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Pharmacognostical and preliminary phytochemical studies on the leaves of *Garcinia mangostana* L., guttiferae

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ABSTRACT

Plants are one of the foremost sources of natural medicine and a large number of modern drugs have been obtained from them.*Garcinia mangostana* L.is a tropical evergreen tree considered as "The queen of fruit" belongs to the family Guttiferae. Aim of the present study was to carry out the pharmacognostical, physico-chemical and phytochemical studies on the leaves of *Garcinia mangostana* L. This includes leaf morphology, microscopy, physicochemical parameters and phytochemical study. The purpose of this study was to explore anatomy, phytoconstituents present and fluorescence analysis of leaves of *Garcinia mangostana* L. Pharmacognostical and physico-chemical parameters help to develop standards and determine identity, purity and quality of the drug. Various primary and secondary metabolites present in the plant can be identified by preliminary phytochemical screening. Morphological study tells about the anatomical characters of the leaf and the phytochemical analysis revealed the presence of alkaloids, carbohydrate, flavonoids, saponins, tannins, steroids and phenols. Soxhlet extraction using ethyl acetate as solvent shows maximum yield. Quantitative and fluorescence analysis were also performed. This study provides the pharmacognostical standards and phytochemical profile of *Garcinia mangostana* L.

INTRODUCTION

God has created 'Mother Earth' blessed by a variety of flora which includes aromatic as well as medicinal plants. Numerous types of this substantial flora has been utilised as a source of many drugs in Indian traditional system of medicine [1]. Garcinia is a large genus of polygamous trees or shrubs, far spread throughout Tropical-Asia, Africa and Polynesia [2], which consists of 180 species in which about 30 species are native to India. *Garcinia mangostana* L., also known as mangosteen is a slow growing tree which can grow up to 6-25m in height. Tribal peoples traditionally use various parts of *Garcinia mangostana* L. for the treatment of numerous diseases [3]. In Thai indigenous system of medicine, mangosteen is used for the treatment of skin infections, urinary tract infections, dysentery, fever, wound healing and gastrointestinal complaints etc [4]. Leaf decoctions are used to treat earache, thrush, and stomatosis. It is cultivated in the tropical rain forests of some South East Asian nations like Indonesia, Malaysia, Sri-Lanka, Philippines and Thailand. There is no proof for the exhaustive study on pharmacognostical and phytochemical assessment of the leaves of *Garcinia mangostana* L. The present study was designed to know the pharmacognostical and phytochemical features of leaves of this plant. Morphological and microscopical data reveals that leaves are ovate and dark green in colour having Paracytic stomata. According to the phytochemical investigation flavonoids, steroids, tannins, carbohydrate, saponins, glycosides and alkaloids were found to be present.

MATERIALS AND METHODS

Collection of Plant material: The fresh leaves of *Garcinia mangostana* L. were collected from Aluva, Ernakulam district, 2020. The collected leaves were authenticated by Dr. SWAPNA, HOD, Department of Botany, University of Kerala, Karyavattom,

Trivandrum. A voucher specimen voucher No.KUBH10730 has been preserved for future reference. The fresh leaves were washed, cleaned, dried and powdered.

Reagents: All the reagents used were of analytical grade obtained from Universal Chemicals and scientific industries, Kerala, India.

Method: Fresh leaves were subjected to various anatomical studies[5,6,7] .Hand section of leaf specimen through midrib were taken using sharp blade and observed under microscope LABOMED, Binocular KXi2000.The stomatal number, stomatal index, vein islet number, vein termination number were determined with the help of Camera Lucida. Air dried coarse powder was investigated for ash values and extractive values. The fine powder was used for fluorescence analysis and for performing powder microscopy [6, 7, 8]. The leaf extract obtained through successive solvent extraction using various solvents of increasing polarity by soxhlation method was used to perform phytochemical screening.

RESULTS

Morphology of leaf

Leaves are Ovate oblong or elliptic, 9 25 cm long, 4.5 11 cm wide, texture is glossy, dark green in colour, characteristic odour and bitter to sour taste, apex is acute and the margin is entire, reticulate venation, cuneate base and having a short petiole 0.75 1.5 cm long (Figure 1)

Fig 1 : Morphology of *Garcinia mangostana* leaf

Microscopical studies

Transverse section of Garcinia mangostana leaf

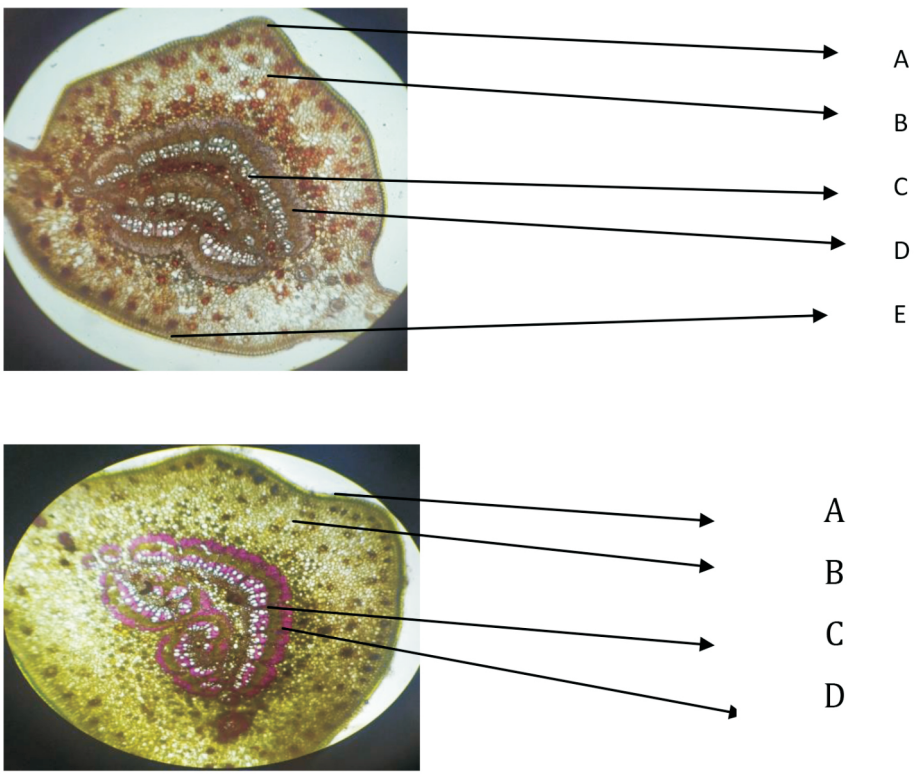

Fig 2 : Transverse section of *Garcinia mangostana* leaf section staining with Phloroglucinol and saffranin A-lower epidermis, B-oil glands, C- xylem, D- phloem, E- upper epidermis. Under magnification 4x.

Microscopical examination of dried powder

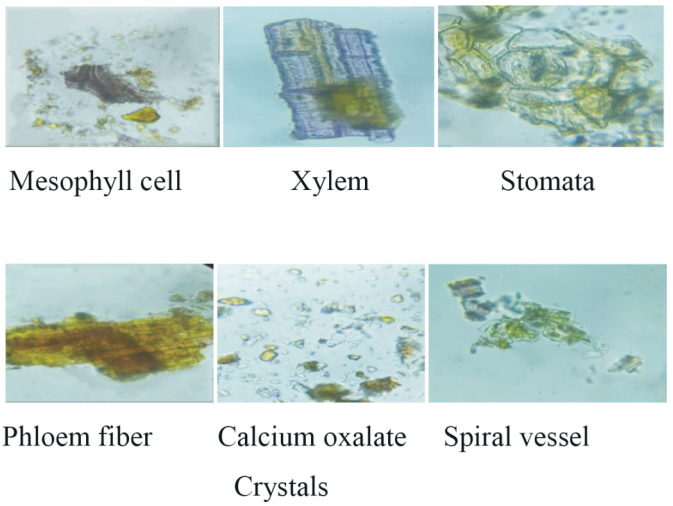

Fig 3 : Powder microscopical observations of *Garcinia mangostana* L. Under magnification 40x.

Table 1 : Leaf constants of *Garcinia mangostana* L.

SL.No	Parameters	Range
1.	Stomatal number	20- 30
2.	Stomatal index	13.09- 15.5
3.	Vein islet number	20
4.	Vein termination number	9

Quantitative analysis

Ash values: Total ash, acid insoluble ash, water soluble ash and sulphated ash values of leaf powder was performed according to the standard procedures [5,6,7]. Results were recorded in Table 2..

Table 2 : Ash values of Garcinia mangostana leaf powder

Ash values:	%w/w
a) Total ash	9.49
b) Acid insoluble ash	3.8
c) Water soluble ash	3.4.1
d) Sulphated ash	2.29

Extractive values: Ether, alcohol and water soluble extractive values are determined in Table 3.

Table 3 : Extractive values of *Garcinia mangostana* leaf powder [9,10]

Type of extractive	%w/w
Ether soluble extractive	3.79
Alcohol soluble extractive	1.89
Water soluble extractive	0.81

Leaf constants

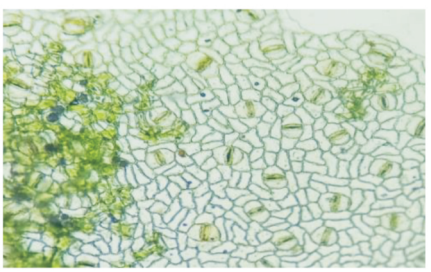

Figure 4: Paracytic stomata

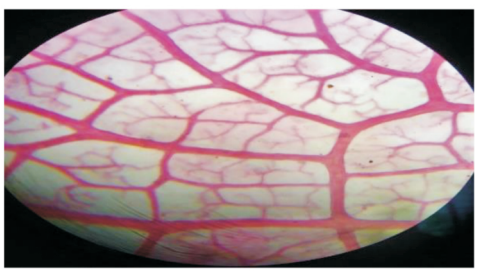

Figure 5: Reticulate venation

Table 4 : Fluorescence analysis of powdered leaves of Garcinia mangostana Linn.

Sl. No:	Treatment	Day light	UV 254nm	UV 365nm
1.	Dry powder	Yellowish brown	Green fluorescence	Light yellow
2.	Powder + Iodine	Yellowish brown	Green fluorescence	Slight yellow
3.	Powder + Glacial acetic acid	Brown	Brown	Dark brown
4.	Powder + Acetone	Pale brown	Dark green	Brown
5.	Powder + Ethanol	Dark brown	Green fluorescence	Orange fluorescence
6.	Powder + Con H_2SO_4	Dark brown	Dark green	Green fluorescence
7.	Powder + Con HCl	Brown	Dark green	Green fluorescence

Fluorescence Analysis

Fluorescence analysis of the leaf powder of *Garcinia mangostana* was studied using various reagents [11,12] and results were recorded in Table 4.

Phytochemical screening [13, 14, 15]

Coarse powder of leaves of *Garcinia mangostana* L. was subjected to Successive Soxhlet extraction using different solvents of increasing polarity [Petroleum ether (60-80ºC), Chloroform, Ethyl acetate, Methanol, Water].Colour and nature of different extracts were noted in Table 6 and the results of phytochemical screening of the extracts were tabulated in Table 7.

DISCUSSION

This research work deals with the Pharmacognostical and Phytochemical, studies on the leaves of *Garcinia mangostana* L**.**

Table 5 : Colour and Nature of Various Extracts of Garcinia mangostana L. by Successive Soxhlet Extraction.

Extracts	Colour	Nature
Petroleum ether	Dark green	Sticky
Chloroform	Dark green	Sticky
Ethyl acetate	Dark green	Sticky
Methanol	Brown	Sticky
Water	Dark brown	Sticky

Table 6 : Phytochemical screening of various extracts of Garcinia mangostana [16, 17, 18].

Chemical constituents	Tests	Petroleum ether extract	Chloroform extract	Ethyl acetate extract	Methanol extract	Aqueous extract
Alkaloids	Mayer's test	-	-	+	+	-
	Dragendorff's test	-	-	+	+	-
	Hager's test	-	-	+	+	-
	Wagner's test	-	-	+	+	-
Carbohydrates	Molisch's test	-	-	+	-	+
	Fehling's test	-	-	+	-	+
	Benedict's test	-	-	+	-	+
	Barfoed's test	-	-	+	-	+
	Iodine test	-	-	+	-	+

Protein and amino acids	Biuret test Millon's test Ninhydrin test Xanthoprotein test	- - - -	- - - -	- - - -	- - - -	- - - -
Steroids and Triterpenoids	Liebermann test Liebermann-Burchard test Salkowski test	+ + +	+ + +	- - -	- - -	- - -
Fixed oils and fats	Filter paper test	-	-	-	-	-
Glycosides	Borntrager's test Modified Borntrager's test Legal test Baljet test	- - - -	- - - -	+ + - -	+ + + +	- - - -
Tannins – phenolic compounds	Ferric chloride test Lead acetate test Potassium dichromate test Dilute HNO_3 test Dilute iodine test Bromine water test	- - - - - -	- - - - - -	+ + + + - -	+ + + + - -	- - - - - -
Flavonoids	Shinoda test Sulphuric acid test Lead acetate test Alkali test	- - - -	+ + + +	+ + + +	+ + + +	+ + + +
Saponins	Foam test	-	-	-	+	+
Mucilage	Ruthenium red test Swelling test	+ -	- -	- -	- -	- -

belongs to the family Guttiferae. Pharmacognostical studies were done on fresh leaves and dried powdered leaves which covered the Macroscopical and Microscopical studies. Leaves are dark in colour and having short petiole (Figure 1). Transverse section of leaf through midrib stained with phluroglucinol and saffranin shows oil glands, xylem, phloem and epidermis (Figure 2).These Macroscopical and Microscopical features will help in the authentication of plant material. Powder character shows Mesophyll cells and spiral vessels (Figure3).Leaf constants such as stomatal number, stomatal index, vein islet number and vein termination number was tabulated in (Table 1), Paracytic stomata (Figure4) and reticulate venation (Figure 5) are noted. Physicochemical parameters such as Ash values (Table 2) and extractive values (Table 3) were determined and the drug was standardized. Total ash was found to be 9.49%w/w .The fluorescence behavior is specific for each compound (Table 4).The colour formation with various reagents was noted and used for the determination of quality and purity of the drug powder. The coarse powder was used for Successive Soxhlation using solvents such as Petroleum ether, Chloroform, Ethyl acetate, Methanol and water (Table 5). Preliminary phytochemical screening was done on all the extracts to identify the presence of various primary and secondary metabolites (Table 6).

CONCLUSION

In conclusion, this study covers the Pharmacognostical and Phytochemical evaluation on the leaves of *Garcinia mangostana* L**.** These standard procedures determine the purity and quality of the drug. And all these helps in the authentication of the drug.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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