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Pharmacognostical and physicochemical study of *Cassia fistula* Linn. Leaflets

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Abstract
Cassia fistula (Family Caesalpiniaceae) is a moderate sized deciduous tree which is well known in Indian system of medicine. Traditionally used by the peoples around tropical and subtropical areas to treat various diseases. For the correct identification of similar looking species, there should be well documented characteristics of plant. The present study laid down the morpho-anotomical and physicochemical standards of *Cassia fistula* leaflets. The evaluation of preliminary phytochemical investigations was carried out which shows the methanolic and aqueous extracts are rich in maximum number of phytoconstituents like alkaloids, flavonoids, glycosides, phenols, tannins and carbohydrates. Physicochemical Parameters like foreign organic matter (2.3%), total moisture content (13.2%) Ash values (Total ash, acid insoluble ash, water soluble ash, sulphated ash) were evaluated which are found to be within standard limits.

Keywords: *Cassia fistula*, pharmacognostical evaluation, physicochemical and phytochemical screening

Introduction
About 600 species of shrubs, herbs and trees are distributed predominantly in tropical & warm temperate regions of India. Cassia fistula commonly known as Golden Shower Tree (English) and in Hindi it is known as *Amaltas*. The genus of cassia belongs to family Caesalpiniaceae which is well known in Indian system of medicine. *Cassia fistula* Linn. Is a moderate sized deciduous tree approximately up to 15 meter in height and distributed throughout India. Traditionally it is used as laxative, purgative, cathartic, antiparasitic, anti-fungal, anti-inflammatory, anti-helminthic, antimicrobial, astringent, digestant, antipyretic, hepatoprotective, antidiabetic, anticancer and in skin disease (Bhote and Barua *et. al*) [1]. Many species of cassia plant used to treat malaria and fever in tropical and subtropical areas. Plants of *Cassia* genus are rich source of polyphenols, flavonoids, tannins, mucilage, polysaccharide, steroids, anthraquinone glycosides and derivatives of anthracene (Sanghi *et al.*, 2006) [2]. Leaflets contain free rhein (4, 5-dihydroxyanthraquinone-2-carboxylic acid) and its glycosides – Sennosides A & B (Thirumal *et al.*, 2012) [3]. Flowers are bright yellow in colour and blooms in the month of April to June. Leaflets and flowers are both used as a purgative drug. Juice of leafletsis useful as dressing for ringworm, relieving irritation and relief of dropsical swelling (Danish *et al.*, 2011) [4]. The main objective is to standardise *Cassia fistula* leaflets on the basis of pharmacognostical properties such as morphology, microscopy and physiochemical constants of the selected species.

Materials and Methods
Collection and authentication of leaflets
The leaflets of *Cassia fistula* were collected from the Jalgaon district, in North Maharashtra region and authenticated by HOD, department of botany, M. J. College Jalgaon.
The specimen of plant has been submitted in the Department of Pharmacognosy, R. C. Patel institute of Pharmaceutical Education and Research, Shirpur, Dhule.
The *C. fistula* leaflets were separated from twigs and shade dried. The dried leaflets were cleaned, and size reduced to coarse powder and stored in suitable container for physicochemical and microscopical analysis. The fresh leaflets of selected plant used to study the histology of the leaflets.

Macroscopic evaluation
The macroscopic evaluation of the *cassia fistula* leaflets were done by observing the external characters like, shape, size, texture, surface characteristics and fractured surface with the help

of visual observation and magnifying lens (figure 1). The organoleptic features like colour, odour, taste, feel and fracture of the crude drug were observed with sensory organs.

Microscopic evaluation
Microscopical studies were carried out from transverse sections (T.S.) of fresh leaflets. Thin free hand fine transverse sections (T.S.) of fresh leaflets of *cassia fistula* were cut with the help of sharp razor blade. The sections were treated with chloral hydrate solution and warmed gently. The cleared sections were stained with phloroglucinol and concentrated hydrochloric acid and mounted in 50% glycerine and observed under microscope for the identification of various tissues and their arrangement.
Microphotographs of sections were taken for the identification of various tissues and their arrangement. Characteristic features of leafletsof Cassia fistula were noted (Figure 2).

Physicochemical analysis
The *cassia fistula* leaflets and powder used for physochemical analysis. The parameters like loss on drying, foreign matter, extractive values were studied as per Kalaskarr [5]. In addition, the sweeling index, foaming index, pH of extract and total fiber content were studied as per WHO guidelines [6]. (WHO, 1998).

Result and Discussion
The present morpho-anotomical and physicochemical study *cassia fistula* leaflets focused to develop the standards for correct identification of selected plant.

Macroscopy of *cassia fistula* leaflets
In the identification of medicinal plants the morphological study is first analysis. For the correct identification of similar looking species, there should be well documented characteristics of plant. The morphology of the leaflets mention below. The specific characteristics like symmetrical base and absence of flexible spine at the point of attachment of rachis with stem.

Morphology of leafletsand leaflets
Colour: Green

Odour: Faint characteristic

Taste: Slightly bitter

Size: length- 9-14 cm

Width-4.5-8.5 cm

Extra feature
Apex: Broadly acute

Margin: Entire

Shape: Ovate

Base: Symmetrical

Surface: Dorsal- dark green
Ventral-light green

Texture: Upper surface- rough
Lower surface- slightly smooth

Midrib: Biconvex and more prominent

Venation: pinnate

Leaflet petiole: 4-6 cm

Microscopical evaluation
The microscopic evaluation plays an important role in differentiating the adulterants. The transverse section of *C. fistula* leaflets showed the typical characteristics for correct identification of plant. The transverse section of leaflet passing through midrib and lamina showed dorsi-ventral structure with straight walled, single layered tightly arranged, cuticulized epidermal cells. The epidermal layer found to contain few of the epidermal cells modified as non- glandular, unicellular trichomes. In the lamina region, the below the epidermal layer, showed the presence of single layer of elongated palisade cells followed by 3-4 layers of loosely arranged spongy parenchymatous cells.

Fig 1: Arrangement of leaflets and leaflet of *C. fistul*

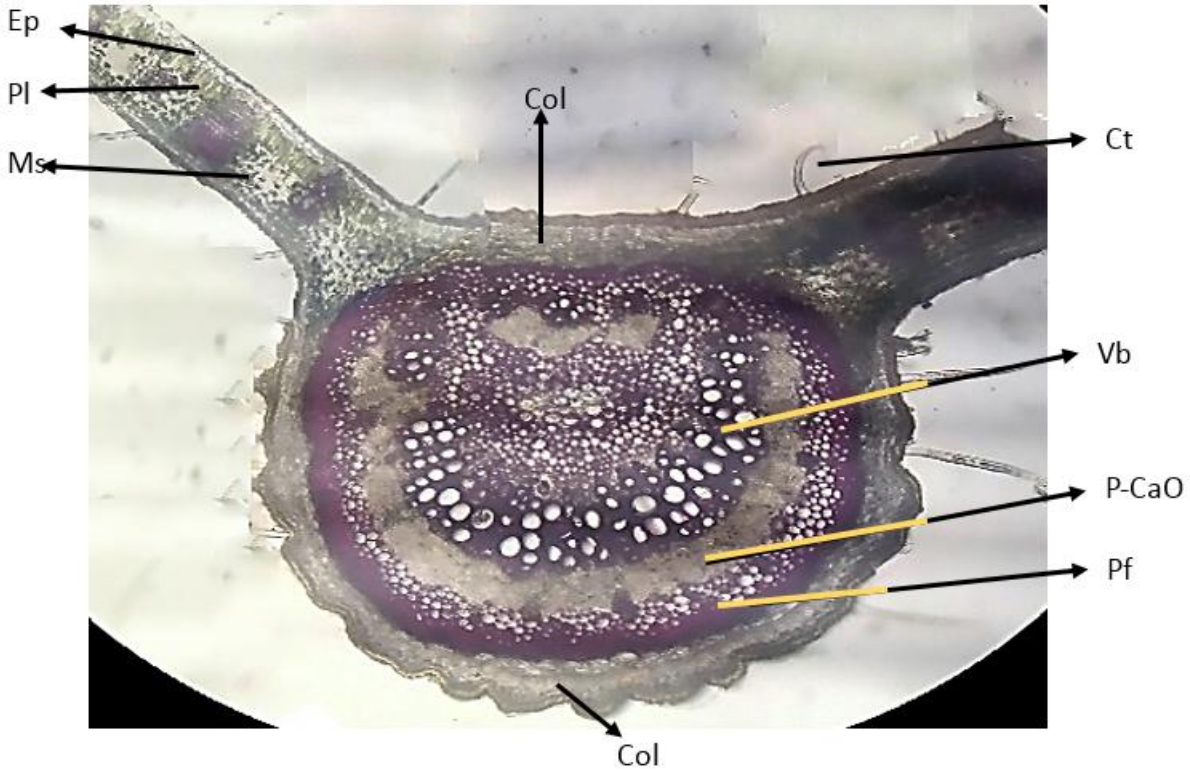

Fig 2: Transverse section of *Cassia fistula* leaflet; lignified cells.
Ct: covering trichome; Col: collenchyma; Ep: epidermis; Ms: mesophyll; Pl: palisade cells; P-CaO: parenchyma with calcium oxalate; Pf: pericyclic fiber; Vb: vascular bundle

In the midrib section, the epidermis is followed by lower and upper collenchyma, which is responsible to give mechanical strength to the leaflet. The vascular bundle present at the center containing lignified primary xylem vessel and phloem as sieve tubes, responsible for conduction of water and food. The parenchymatous cells containing calcium oxalate followed by lignified percyclic fibre surrounds the vascular bundle.

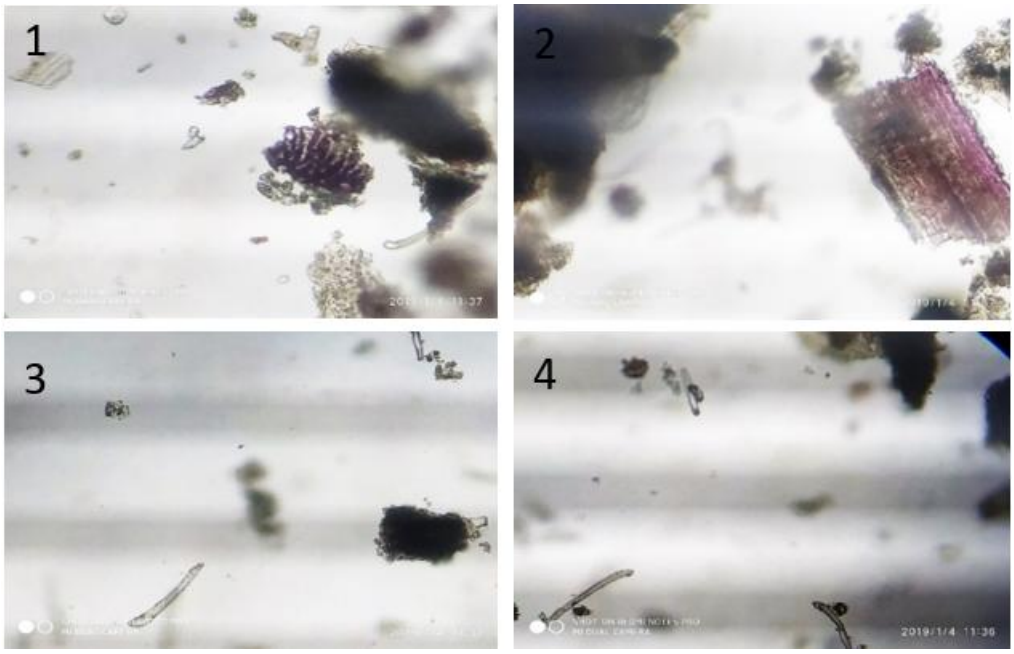

Fig 3: Powder characteristics of *C. fistula* Leaf
Lignified xylems and *phloem, Calcium oxalate crystals* (1). *Lignified vascular bundles* (2). *Non-glandular, unicellular trichomes* (3, 4)

Physicochemical evaluation

The evaluation of physico-chemical parameters, was carried to laid down the physicochemical standards for identification of plant.

The preliminary phytochemical investigations of ethyl acetate, chloroform, acetone, methanol and aqueous extracts of *C. fistula* leaflets were performed. Maximum phyto-constituents were found in methanol and aqueous extracts of *C. fistula* leaflets, with prominent presence of flavonoids, tannins, phenolic compounds, anthraquinone,

triterpenes and carbohydrates.

Foreign organic matter is matter or part of the matter other than the crude drug which is not defined and described in the prescribed monograph of sample is known as foreign organic matter. High percentage of foreign organic matter is considered as a more deteriorating quality of drug or sample [7] (Mukherjee, 2002). The content of FOM in selected samples was found in appraisable limit.

Table 1: Preliminary phytochemical study of *Cassia fistula* leafletsextracts

Extracts/phytoconstituents	Ethyl acetate	Chloroform	Acetone	Methanol	Aqueous
Alkaloids	+	-	+	+	+
Flavonoids	+	+	-	+	+
Glycosides	+	+	-	+	-
Anthraquinone	-	-	-	+	-
Phenols	+	-	+	-	+
Saponins	-	-	-	-	-
Steroids	+	-	-	-	-
Tannins	+	+	+	+	+
Carbohydrates	-	-	+	+	+
Proteins	+	-	-	+	+
Triterpenoids	+	-	+	+	-

Loss on drying measures the sum amount of water and volatile content present in the crude drug. The higher amount of loss on drying represents the higher amount of moisture and may responsible for crude drug detoriation on long storage, through the activation of chemical reaction or microbial contamination. The *C. fistula* leaflets showed the loss on drying within the limit.

The determination of different type of ash values gives the idea about the purity and quality of crude drug. The Total ash gives the information of physiological mineral content of the plant. The high total ash indicates the plant may contains the mineral like calcium carbonate, oxalate as cell content. In the present study, C. *fistula* exhibited total ash content about 8.5. Furthermore, Acid insoluble ash measures presence of amount of silica or silicates in the form sand or siliceous earth in the crude drug. Similarly, water soluble ash determine inorganic content of ash of crude drug which is found to be soluble in water as this gives a useful indication of the quality of plant material. The powder of the *C. fistula* leaflet was exhibited higher water soluble ash content. Sulphated ash determines inorganic impurities or residual matter in an organic substance which is not volatilized from a sample when the sample is ignited in the sulphuric acid.

Extractive values are primarily useful for the determination of exhausted or adulterated drug. *C. fistula* leaflet showed water extractive value higher than alcohol extractive value, This signifies that the large amount of constituents of leaflets were soluble in water than alcohol. The alcohol extractive values indicated the presence of polar constituents like phenols, alkaloids, steroids, glycosides, flavonoids, etc. and the water extractive values indicated the presence of sugar, acids and inorganic compounds [7].

Table 2: Physico-chemical parameters of leafletsof *Cassia fistula.*

S. No.	Parameters	*Cassia fistula*
1	Foreign organic matter (%w/w)	2.3
2	Total Moisture Content (%w/w)	13.2
	Ash Values	
3	Total Ash (%w/w)	8.5
4	Acid Insoluble Ash (%w/w)	1.03
5	Water soluble Ash (%w/w)	5.07
6	Total Sulfated Ash (%w/w)	33
	Extractive Values	
7	Water Extractive Value(%w/w)	8.25
8	Alcohol Extractive Value(%w/w)	7.23
	Miscellaneous Parameters	
9	Foaming index (ml)	-
10	Swelling index	-
11	Crude fibre content	34.85

Foaming and swelling index are quantitative physicochemical test useful for determination of saponins and mucilage content. The *C. fistula* leaflet showed the absence of saponins and mucilage content.

Conclusion

The present study provides in-depth macroscopical and microscopical features, and preliminary identification and quantification of biologically active phytoconstituents which also provide pharmacopoeia standards for easy identification of the *C. fistula* leaflets. Hence, differentiating it from closely related species.

Acknowledgement

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