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Pharmacognostic and phytochemical evaluation of aerial parts of *Bignonia alliaceae*

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Abstract

Bignonia alliaceae is an important drug mentioned in the traditional medicinal texts. Recent pharmacological findings indicate that it possesses significant analgesic, anti-inflammatory, anti-tussive, antibacterial, muscle relaxant, uterine relaxant and hypotensive effect and can be used in cutaneous arthritis and rheumatism which comply with the claims made in the traditional medicinal texts regarding it. However, no conclusive pharmacognostic study or phytochemical investigation of these leaves and stem has been performed yet. The present work deals with the qualitative and quantitative pharmacognostic evaluation of the leaf and stem material of *Bignonia alliaceae* and establishment of its quality parameters, including phytochemical evaluation. Diagnostic microscopic characters include unicellular covering trichomes, anisocytic stomata, bordered pitted xylem vessels and pericyclic fibers. Phytochemical screening showed the presence of important classes of phytoconstituents like steroids, terpenoids and flavanoids. Such a detailed work would pave the way for isolation of phytoconstituents, therapeutic investigations and standardization of formulations containing the plant material.

Key-Words: *Bignonia alliaceae*, Bignoniaceae, Garlic vine

Introduction

Bignonia alliacea syn. *Adenocalymma alliaceum*, *Adenocalymma pachypus*, *Adenocalymma sagotii*, *Pachyptera alliacea*, *Pseudocalymma alliaceum*, *Pseudocalymma pachypus* and *Pseudocalymma sagotti* (Bignoniaceae) is also known as Garlic vine. It is a very common plant remedy for the pain and inflammation of arthritis and rheumatism as well as cold, flu, fever. Generally leaves are used in the preparation of infusion or decoction. Roots are used in the preparation of cold maceration and tincture and generally taken as a whole body tonic. [1, 2] The present investigation deals with the qualitative and quantitative microscopic evaluation of the leaf material and establishment of its quality parameters, including phytochemical evaluation.

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Material and Methods

Collection and authentication of leaves

Aerial parts of *Bignonia alliaceae* were collected from the herbal garden of RK College of Pharmacy, Rajkot, Gujarat, in July 2011. Herbariums and voucher sample were prepared and deposited in Department of Pharmacognosy, RK College of Pharmacy (Voucher no. RKCP/COG/13/2011).

Pharmacognostic studies

Morphology of fresh leaves and stem of *B. alliaceae* was studied. Photomicrography of stained and unstained transverse sections of fresh leaves and stem were performed. Leaf constants were established using camera lucida. The leaves were dried under shade, powdered to 60#, stored in airtight containers and used for powder study and quantitative microscopy (Table 1). [3]

Phytochemical study

5g powder was extracted with 50ml each of water and methanol at 70°C for 30min. Various phytoconstituents present in the leaves and stems were detected by their respective chemical tests using the appropriate extracts (Table 2). [4-10]

Results and Discussion

Pharmacognostic study

Macroscopy

Leaves are simple, 7-15 cm x 4-5 cm in size, ovate to lanceolate, apex mucronate, margin entire, surface glabrous and glaucous, texture papery, base symmetric and tapering, venation reticulate, color of upper surface green and lower surface is light green. Petiole is round and green in color (Figure 1). On crushing leaves gives garlic like smell and flavor. Stem is 7-8 cm in length and 10-20 mm in diameter. Surface is rough because of small pits present on stem. Shape is cylindrical, color of young stem is green and old stem is light brownish. It has garlic like smell and taste.

Microscopy

Surface preparation of leaf

Epidermal cells are wavy walled, having anisocytic stomata and cicatrix (Figure 2).

Transverse section of leaf

Lamina of transverse section shows an upper epidermis covered by thin cuticle. Unicellular covering trichomes are present on both the epidermis. Underlying the upper epidermis is a single-layered, compact, radially elongated palisade having scattered rosette crystals of calcium oxalate followed by spongy mesophyll composed of 2-3 layers of loosely arranged parenchymatous cells. Midrib consists of well-developed collenchyma beneath the epidermis. Vascular bundles are bicollateral. Ground tissue consists of loosely arranged polygonal parencymatous cells and cicatrix.

Transverse section of stem

Epidermis consists of single layer of straight walled cubical cells covered by thin cuticle. Cortex contains many layers of parenchymatous cells having scattered groups of lignified pericyclic fibers. Stele consists of bicollateral vascular bundles having many patches of sieve tubes cells embedded in phloem parenchymatous cells and an exarch xylem through which passes the multiseriate medullary rays. Pith has pitted parenchymatous cells with intercellular spaces.

Powder characteristics

The powdered drug is dark green and brown with garlic like aromatic odor and pungent taste. The important diagnostic features of the powder include unicellular covering trichomes, bordered pitted xylem vessels, pericyclic fibers and anisocytic stomata (Figure 7).

The present work deals with the morphological, microscopic and phytochemical evaluation of the leaves and stems of *Bignonia alliaceae*. Diagnostic characters of powder include unicellular covering trichomes, anisocytic stomata, bordered pitted xylem vessels and pericyclic fibers. Phytochemical analysis showed the presence of important classes of phytoconstituents like steroids, terpenoids and flavanoids. This would pave the way for isolation of phytoconstituents, therapeutic investigations and standardization of formulations containing the plant material.

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Fig. 1: Aerial parts of *B. alliaceae*

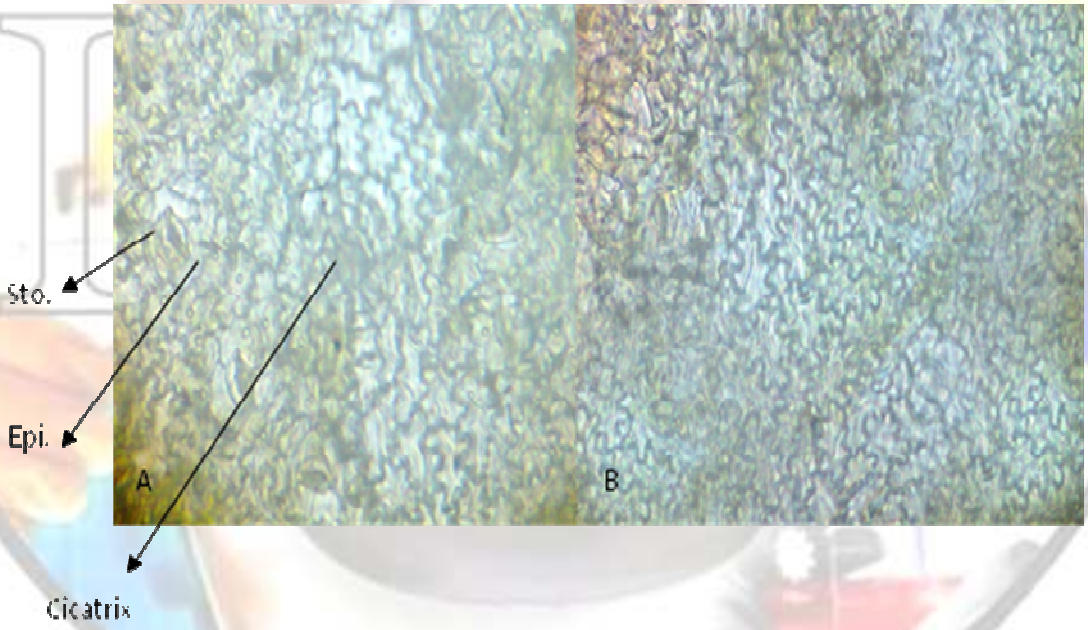

Fig. 2: Surface preparation (x100)
(A: Lower surface; B: Upper surface; Sto, stomata; Epi, epidermis)

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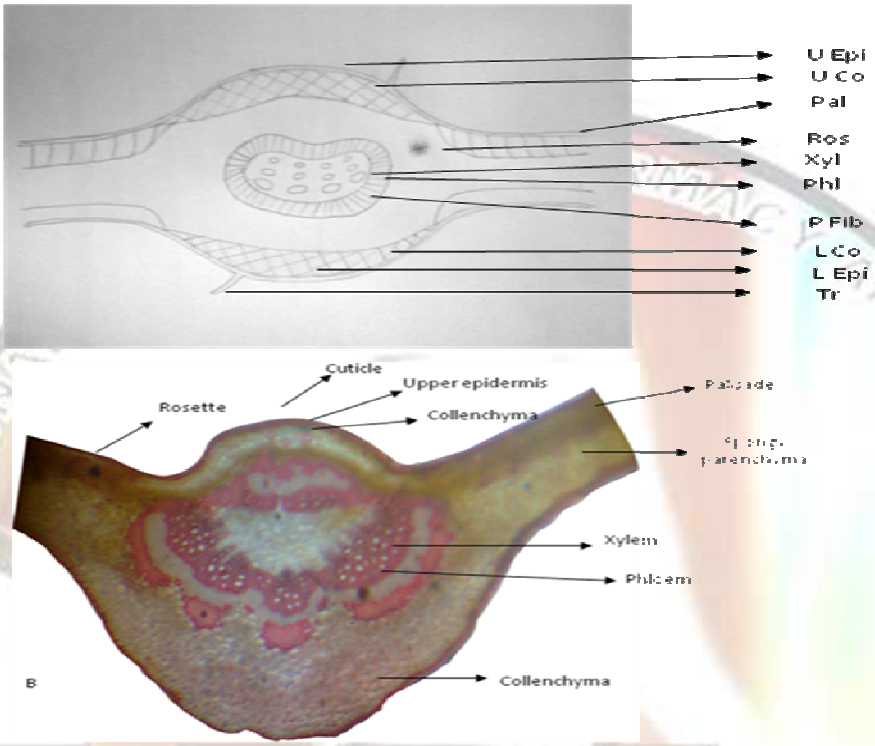

Fig. 3: A - Schematic T. S. of leaf, B - Detailed T. S. of leaf (x100)
(U Co, Upper Collenchymas; U Epi, Upper Epidermis; L Co, Lower Collenchymas; L Epi, Lower Epidermis; Pal, Palisade; Xyl, Xylem; Phl, Phloem; Tr, Trichomes; P Fib, Pericyclic fiber; Ros, Rosette)

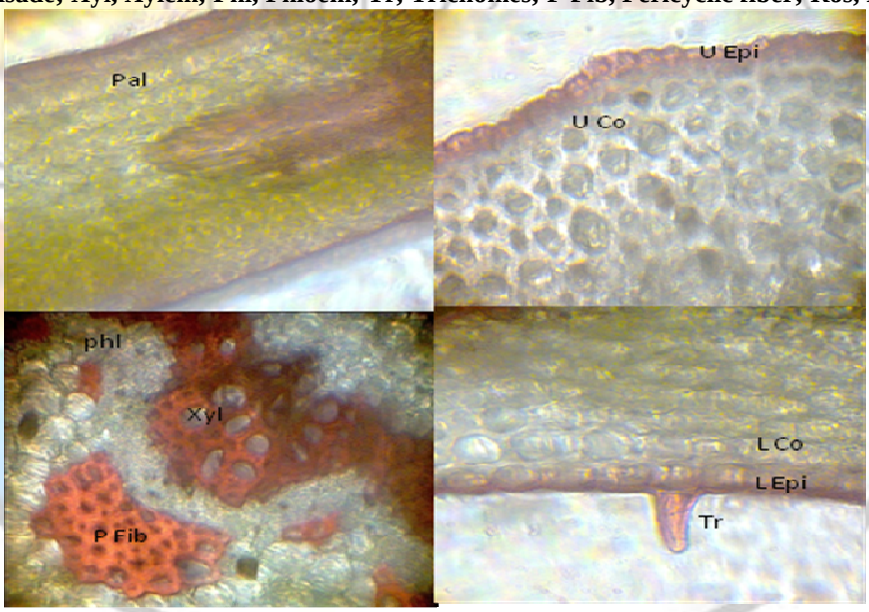

Fig. 4: T. S. of leaf showing single enlarged portions (x450)
(U Co, Upper Collenchymas; U Ep, Upper Epidermis; L Co, Lower Collenchymas; L Epi, Lower Epidermis; Pal, Palisade; Xyl, Xylem; Phl, Phloem; Tr, Trichomes; P Fib, Pericyclic fiber)

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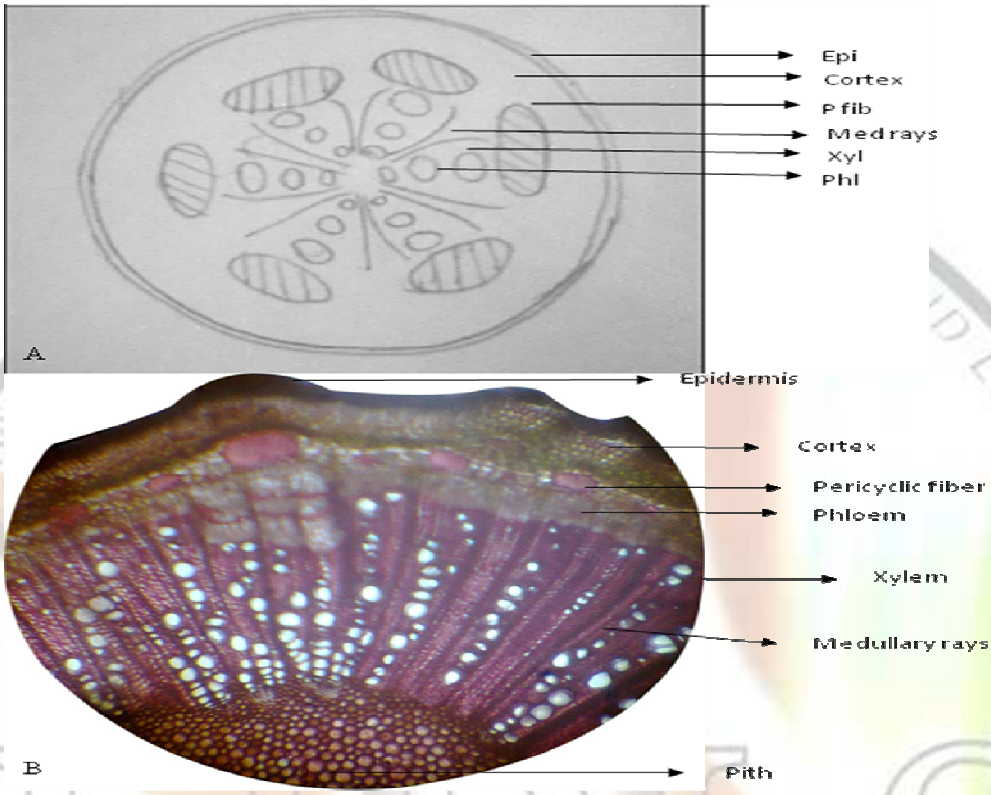

Fig. 5: A- Schematic T. S. of stem, B- Detailed T. S. of stem (x100)
(Epi, Epidermis; L Epi, Xyl, Xylem; Phl, Phloem; P Fib, Pericyclic fiber; Med rays, Medullary rays)

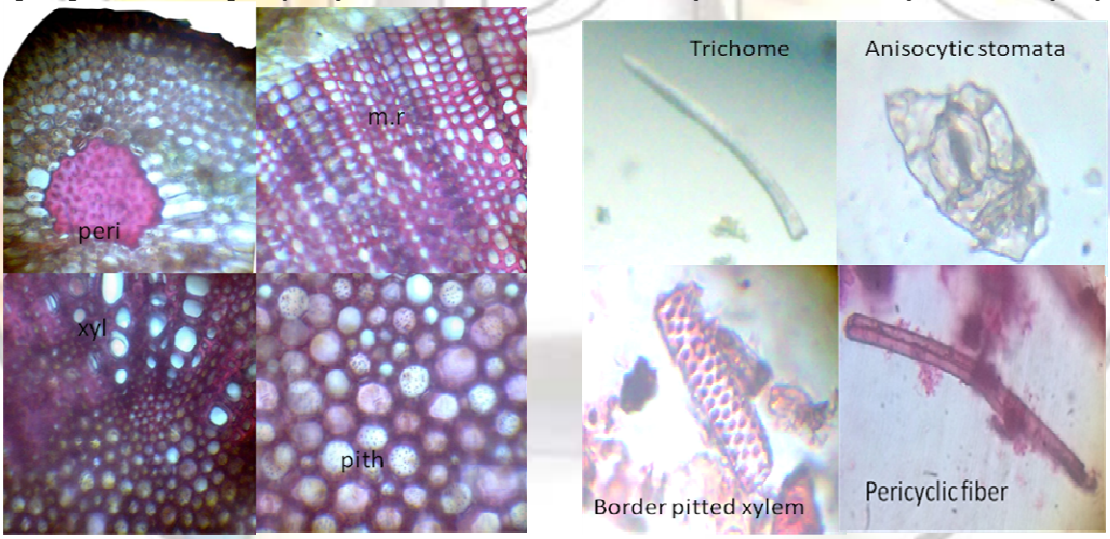

Fig. 6: T. S. of stem showing single enlarged portions (x450)
(Epi, Epidermis; L Epi, Xyl, Xylem; Phl, Phloem; P Fib, Pericyclic fiber; Med rays, Medullary rays)

Fig. 7: Powder characteristics of aerial parts (x450)

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Table 1: Quantitative microscopy

Leaf constant	Result
Stomatal Number Upper surface Lower surface	 0 5
Stomatal Index Upper surface Lower surface	 0 13.5 to 15.7
Vein islet number	16
Vein termination number	9

No. of observations = 5, SD = Standard Deviation

Table 2. Phytochemical screening

Phytoconstituents	Test	Result
Steroids and terpenoids	Salkowski test Libermann's test	+ve +ve
Flavonoids	Shinoda test Lead acetate test	+ve +ve
Alkaloids	Dragendorff's test Hager's test Wagner's test Mayer's test	-ve -ve -ve -ve
Cardiac Glycosides	Legal test Baljet test Keller Killiani test	-ve -ve -ve
Saponin Glycosides	Foam test Lead acetate test	-ve -ve
Anthraquinone Glycosides	Borntrager's test Modified Borntrager's test	-ve -ve
Carbohydrates	Fehling's test Molisch test	+ve +ve