplasts, spongy mesophyll cells are 5-6 layers, the cells are irregularly and loosely arranged (Fig. 18).

In Transverse section of middle portion of lamina, cuticles are slightly thick and slightly wavy on both surfaces. The epidermal cells of the upper surfaces are polygonal in shape and those of the lower surfaces are more or less rectangular in shape, upper epidermal cells are more larger than the lower ones, palisade cells are two layers; upper layers is more longer than the lower, spongy mesophyll cells are 5-6 layers; the cells are irregular (Fig. 19).

In Transverse section of basal portion of lamina, cuticles are slightly thick and slightly wavy on both surfaces. The epidermal cells of both surfaces are irregularly and loosely arranged, thin wall, parenchymatous cells and oval to rounded in shape, palisade cell short, more broad, 2-3 layers, irregular in shape; spongy mesophyll cells are 4-6 layers (Fig. 20).

In all portions of Transverse section of lamina, calcium oxalate crystals (druses) were abundant, vascular bundles are inconspicuous because lateral viens are narrow and few.

Microscopical characters of leaves of *Polygonum chinense* L.

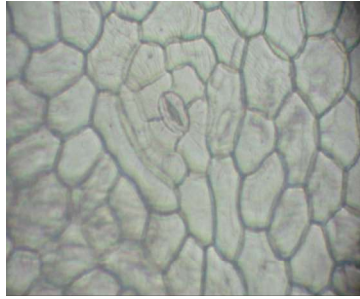


Figure.16 Surface view of upper epidermis (X 400)

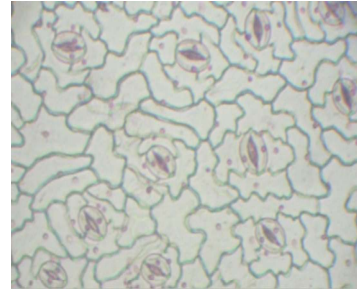


Figure.17 Surface view of lower epidermis (X 400)

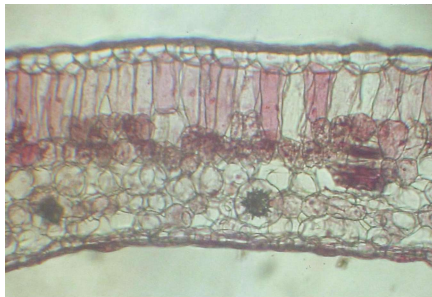


Figure.18 Tip portion of Lamina (X 400)

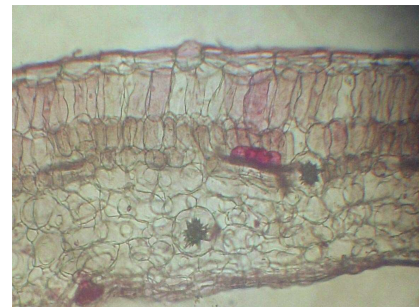


Figure. 19 Middle portion of Lamina (X 400)

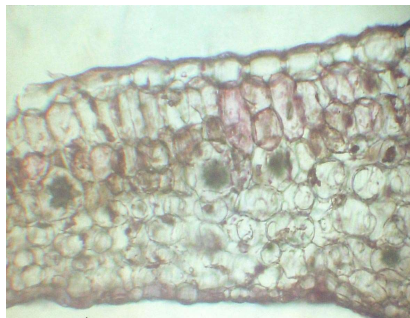


Figure. 20 Basal portion of Lamina (X 400)

Midrib

In surface view, both epidermal cells thin walled parenchymatous, rectangular to polygonal in shape. The cells are elongated along the length of the midrib. Lower epidermal cells are longer than upper ones (Fig. 21 and 22).

In Transverse section, upper and tip portion of midrib is and funnel shaped; middle portion is rectangular and basal portion is shield shape. The cuticle layers of the midrib are thin-walled (Fig. 23, 24 and 25).

Upper epidermal cells are oval to rounded; lower epidermal cells are round. Below the upper epidermis are 2-4 layers of collenchymatous cells, the cells are rounded in shape. Above the lower epidermis is 1-2 layers of thick collenchyma, the cells are also rounded. Vascular bundles are 8 in number at basal portion of midrib, one was larger than the other bundles. Collateral vascular bundles were observed in all portions of midrib. Phloem lies towards the outer portions and xylem lies towards the inner portion. Phloem consists of sieve tube, companion cell and phloem parenchyma. Xylem consists of vessel, tracheids and xylem parenchyma. At the upper and middle portion of the midrib, two vascular bundles were found. At the tip of the midrib, only one vascular bundle is observed.

All portions of midrib, vascular bundles are sheathed by collenchymas instead of sclerenchyma. Calcium oxalate crystals were present in all portions of midrib (Fig.

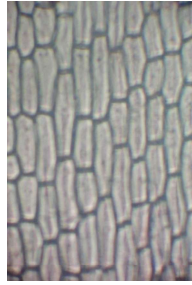


Figure.21 Upper surface view of midrib (X400)

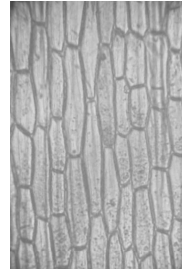


Figure.22 Lower surface view of midrib(X 400)



Figure. 23 T.S of midrib (apical) (X 400)



Figure. 24 T-S of midrib (middle) (X 400)

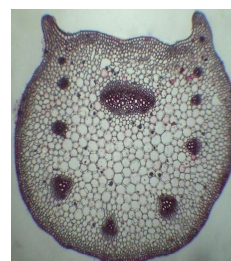


Figure. 25 T-S of midrib (basal) (X 400)

Petiole

In surface view, both epidermal cells are thin walled parenchymatous and rectangular to polygonal in shape (Fig. 26 and 27).

In Transverse section of petiole is semi-circular shape in outline. The epidermal cells of upper portion are thin wall parenchymatous, polygonal in shape. Epidermal cells of lower portion are rounded. Beneath the epidermis are collenchymatous and parenchymatous cells.

Collenchyma cells of upper portion are 3-5 layers; the cells are in shape and collenchyma cells of lower portion is 2-4 layers; the cells are also rounded. At the parenchyma cell beneath the collenchyma extend to the center, the cells are isodiametric in shape. Vascular bundles are about 10 in number, collateral type, are vascular bundle in the upper portion is largest. Phloem lies towards the outer portion and xylem towards the inner portion. Calcium oxalate crystals (druses) are abundant (Fig. 28 and 29).

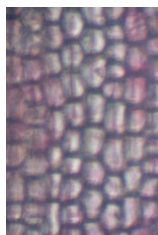


Figure. 26 Upper surface view of petiole (X 400)

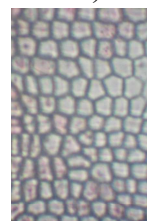


Figure. 27 Lower surface view of petiole (X 400)

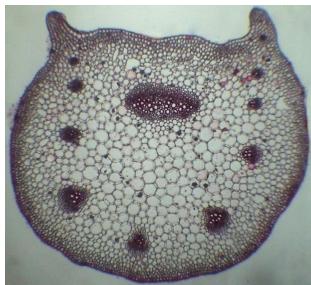


Figure.28 Transverse section of petiole (X 400)

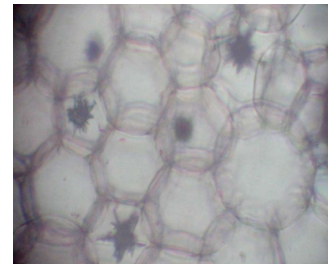


Figure.29 Transverse section of petiole (calciumoxalate crystals) (X 400)

Microscopical characters of powdered leaves of *Polygonum chinense* L.

Lower fragment of upper epidermal cells and lower epidermal cells with anomocytic stomata are found. Stomata are abundant in lower epidermal cells. Calcium oxalate crystals are abundant. Scalariform vessel, pitted vessel,

pitted tracheid, fiber tracheid, fiber, xylem parenchyma were also found (Fig. 30 to 37).

Table 1. Sensory characters of powdered leaves of *Polygonum chinense* L.

No	Characters	<i>Polygonum chinense</i> L.
1	Colour	Pale brown
2	Odour	Slightly pungent
3	Taste	Sour
4	Texture	Granular

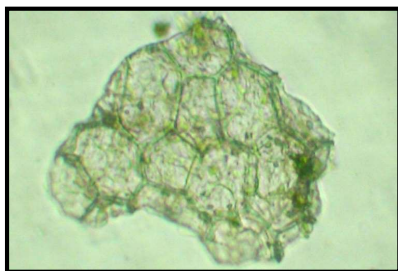


Figure.30 Surface view of upper epidermal cells (X 400)



Figure.31 Surface view of lower epidermal cells (X 400)



Figure.32 Scalariform vessel (X 400)



Figure.33 Pitted vessel (X 400)



Figure.34 Pitted tracheid (X 400)



Figure.35 Fiber tracheid (X 400)

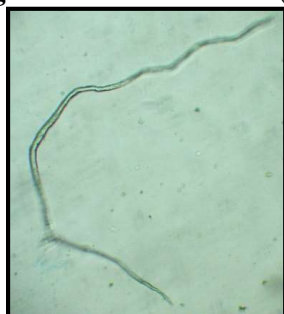


Figure.36 Fiber (X 400)

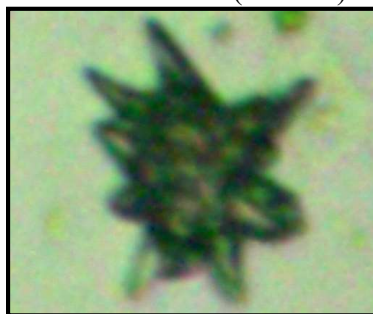


Figure.37 calciumoxalate crystal(X 400)

Nutritional values of leaves of *Polygonum chinense* L.

In the present work, In nutritional values of leaf powdered of *Polygonum chinense* L. carbohydrate, vitamin C, protein, fat, fibre and vitamin B₁ were present. The carbohydrate content is highest amount and vitamin B₁ is the lowest. The results are shown in (Table 2 and Fig 38).

Table 2. Constituents and nutritional values of the leaves of *P. chinense* L.

No.	Constituents	Nutritional values (mg/100g)
1.	Carbohydrates	63.36
2.	Protein	11.16
3.	Fat	1.76
4.	Fibre	1.12
5.	Vitamin B ₁	0.46
6.	Vitamin C	28.78

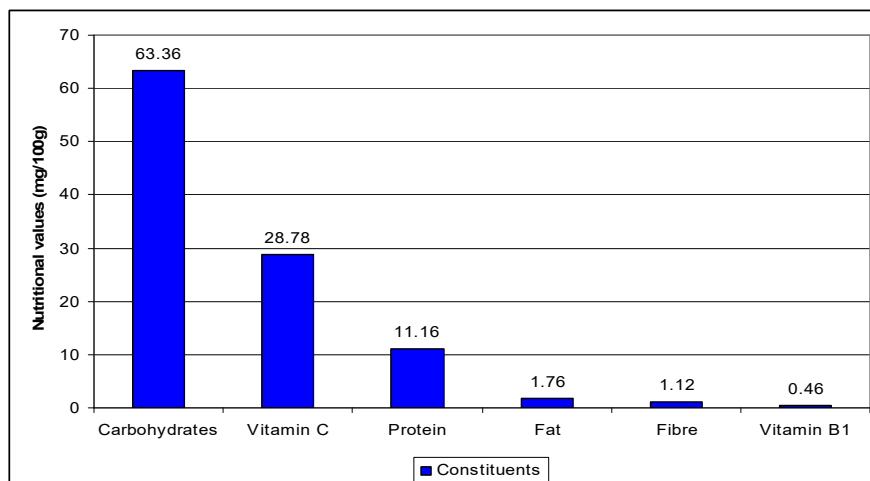


Figure. 38 Nutritional values of leaves of *P. chinense* L.

Discussion and Conclusion

Botanical study plays a vital role in identification of plants. There is a number of literature in which characters of family Polygonaceae, genus *Polygonum* and the species named *Polygonum chinense* L. were described. The morphological characters of *Polygonum chinense* L. in the present study revealed that its habit was perennial herbs, about 1.5 ft in height. (Burkill, 1935), Wealth of India, (1959). Cylindrical glabrous stems were observed in the present work. Leaf shape observed in the present work was ovate. It is more or less similar to the finding of Bailey (1939) who stated that the leaves were ovate or even broader and (website 2) mentioned that the leaves are ovate to oblong. Dutta (1969) stated that the diagnostic character of family Polygonaceae is having ochreate stipules. A distinctive character of *Polygonum chinense* L. is that an inverted 'v' shaped spot occurs on the upper surface of the leaf (website 2). Purple coloured patches are found to be present at the central portion of leaf blade in the present study.

Inflorescence observed in *Polygonum chinense* L. was terminal paniculate corymbose cymes. This is agreed with Hooker (1885), who stated that inflorescence was head panicle or corymbose. White colour of flower observed in the present work was more or less similar to finding of previous workers; white or light reddish in colour. (Website 2) white or pink (Kirtikar and Basu, 1975). Polygonaceae is an apetalous family. Perianths are petaloid.

The segments or whole flora parts are called calyx in some literature while others mention as perianth. Perianth are fused and 5-lobed, perianth 5-cleft (Bailey, 1939); perianth lobes 5 (Cooke, 1958). In Dutta (1969) stamens are 5-8 and that was the same as Hooker (1885). This character of the species supported the finding of the present work in which 8 stamens are observed. Ovary trigonous, style tri-fid in the present study that agree with those of Kirtikar and Basu (1935), Ridely (1924). Observation of nutlets as trigonous fruit, is in agreement with that of Hooker (1885); Cooke (1958); Kirtikar and Basu (1935).

In the histological characters, the microscopical characters was in agreement with work of previous authors especially Metcalfe and Chalk (1950). These are 2-4 layers of palisade tissue in leaf, vascular bundles are sheathed by collenchymas instead of sclerenchyma and collateral type of vascular bundles and abundant calcium oxalate crystals and anomocytic stomata.

In the powdered characters, relatively large and abundant calcium oxalate crystals, and wide distribution of tannin, scalariform vessels, pitted vessels, pitted tracheids, fiber tracheids and druses in powder of leaves. It can standardization of the drug that used of the leaf of *Polygonum chinense* L. in traditional medicine formulation.

According to the nutritional value the leaf may support human health care because of having minerals, protein, carbohydrates, fat and vitamins. In conclusion, plant parts and its products are important therapeutic agents.

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