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Pharmacognostic and phytochemical evaluation of leaves of *Cassia fistula*

Devang J. Pandya*, Vishal L. Patel, Tusharbindu R. Desai, Rutu R. Lunagariya, Swati D. Gajera and Amee J. Mehta

RK College of Pharmacy, Rajkot, (Gujarat) - India

Abstract

Recent findings indicate that leaves of *Cassia fistula* possess significant pharmacological activities which comply with the claims made in the traditional medicinal texts. However, no conclusive pharmacognostic study or phytochemical investigation of these leaves has been performed yet. The present work deals with the qualitative and quantitative pharmacognostic evaluation of the leaf material of *Cassia fistula* and establishment of its quality parameters, including pharmacognostic and phytochemical evaluation. Diagnostic characters of powder include unicellular covering trichomes, anomocytic and paracytic stomata, xylem vessels with reticulate thickening and prism-shaped calcium oxalate crystals. Phytochemical analysis showed the presence of important classes of phytoconstituents like anthraquinone glycosides, flavonoids, phenolic compounds and carbohydrates. This would help in isolation of phytoconstituents, therapeutic investigations and standardization of formulations containing leaf material of *C. fistula*.

Key-Words: Amaltaas, *Cassia fistula*, Leguminosae

Introduction

Arthritis is a common condition affecting millions of *Cassia fistula* (Caesalpiniaceae) is known as Amaltaas (Hindi), Garmalo (Gujarati), Purging cassia and Golden Shower Tree (English) and in Sanskrit it is known as Amaha, Amayaghata, Himapushpa, Rajataru, Rajavraksha, Sauvarni, Shamyaka and Vyadhighatah.[1] Its leaves are traditionally used as laxative, it also used in skin eruption, piles, inflammation and rheumatoid arthritis.[2] Flowers and pods are purgative, febrifugal, astringent, antibilious. Seed powder used in amoebiasis. *The Ayurvedic Pharmacopoeia of India* indicated the fruit pulp for constipation, colic, chlorosis and urinary disorders. Pulp of the pod contains anthraquinone glycosides, sennosides A and B, rhein and its glucoside, barbaloin, aloin, formic acid, butyric acid, their ethyl esters and oxalic acid. Presence of pectin and tannin is also reported. Seeds gave galactomannan free sugars and free amino acids; extract laxative, carminative, cooling and antipyretic properties.

*** Corresponding Author**
E-Mail: pandyadevang82@yahoo.com
Fax: +91- 0281-2785115
Mob.: +9-19898168034

Flowers gave ceryl alcohol, kaempferol, rhein and a bianthraquinone glycoside, fistulin. Leaves gave free rhein, its glycosides - sennosides A and B. *Cassia javanica* L., a related species found in West Bengal, Maharashtra and Tamil Nadu, is used as a substitute for *Cassia fistula*. Its leaves have weight lowering activity.[3] However, no conclusive pharmacognostic study or phytochemical investigation of these leaves has been performed yet. The present investigation deals with the qualitative and quantitative microscopic evaluation of the leaf material and establishment of its quality parameters including phytochemical evaluation.

Material and methods

Collection and authentication of leaves

Leaves of *Cassia fistula* 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.

Pharmacognostic studies

Morphology of fresh leaves was studied. Free hand transverse sections of fresh leaves were studied, using chloral hydrate as clearing agent and safranin as staining agents. Photomicrography was 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).[4]

Phytochemical study

5g powder was extracted in round-bottom flask with 25ml each of water and methanol at 50°C for two hours. Various phytoconstituents present in the leaves were detected by their respective chemical tests using the appropriate extracts (Table 2).[5-11]

Results and discussion

Pharmacognostic study

Macroscopy

Leaves are compound, paripinnate, with 4-8 pairs of leaflets, 5-15cm long, oblong, ovate, apex acuminate or obtuse or emarginated, margin entire, surface texture coriaceous when fresh and papery on drying, base symmetric, venation reticulate, color of upper surface dark green and lower surface light green. Petiole is round and green in color. Mid-rib is densely pubescent beneath (Figure 1).

Surface preparation

Epidermal cells are wavy walled, having both anomocytic and paracytic stomata and unicellular covering trichomes (Figure 2).

Transverse section

Lamina of transverse section shows the epidermis covered by thin cuticle. Unicellular covering trichomes are few and present on both the epidermis. Underlying the upper epidermis is a 2-3 layered hypodermis, followed by a single layer of compact, radially elongated palisade cells. It is followed by a spongy mesophyll composed of 3-4 layers of loosely arranged parenchymatous cells. The mid-rib consists of well-developed chlorenchyamatous layer beneath the hypodermis. Vascular bundles are bicollateral. Calcium oxalate prism crystal sheath is present below the vascular bundle. Pericyclic fibres are found surrounding the vascular bundles. Ground tissue consists of loosely arranged polygonal parenchymatous cells followed by lower collenchyma and lower epidermis (Figure3, 4).

Powder characteristics

The powdered drug is dark green with characteristic distinct odor or taste. The important diagnostic features of the powder include parts of epidermis in surface view showing wavy walled epidermal cells and anomocytic and paracytic stomata, xylem vessels with reticulate thickening, abundant unicellular covering trichomes and calcium oxalate prisms (Figure 5).

The present work deals with the microscopic and phytochemical evaluation of the leaves of *Cassia fistula*. Diagnostic characters of powder include unicellular covering trichomes, anomocytic and paracytic stomata, xylem vessels with reticulate thickening and prism-shaped calcium oxalate crystals. Various leaf constants were established which can be important in detecting adulteration and mishandling of the crude drug. Phytochemical analysis showed the presence of important classes of phytoconstituents like anthraquinone glycosides, flavonoids, phenolic compounds and carbohydrates. Development of such a monograph would help in isolation of phytoconstituents, therapeutic investigations and standardization of formulations containing the leaf material of *Cassia fistula*.

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Fig. 1: Leaves of *Cassia fistula*

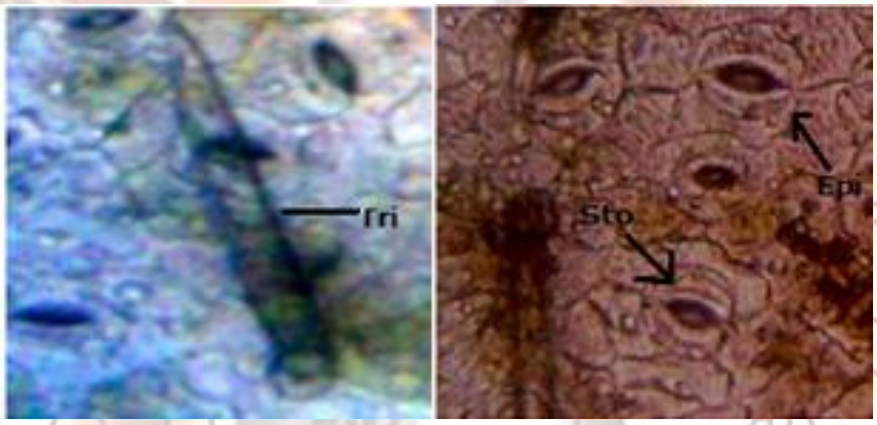
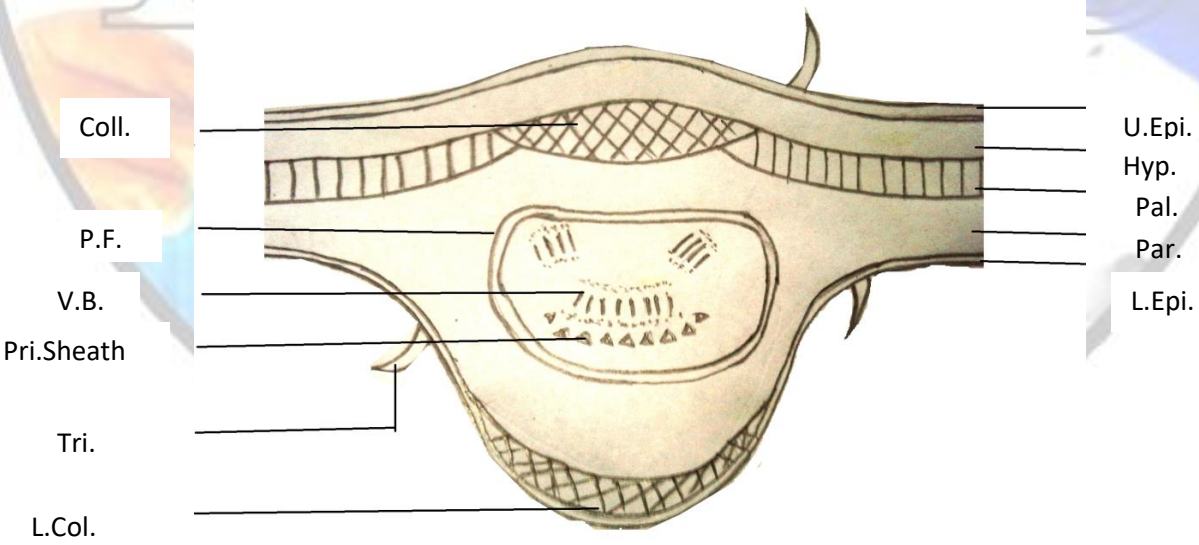


Fig. :. Surface preparation (x450)
(Tri, trichome, Sto, stomata.Epi, epidermis.)



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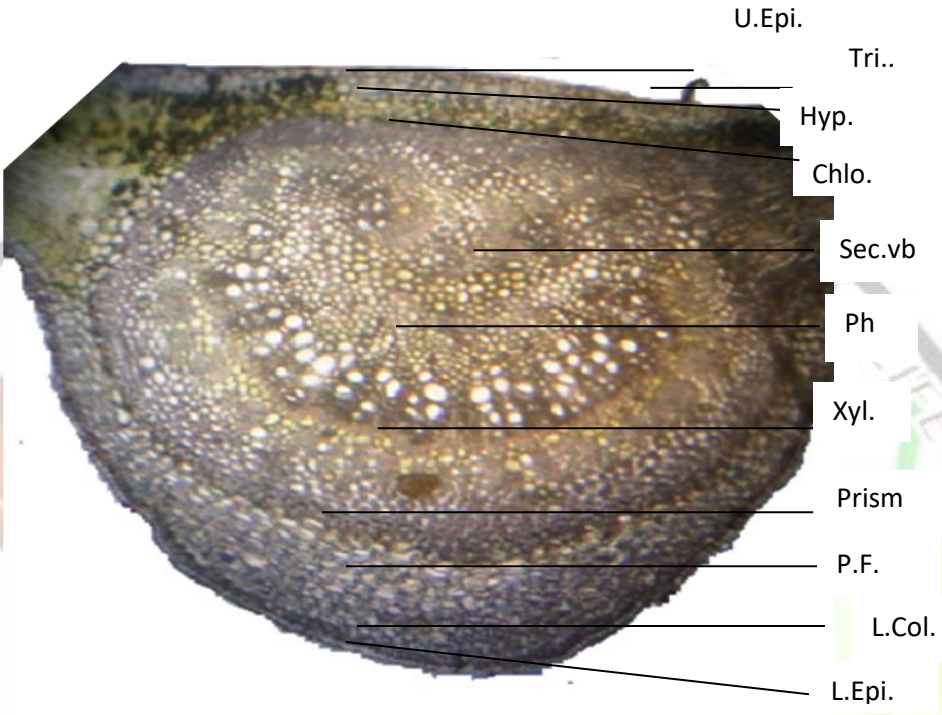

Fig. 3: A- Schematic T.S., B- Detailed T. S. of leaf (x100)
(U.Epi.: Upper Epidermis**,** Hyp.: Hypodermis, L. Col.: Lower Collenchymas, Chl.: Chlorenchyma, L. Epi.: Lower Epidermis, Pal.: Palisade, Xyl.: Xylem, Ph.: Phloem, Tri.: Trichomes, Prism.: prism crystals of calcium oxalate, Vb.: Vascular bundles).

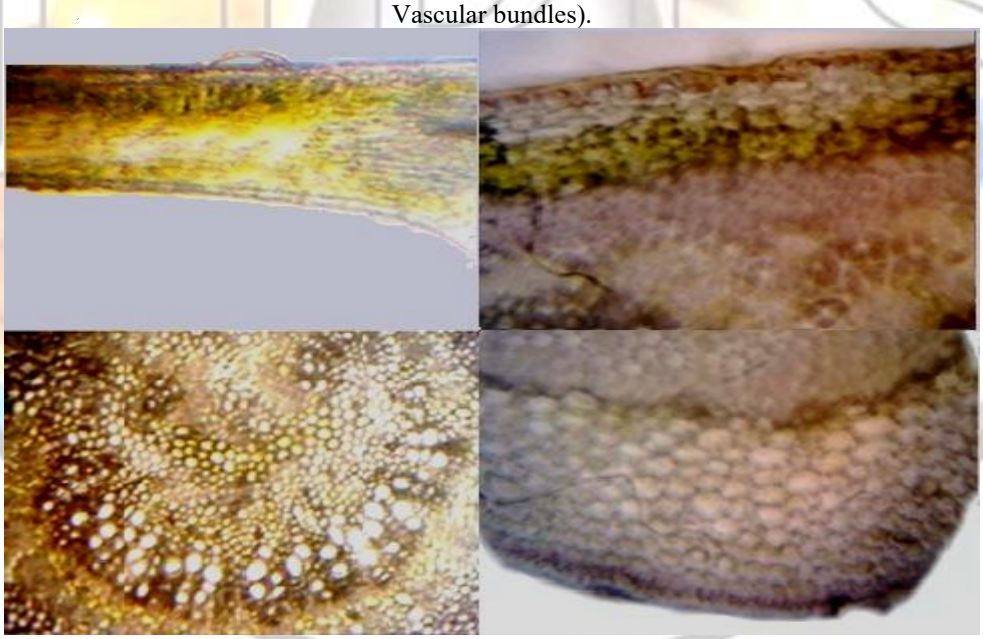

Fig. 4: T. S. of leaf of *Cassia fistula* showing single enlarged portions (x450)
(U. Epi.: Upper Epidermis; L. Col.: Lower Collenchymas, L Epi.: Lower Epidermis, Pal.: Palisade layer, Hyp.: hypodermis, Pri. Xyl.: Primary Xylem, Sec X: Secondary Xylem, Phl.: Phloem)

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Fig. 5: Powder study (x450)
(A: Tri. - Unicellular covering trichome, B: Pericyclic fibre, C: Ca cry.- Calcium oxalate prism crystals, D: Xyl. - Xylem vessels with reticulate thickening)

Table 1: Quantitative microscopy

Leaf constant	Mean ± SD
Stomatal Number Upper surface Lower surface	 0 25
Stomatal Index Upper surface Lower surface	 0 20
Vein islet number	28
Vein termination number	14

No. of observations = 5, SD = Standard Deviation

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Table 2: Phytochemical screening

Phytoconstituent	Test	Result
Alkaloids	Dragendorff's test	+ve
	Hager's test	+ve
	Wagner's test	+ve
	Mayer's test	+ve
Flavonoids	Shinoda test	+ve
	Lead acetate test	+ve
Phenolics	Ferric chloride test	+ve
	Acetic acid test	+ve
Sterols and triterpenoids	Salkowski test	+ve
	Libermann-Buchard test	+ve
Cardiac glycosides	Legal test	+ve
	Baljet test	+ve
	Keller Killiani test	+ve
Saponin glycosides	Foam test	+ve
	Lead acetate test	+ve
Anthraquinone glycosides	Borntrager test	+ve
	Modified Borntrager test	+ve
Carbohydrates	Fehling's test	+ve
	Molisch test	+ve