

A STUDY ON MORPHOLOGY AND PHYTOCHEMICAL TEST OF *ASYSTASIA GANGETICA* (L.) T. ANDERS.

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Abstract

Asystasia gangetica (L.) T. Anders belongs to the family Acanthaceae and it is perennial herbs and quadrangular stem present. In Myanmar, it has been found in wild and cultivated as ornamental and medicinal plant. In this paper, morphological, microscopical characters and phytochemical constituents of leaves and stem have been described by available literature and test. Leaves are opposite and decussate, simple, the margin entire and acute at the tip, lanceolate and petiole is long. In microscopical character of leaves, the cell shape is wavy and the diacytic type of stomata is found on both surfaces. The mesophyll consists of palisade and spongy parenchymatous cells. In the phytochemical tests, alkaloids, reducing sugar, steroid, and saponin are not found. Starch is found in the leaves and not in stem. Indigenous medicinal system can be supported by the information of the present study. According to results, this plant can be further studied for the application in Myanmar traditional medicine.

Keywords : *Asystasia gangetica* (L.) T. Anders , morphological , microscopical characters, phytochemical constituents

Introduction

Plant based natural constituents can be derived from different parts of the plant and various herbal medicines derived from plant extracts were used to treat a wide range of clinical diseases. In Myanmar, most people have been living in rural area and which had used traditional medical for health care needs for the past decades. (Health and Myanmar's Medicine, 1999) . *Asystasia gangetica* (L.) T. Anders. belongs to the family Acanthaceae. It is commonly known as Chinese Violet in English and it is also known as Kyauk hkwe Pin in Myanmar.

The chemical constituents of this plant were carbohydrates, protein, alkaloids, tannins, steroidal aglycans, saponin, flavonoides and triterpenoides. It also contained mineral like calcium, phosphorus, sodium, manganese, copper, zinc, magnesium, iron that described by Tilloo & et al, 2012. In addition, phenol and terpenoids were present and alkaloids, flavonoids, tannins, saponin, and terpenoids were absent in the watery extract of this plant as described by Rajeshwari Sivarai & et al, 2013.

Kirtikar & Basu, 1935, described the medicinal uses of *Asystasia gangetica* (L.) T. Anders. plant is the juice of the plant used as an anthelmintic. It is also given in swellings and rheumatism. Similarly, a leaf decoction is used in the treatment of fever aches, epilepsy, and urethral discharge as described by Lemmens and Bunyapraphatsara, 2003.

The present study involved the morphological and microscopical characters and preliminary phytochemical test on leaf and stem.

Aim and Objectives

- To know the morphological characters of *Asystasia gangetica* (L.) T. Anders.
- To know the chemical constituents of its leaf and stem.
- To know the medicinal uses.

Materials and Methods

Collection and identification of *Asystasia gangetica* (L.) T. Anders.

The plant *Asystasia gangetica* (L.) T. Anders. was collected from Yangon from June to July in 2019. The collected specimens were identified with the help of available literature of Backer & Brink, 1965; Dassanayake, 1998, Kress, 2003, Flora of

Hong Kong,2009 .The leaves and stem were used to study its morphological, microscopical characters and preliminary phytochemical tests.

Microscopical characters of leaves and stem of *Asystasia gangetica* (L.) T. Anders

For the microscopical characters examination, the leaf and stem were observed by free hand section by using the razor blade. The sections were cleared in chloral hydrate solution.

For the preliminary phytochemical test, the specimens were washed and then dried in room temperature about three weeks. After that, the specimens were ground to get powder and stored in air tight containers. Phytochemical tests were conducted according to British Pharmacopeia, 1968

Preliminary phytochemical test

Phytochemical tests were carried out to determine the presence or absence of chemical constituents such as alkaloid, glycoside, reducing sugar, saponin, carbohydrate, starch, α amino acid, phenolic compound, tannin and steroid.

Results

Morphological characters of *Asystasia gangetica* (L.) T. Anders

Scientific name	- <i>Asystasia gangetica</i> (L.) T. Anders
Family	- Acanthaceae
English name	- Chinese Violet
Myanmar name	- Kyauk hkwe Pin
Synonym	- <i>Asystasia coromandeliana</i> Nees

The plant was erect perennial herbs and quadrangular stem present. Leaves were opposite and decussate, simple, the margin entire and acute at the tip, lanceolate 4.6to 12.5cm length and2.6 to 6.5cm wide , petiolate about 0.6 to 2.3 cm long and stipulate, hair present in upper and lower surface . Inflorescences were terminal and axillary racemose and unilateral. Flowers were bracteates, bracteolate, pedicellate, complete, bisexual, irregular, zygomorphic, pentamerous and hypogynous. Calyx were five sepals, synsepalous, imbricate, sepaloid, persistent and inferior. Corolla were five, synpetalous, twisted, petaloid(white and purple blotches inside one petal), and inferior. Androecium were stamens four, epipetalous, introrse, didynamous, anther ditheous, dorsifixed and longitudinal dehiscence. Gynoecium was two carples, bicarpellary, syncarpous, style long, stigma bifid, axile placentation, bilocular,many ovules in each locule, ovary superior. Flowering period was from January to September.



Figure 1. Morpological characters of leaves of *Asystasia gangetica* (L.) T. Anders

Microscopical characters of leaves of *Asystasia gangetica* (L.) T. Anders**Lamina**

In surface view, the epidermal cells of both surfaces were parenchymatous and thin walled. The cell walls of upper and lower surface were wavy. Stomata were present on the upper and lower surfaces. They were diacytic type. The guard cells were crescent shape. Trichome and glandular hair were present on upper surface.

In transverse section, the upper and lower epidermal cells were rectangular in shape. The mesophyll consisted of palisade and spongy parenchyma cells. The palisade cells were cylindrical shaped and closely packed arranged in the upper surface. The spongy mesophyll cells were rounded and loosely between them.

Midrib

In surface view, the epidermal cells of both surfaces were thin walled, parenchymatous and rectangular in shape, elongated along the midrib. Stomata were present in the upper surface.

In transverse section of midrib, the cuticle layer of upper and lower surface was present. The upper and lower epidermal cells were rectangular shaped. It was slightly project four lobes were found in the upper surface. The cortex made up of parenchymatous cells 5 to 7 layers. Collenchyma cells were found 2- 3 layers at the below of the lower epidermis. They were polygonal in shaped. The bundle sheath was not found in the vascular bundle. Xylem cells towards the lower surface and xylem strands were 9-16 rows. Each xylem strands consists of 3-5 xylem cells. They were hexagonal shaped. The phloem cells were very small and 3 to 4 layers in the lower surface.

Petiole

In surface view, the epidermal cells were parenchymatous compact with thin cuticle, rectangular shaped. In transverse section, it was slightly project two lobes and trichomes were found on the upper surface and wing shaped were found at the corner of upper surface. The upper and lower epidermal cells were single layer and laterally elongated and rectangular shaped. 2-3 layers of collenchymas cells were found around the petiole. The vascular bundles were in the form of shallow arch. The vascular bundle consisted of many xylem strands and small cells phloem. Bundle sheath was not found. Each strand consist 2- 3 xylem cells. The phloem cells were very small and 2-3 rows. The cortex made up of many parenchymatous cells.



Figure 2. Microscopical characters of *Asystasia gangetica* (L.) T. Anders leaves

Stem

In surface view, the epidermal cells were parenchymatous compact with thin cuticle, rectangular shaped and diacytic type stomata and trichomes were found.

In transverse section, the stem was quadrangular shaped and had hollow at the pith in the mature and there was no hollow in the young stem. 2- 3 layers of collenchymas cells were found around the stem. Vascular bundles consisted of single strand xylem and it were found at the corner of the stem. Phloem cells were small and were found around the stem. The cortex made up of parenchymatous cells.



Figure 3. Microscopical characters of *Asystasia gangetica* (L.) T. Anders Stem

Preliminary phytochemical test

The dried powder of the leaves and stem were examined by using various chemical reagents for the presence or absence of the chemical constituents. It was determined by observation of the resulting color or precipitation as shown in table.

According to observation, glycoside, carbohydrate, tannin, and α - amino acid were found in the leaves and stem. Among them, carbohydrate, tannin and glycoside were more prominent than other constituents. Alkaloids, steroid, reducing sugar and saponin were not found . Starch was found in the leaves and not found in stem.

**Table-Preliminary phytochemical test on powder of leaves and stem of
Asystasia gangetica (L.) T. Anders**

No.	Test	Extract	Test Reagent	Observation (Leaves)	Result	Observation (stem)	Result
1	Alkaloid	H ₂ O	Mayer's reagent Dragendroff's reagent Wagner's reagent	No ppt No ppt No ppt	- - -	No ppt No ppt No ppt	- - -
2	Glycoside	H ₂ O	10% lead acetate solution	White ppt	+	White ppt	+
3	Reducing sugar	H ₂ O	Benedict's solution, H ₂ SO ₄ (conc)	Blue black	-	Blue black	-
4	Saponin	H ₂ O	Distilled water	No frothing	-	No frothing	-
5	Carbohydrate	H ₂ O	10% α - naphthol	Red ring	+	Red ring	+
6	Starch	H ₂ O	I ₂ solution	Blue black ppt	+	brown	-
7	α -aminoacid	H ₂ O	Nihydrin reagent, 10% acetic acid	Pale pink	+	Pale pink	+
8	Phenolic compound	H ₂ O	10% FeCl ₃ solution	Deep blue	+	Pale brown	-
9	Tannin	H ₂ O	10% FeSO ₄ solution	Blue black	+	Blue black	+
10	Steroid	H ₂ O	Acetic anhydride, H ₂ SO ₄ (conc)	Red brown	-	Pale brown	-

Present + , Absent -

Discussion and Conclusion

In this paper, the morphological characters of *Asystasia gangetica* (L.) T. Anders plant and microscopical characters of leaves and stem were described. Moreover, the chemical constituents of leaves and stem of this plant were also described.

According to the result, the plant of *Asystasia gangetica* (L.) T. Anders was erect perennial herbs and quadrangular stem present. These characters were in agreement with mentioned by Backer & Brink, (1965)

In addition, the leaves were opposite and decussate, simple, the margin entire and acute at the tip and petiole was long. These characters were in agreement with as shown in Backer and Brink, 1965 and Dassanayake, 1998.

Moreover, inflorescence was racemose and axillary or terminal was found. Flower were white with purple blotches inside on one petal and zygomorphic, stamens didynamous. These characters were in agreement with Flora of Hong Kong, 2009.

In the present study, the microscopical character of leaves were dorsiventral, stomata were present on the upper and lower surface and diacytic type. The epidermal cells were wavy on the anticlinal walls on both surface and trichome and glandular hair were found. The mesophyll consisted of palisade and spongy cells. These characters were agreed by Metcalf and Chalk, (1950) and Journal of phytochemical research, 2005.

In this paper, phytochemical tests were carried out to examine the presence or absence of chemical constituents. Glycoside, carbohydrate, tannin and α - amino

were more prominent than other constituents found in the leaves and stem. Alkaloid, saponin, reducing sugar and steroid were not found in the leaves and stem. Starch and phenolic compound were found in the leaves. These characters agreed with the facts described by International Research Journal of Pharmacy, 2013.

Mostly, plants in Acanthaceae family contain various compounds and some of which have medicinal properties. Phenolic compounds like flavonoids and glycoside, tannin and others make plant useful in various ailments or disease. These compounds have hypoglycemic activities, anti-inflammatory activities. These compounds are now used worldwide to treat and protection against chronic diseases. These fact were described by Rajeshwari Sivarai & et al , 2013.

In this paper, glycoside, tannin, phenolic compound were found in the leaves and stem of this plant. According to available literature, this plant was used to treat as an anthelmintic. It is also given in swellings and rheumatism, asthma, skin allergies, gonorrhea and ear disease, diabetes as ethnomedicine uses.

In Myanmar, *Asystasia gangetica* (L.) T. Anders plants are used as ornamental plant, vegetable and medicinal plant. The medicinal uses are mucolytic, digestion in food, dysentery and diuretic and digestion on urolith. These facts were described by A Shin Na Ga Thein, 1972. Moreover, this plant has grown wild and cultivated a ornamental plant, so it can be easily ascertained and used as traditional medicinal plant. According to result, this plant can be further studied for the application in Myanmar traditional medicine.

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References

- Ashin Nagathein. 1972. **Pon PYA Say Ah Bea Dan**, Myanmar Vesion . Yangon; Mingalar Press.
- Backer, C.A Van Den & Brink, R.C.B. 1965. **Flora of Java**. Vol II, N . V . P . Noordhoof Of Grningen Company, The Netherlands.
- British Pharmacopeia** .1965 . Department of Health and social security Scottish Home for Northern Irenlan , London.
- Dassanayake, M.D., 1998. **Flora of Ceylon**.(Vol. XII) . the University of Peradeni Department of Agriculture, Peradeniya, Sri Lanka.
- Flora of Hong Kong**, 2009.(Vol.III). Agriculture, Fisheries and Conservation Department.
- Kirtikar, K.R & Basu , B.D.1935.**Indian medicinal plant**.(Vol.IV). India: International Book Distributors.
- Kress, J. W., Robert, A.D., Farr, E.& Yin Yin Kyi (2003). **A checklist of the Trees, Shrubs, Herbs, and Climbers of Myanmr**. Department of Systematic Biology Botany, National Museum of Natural History, Washington DC: U.S.A
- Rajeshwari Sivaraj & et al ,2013. **Pharmacognostical and Phytochemical Screening of *Asyatasia gangetica* (Chinese Violet)**, International Research Journal of Pharmacy. www.iriponline.com
- Tilloo SK & et al.,2012. ***Asyatasia gangetica*: Review on Multipotential Application**, **International Research Journal of Pharmacy**. www.iriponline.com
- Lawrence, G.H. 1969. **Taxonomy of vascular plants**.(10thed) New York; The Mac Millian Company.
- Lemmens & Bunyapraphatsara,2003. **Medicinal and poisonous plants 3**, Plant Resources of South- East Asia, Bogor, Indonesia.
- Metcalf, C .R. & Chalk , L. 1950 . **Anatomy of the Dicotyledons, Leaves, Stem and Wood in relation to taxonomy with notes on economic uses** (1thed.). Oxford University Press.