Morphology, Anatomy and Phytochemical investigation of Leaves of *Quisqualis indica* L. (Dawe-hmaing)

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Abstract

The study was carried out to determine the morphology, anatomy and phytochemical investigation of the leaves of *Quisqualis indica* L. belongs to the family Combretaceae. The specimens were collected from Chanayethazan Township, Mandalay Region during December 2018 to May 2019. The selected plants, *Quisqualis indica* L. were studied and identified at the Department of Botany, Yadanabon University by using literature. The morphological characters of *Quisqualis indica* L. was woody climber; leaves simple; inflorescences terminal or axillary spikes. The anatomical characters of leaves (lamina, midrib and petiole) were also examined by making free hand sections. Moreover, the phytochemical investigation was carried out to reveal the chemical constituents by using Harborne method. Glycosides, steroids, saponins, phenolic compounds, polyphenol, flavonoids, reducing sugars and terpene were present but alkaloids and tannins were absent. These results will scientifically support the authentication and quality control of crude drugs of *Quisqualis indica* L.

Keywords : *Quisqualis indica* L., Morphology character, Anatomy character, Phytochemical investigation

Introduction

The selected species of *Quisqualis indica* L. is well known as Dawe-hmaing in Myanmar, belongs to the family Combretaceae, is a woody climber with attractive flowers, is cultivated for ornament in the tropics.

Many plant parts, such as root, leaves, barks, seeds, fruits and flowers are used in traditional medicine. Most of the people use traditional medicine for the treatment of diseases. In Myanmar, there are many traditional medicinal plants which have been reputed for their various kinds of activities and usefulness in pharmacology (Harbone 1993).

Metcalfe and Chalk (1950) described that the general anatomical structure of the family Combretaceae. The leaves were generally dorsiventral with ranunculaceous (anomocytic) type stomata is found on the lower surface of the leaves.

Plants contain hundreds of different constituents of chemicals that interact in complex ways although it is very useful to be known that a plant contains certain active constituents (Chevallier 1996). Phytochemical, that occurs naturally in plants and currently many phytochemical in clinical trails for a variety of diseases (Lewis 1977).

The decoction of the leaves of *Quisqualis indica* L. are used as a vermifuge, ulcers, parasitic skin infections and both externally and internally for pain relief. Fresh leaves are taken as salad in case of dysentery. In Indonesia, very young shoot are eaten raw or steamed (Padua *et al* 1999).

In the present study, morphology, anatomy and phytochemical analysis of *Quisqualis indica* L. had been thoroughly investigated. The aim and objectives of present work are to obtain detailed information of morphology and anatomy

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characteristics of Dawe-hmaing, to examine the phytochemical constituents and to provide the useful information for further pharmceutical study.

Materials and Methods

Morphological studies

The fresh plant parts of *Quisqualis indica* L. were collected in Chanayethazan Township, Mandalay Region. Identification for taxonomic description was made by using literature such as Flora of British India (Hooker 1879), Flora of Java (Backer 1963) and Flora of Ceylon (Dassanayake 1995) at the Department of Botany, Yadanabon University.

Anatomical studies

For anatomical study, some of the fresh leaves (lamina, midrib, petiole) were cut into the sections by using razor blades. The free hand sections were cleared in chloral hydrate solution and stained with safranin and temporarily mounted by glycerin and observed under a light microscope according to the method of Johansen (1940).

Chemical Studies

Phytochemical Test

The dried crude powder of leaves were percolated with ethanol and filtered with filter paper. A few grams of ethanol extracts of leaves of *Quisqualis indica* L. was subjected to the tests of alkaloids, flavonoids, glycosides, phenolic compounds, polyphenols, terpenes, reducing sugars, saponins, steroids and tannins according to standard procedures, Harborne (1993).

Results

A. Morphological studies

Family **:** Combretaceae
Scientific name **:** *Quisqualis indica* L.
Myanmar name : Dawe-hmaing
English name : Rangoon Creeper

Woody climber; stems and branches terete, shortly and densely tomentose. Leaves simple, opposite to subopposite; petioles densely tomentose; blades elliptic to oblong-elliptic, rounded to subcordate at the base, entire along the margin, acuminate at the apex, minutely verrucose above, finely pubescent beneath. Inflorescences terminal or axillary spikes; sometimes forming a leafy panicle; peduncles 2-8 cm long. Flowers 3.5 cm in diameter at anthesis, at first white, soon turning red, fragrant; bracts linear to narrowly-lanceolate, pubescent. Sepals triangular, acute or obtuse, reflexed at maturity. Petals 5, oblong, white, turning deep red at maturity, shortly clawed, finely and sparsely pubescent. Stamens 10 in 2 series, free, included. Ovary inferior, oblong, unilocular, with one pendulous ovule; style filiform, adnate in part to the inner wall of the upper receptacle or calyx tube equal to the length of calyx-tube. Fruits is not available.

Figure 1. Natural Habit

B. Anatomical Studies

Lamina of *Quisqualis indica* L. - In transverse section, the lamina of *Quisqualis indica* L. was typically dorsiventral and reticulate venation. It was distinguishable into dermal, ground and vascular tissue systems.

Dermal tissue system: Composed of epidermal cells and guard cells of the stomata. In surface view, the epidermal cells of the both surfaces parenchymatous, irregularly arranged. Stomata present only on the abaxial surface, of ranunculaceous or anomocytic type, oval or elliptical in outline; the guard cells reniform. In transverse section, both adaxial and abaxial epidermal cells one–layered, oval or barrel–shaped, compact, continuous; cuticle smooth and thin. **Ground tissue system:** Composed of mesophyll cells differentiated into palisade and spongy parenchyma; palisade parenchyma lying internal to the adaxial epidermal cells, 1-2 layered, the cells vertically elongated, compactly arranged, thin-walled; spongy parenchyma lying internal to the abaxial epidermal cells, 3-4 layered, the cells oval or rounded in shape, thin–walled; intercellular spaces present. **Vascular tissue system:** Vascular bundles embedded in the mesophyll cells, of collateral type, oval–shaped; xylem at the adaxial side and phloem at the abaxial side. Phloem 1-3 layered, cells oval or polygonal in shape, composed of sieve-tube, companion cells and phloem parenchyma. Xylem cells 1-6 cells; xylem composed of vessel elements, tracheids, fibers and xylem parenchyma.

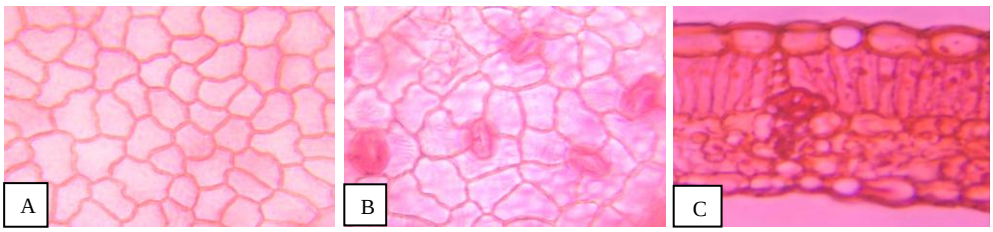

Figure 2. Internal structure of lamina of *Quisqualis indica* L.
A. Surface view of adaxial side
B. Surface view of abaxial side
C. Transverse section

Midribs of *Quisqualis indica* L. - In transverse section, the midribs studied were semi–circular in outline, slightly convex at adaxial side and wavy at abaxial side. It was distinguishable into dermal, ground and vascular tissue systems.

Dermal tissue system: Composed of epidermal cells and non-glandular trichome. In surface view, epidermal cells parenchymatous, more or less rectangular, thin–walled; chloroplast present. In transverse section, both adaxial and abaxial epidermal cells one–layered, oval or barrel–shaped, compactly arranged, continuous, thick–walled; non-glandular trichome multicellular, uniseriate; cuticle smooth and thin. **Ground tissue system**: Composed of cortex, endodermis and pericycle. Cortex composed of outer collenchymatous cells and inner parenchymatous cells. Outer collenchymatous cells toward the adaxial cells 3-4 layered; those toward the abaxial side 2-3 layered, the cells oval or rounded. Inner parenchymatous layers towards the adaxial side 1-2 layered, the cells oval or rounded, thin–walled; those toward the abaxial side 2-3 layered, the cells oval or rounded in shape, thin–walled. Endodermis one layered, parenchymatous cells, barrel-shaped in cell, thin walled; pericycle sclerenchymatous, surrounding the vascular bundle, 3-4 layered. Crystal were observed in the cortical region. **Vascular tissue system:** Vascular bundles embedded in the ground tissue system and enclosed by a ring of sclerenchymatous cells, concentric type. Phloem towards the adaxial side, 3-4 layered; those at the abaxial side, 4-6 layered, composed of sieve tubes,

companion cells, fibers and phloem parenchyma. Xylem 4-8 cells in each row, composed of vessel elements, tracheids, fibers and xylem parenchyma.

Figure 3. Internal structure of midrib of *Quisqualis indica* L.

A. Surface view
B Transverse section
C. Vascular bundle

Petioles of *Quisqualis indica* L. - In transverse section, the petioles studied were semicircular in outline. It was distinguishable into dermal, ground and vascular tissue systems.

Dermal tissue system: Composed of epidermal cells and non-glandular trichome. In surface view, epidermal cells parenchymatous, irregularly rectangular in shape, thin–walled. In transverse section, both adaxial and abaxial epidermal cells one–layered, the cells oval or barrel–shaped, thin–walled, compact, continuous, anticlinal walls straight, outer and inner walls slightly convex; non-glandular trichome unicellular, uniseriate; cuticle smooth and thin. **Ground tissue system**: Composed of outer collenchymatous cells and inner parenchymatous cells. Outer collenchymatous layers lying internal to the adaxial and abaxial epidermis; those at adaxial cells 4-7 layered; those at abaxial cells 3-6 layered, the cells oval or rounded in shape. Inner parenchymatous layers lying internal to the adaxial and the abaxial collenchymatous layers; those at adaxial cells 2-3 layered, cells oval or rounded in shape, thin–walled, those at abaxial cells 3-5 layered, the cells oval or rounded in shape, thin–walled; numerous druses crystal present. **Vascular tissue system:** A large vascular bundles embedded in the ground tissue system, arranged in closed collateral type, large vascular bundles crescent-shaped, the cells oval or rounded. Phloem toward the abaxial side, 6-8 layered, composed of sieve-tubes, companion cells, phloem fibres and phloem parenchyma. Xylem towards the adaxial side, 2-8 celled in each row, composed of vessel elements, tracheids, fibers and xylem parenchyma.

Figure 4. Internal structure of petiole of *Quisqualis indica* L.

A. Surface view
B. Transverse section
C. vascular bundle

C. Phytochemical Test of *Quisqualis indica* L.

Phytochemical investigation of leaves of *Quisqualis indica* L. was carried out on ethanol extracts and the presence or absence of active constituents as shown in Table 1.

Table 1. Phytochemical Test of Leaves of *Quisqualis indica* L.

No	Chemical constituents	Chemical Reagent	Result	
			Observation	Remark
1	Alkaloids	Dragendroff's reagent	No orange ppt	–
2	Flavonoids	Mg + conc: HCl	Yellow	+
3	Glycosides	10 % lead acetate	White ppt	+
4	Phenolic Compounds	10% $FeCl_3$	Blue colour	+
5	Polyphenol	1% $FeCl_3$ and 1% $K_3[Fe(CN)_6]$	blue green colour	+
6	Terpenes	Acetic anhydride, conc: H_2SO_4, chloroform	Red brown	+
7	Reducing sugar	Benedict's reagent	Brick red ppt	+
8	Saponins	distilled water	Frothing	+
9	Steroids	pet-ether, acetic anhydride, conc: H_2SO_4	Green colour	+
10	Tannins	0.1% $FeCl_3$	No ppt	–

\+ = presence of chemical constituents
– = absence of chemical constituents, ppt = precipitation

Discussion and Conclusion

Quisqualis indica L. of the family Combretaceae is distributed in the tropical and subtropical regions in Myanmar and is found to be growing cultivated throughout in Chanayethazan Township, Mandalay Region.

In the present work, morphology, anatomy and phytochemical investigation of *Quisqualis indica* L were studied, described and discussed.

Quisqualis indica L**.** is woody climber and leaves are simple, opposite to subopposite, rounded to subcordate at the base, entire along the margin, acuminate at the apex and verrucose above and pubescent beneath. Inflorescences are axillary or terminal spike. Sepal are reflexed at maturity. Petals are at first white, turning red at maturity. Stamens are ten in two series, free, included and anthers are dithecous. Ovary is inferior, unilocular with one pendulous. These morphological characters observed in present work were agreed with those described by Hooker (1879), Dassanayake (1995) and some workers.

The anatomical characteristics of lamina, midrib and petiole of *Quisqualis indica* L**.** were studied. Of these plant parts, dermal tissue system, ground tissue system and vascular tissue system were described.

In this research, the lamina of *Quisqualis indica* L**.** are dorsiventral and reticulate venation. The epidermal cells are irregularly arranged onsurface view. Stomata are anomocytic and usually present on the abaxial side. In transverse section of lamina, the epidermal cells are one–layered and covered with thin cuticle. Mesophyll was differentiated into palisade parenchyma and spongy parenchyma. In addition, vascular bundles were embedded in the mesophyll, of collateral type and oval–shaped in outline. Xylem lying at the adaxial side and phloem at the abaxial side. These anatomical characters were in agreement with Metcalfe and Chalk (1950).

In transverse section of midribs, the epidermal cells outermost and parenchymatous. The ground tissue is composed of cortex, endodermis and pericycle. Vascular bundles are embedded in the ground tissue system and enclosed by a ring of sclerenchymatous cells, concentric type. The petioles of *Quisqualis indica* L**.** studied are outer collenchymatous and inner parenchymatous. In large vascular

bundles are crescent-shaped, closed collateral type. These anatomical characters were also agreed with Metcalfe and Chalk (1950) and Esau (1965).

According to the preliminary phytochemical test of leaves extracts of *Quisqualis indica* L**.** contains glycosides, phenolic compounds, polyphenols, saponins, flavonoids, reducing sugar, steroids, terpene are present but alkaloids and tannins are absent. The result of preliminary phytochemical studies of leaves powdered sample of *Quisqualis indica* L**.** is providing information to the standardization of this drug and for production of the synthetic beneficial drugs.

In research work, a detailed study of morphological and anatomical characteristics of *Quisqualis indica* L**.** The present study can serve as a useful gauge in the identification and authentication of plant material as well as investigating its phytochemical composition, would help in investigation of its possible pharmacological actions.

Acknowledgements

I wish to express my heartfelt thank to Dr Htar Lwin, Professor and Head, Department of Botany, Yadanabon University for permitting to undertaken this research and for providing all the departmental facilities. I wish also to express my sincere thank to Dr Pyone Yi, Professor, Department of Botany, Yadanabon University, for her valuable suggestion.

References

Backer, C.A & R.C. 1963. "Flora of Java Vol I", Published Under the Auspices of the Rijksherbarium, Leyden, N.V.P Noordhoff.

Chevallier, A. 1996. The Encyclopedia of Medicinal Plants. Darling Kindergley Limited, London.

Dassanayake, M.D. 1995. "A Revised Handbook to the Flora of Ceylon". Vol. IX.

Esau, K. 1965. "Plant Anatomy", 2nd ed. John Wilely and Sons, Inc., New York. London.

Franklin, G.L. 1945. "Preparation of thin sections of synthetic resins and wood resin composites, and a new macerating method for wood". Nature 155: 51.

Harborne, JB. 1993. "Phytochemical methods". A Guide to Modern Techniques of Plants Analysis, 2nd Edition Chapmen & Hall. London, U.S.A.

Hooker, J.D. 1879. "The Flora of British India". Vol. II. L. Reeve & Company, Henrietta Street– Convent Garden, London.

Johansen, D. A. 1940. Plant Microtechnique. MC Graw-Hill Book Company, Inc. New York and Landon.

Lewis, H. 1977. Medicinal Botany; Plant Affecting Man's Health. Washington University, St. Louis, Missouri.

Metcalfe, C.R. and Chalk, L. 1950. "Anatomy of the Dicotyledons". Vol. I. The Clarendon Press Oxford.

Padua, l.S, Bunyappraphatsarn, N and Lemmens. R.H.M.J. 1999. "Medicinal and Poisonous Plant". No. 12 (1).