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PHYTOPHARMACOGNOSTICAL STUDY ON 'MAKKHAN KATORI': *FICUS KRISHNAE*

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ABSTRACT

Background: *Ficus krishnae* (Moraceae) is also known as Krishna fig, Krishna's butter cup (E) & Makkhan Katori (H). Its aerial root is styptic, useful in syphilis, biliousness, dysentery, inflammation of liver etc. It has been proven to have anti-diabetic and anti-hyperlipidemic activity. Phenolic compounds and halogenated coumarins have been isolated from it. Objectives: However, no pharmacognostic work of this species has been reported so far, thus serving as a basis for initiation of the present work. Methods: Detailed morphological and qualitative as well as quantitative microscopic study was carried out. Results: A special feature of the leaves is that they have a pocket-like fold at the base. Chief features of the transverse section are the presence of hypodermis in the lamina, bilayered palisade and crescent-shaped vascular bundles. Chief powder characters are anomocytic stomata, spirally-thickened xylem vessels, dagger-shaped covering trichomes and cluster crystals of calcium oxalate. Preliminary phytochemical screening showed the presence of alkaloids, cardiac glycosides, saponins, flavonoids, tannins and carbohydrates. Conclusion: This study, combined with quantitative microscopic data, can be useful in evaluation and detection of adulteration in plant material or formulations of the leaves of this species.

Keywords: Ficus, Krishna, Makkhan katori, Moraceae, Pharmacognosy

1. Introduction

Ficus krishnae (Moraceae) is also known as Krishna fig, Krishna's butter cup (E) & Makkhan Katori (H). It is mainly found in India, tropical Africa and Sri Lanka. It is a very large, fast growing, evergreen tree up to 30 m tall, with spreading branches and aerial roots.[1, 2] The unique feature of the tree is that the leaves have a pocket-like fold at the base, behind which is a mythological story that Lord Krishna was very fond of butter and would even steal it. Once when he was caught by his mother, Yashoda, he tried to hide the butter by rolling it up in a leaf of this tree. Since then, the leaves of these trees have this shape.[3]

All parts are used to cure diseases of 'Kapha'. It is astringent to bowels; useful in treatment of ulcers, vomiting, vaginal complaints, fever, inflammations and leprosy. Latex is aphrodisiac, tonic; useful in piles and gonorrhea. The aerial root is styptic, useful in syphilis, biliousness, dysentery, inflammation of liver etc.[4] It has been proven to have anti-diabetic and anti-hyperlipidemic activity.[5] Phenolic compounds and a halogenated coumarin 2***H***-chromen-2-one named 3-chloro-7-methoxy-4-methyl-chromen-2-one has been isolated from it.[6-8] However, no pharmacognostic work of this species has been reported so far. This study will prove to be useful in documentation of these plants and provide guidelines for further study on *Ficus krishnae*. It can be useful in evaluation, standardization and detection of adulteration in plant material or formulations of leaves of this species.

2. Materials and Methods

2.1 Collection and authentication of leaves: Leaves of *F. krishnae* were collected from the herbal garden of RK College of Pharmacy, Rajkot, Gujarat in July, 2009. Herbariums and voucher sample were prepared and deposited in Department of Pharmacognosy, RK College of Pharmacy (Voucher no. RKCP/COG/1/2009).

2.2 Pharmacognostic studies: Morphology of leaves of *F. krishnae* was studied. Photomicrography of stained and unstained transverse sections of fresh leaves was carried out. Leaf constants were established using camera lucida. The leaves were dried under shade and powdered to 60#, stored in airtight containers and used for powder study and quantitative microscopy (Table 1) [9].

2.3 Phytochemical study: 5g powder was extracted with 25ml each of water and 80% methanol at 50°C for 15mins. Various phytoconstituents present in the leaves were detected by their respective chemical tests using the appropriate extracts (Table 2). [10-14]

3. Results

3.1 Morphology: Leaf is simple, dorsiventral, 13-14cm X 8-9cm, ovate. Color of upper surface

is dark green and lower surface is light green. Apex acute, margin entire, venation reticulate, base symmetric, upper surface is glabrous and lower surface is pubescent. Petiole is long, pubescent and has a small spine. Leaf base has a cup shape. Two notches are present near the base (Fig. 1).

Fig. 1. *Ficus krishnae*

3.2 Microscopy: Epidermis of the leaf is composed of single layered rectangular cells with thick cuticle. It shows the presence of multicellular and unicellular dagger-shaped covering trichomes. Hypodermis of the lamina is composed of 2-3 layer of parenchymatous cells. Palisade cells are 3-4 layered, compact and radially elongated. Spongy parenchyma beneath the palisade consists of 3-4 layers of loosely arranged polygonal parenchymatous cells. It shows the presence of calcium oxalate cluster crystals. The mid-rib shows the presence of abundant unicellular and multicellular covering trichomes. Collenchyma is well developed, 2-4 layered. Ground tissue consists of loosely arranged isodiametric parenchymatous cells having calcium oxalate cluster crystals and brownish matter. Vascular bundles are crescent-shaped and bicollateral. Patches of perimedullary phloem and secondary vascular bundles are found above primary vascular bundle (Fig. 2, 3).

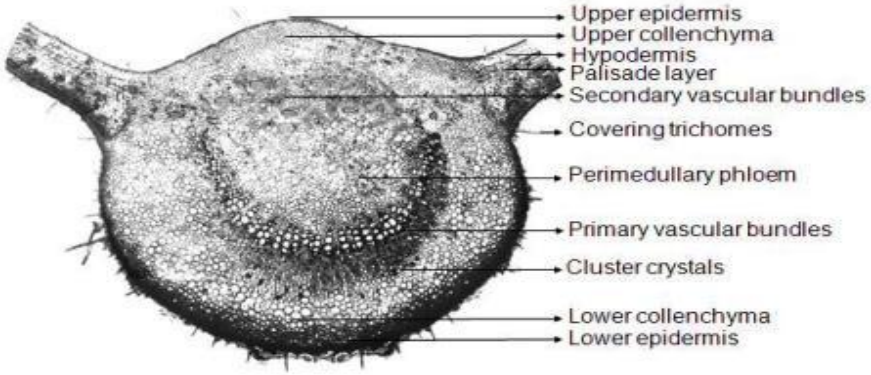

Fig. 2. Entire transverse section of *F. krishnae* leaf (x40)

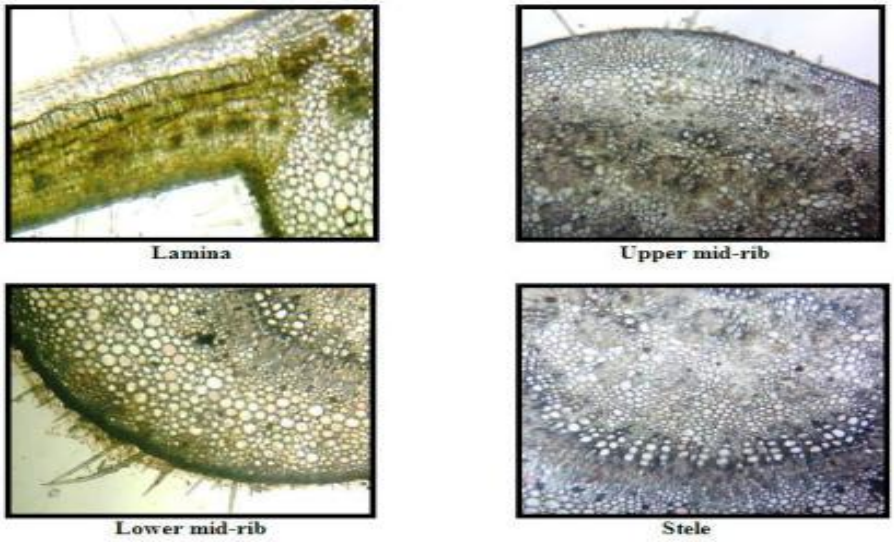

Fig. 3. Detailed transverse section of *F. krishnae* leaf (x100)

3.3 Powder characteristics: The powder is light green in color. Anomocytic stomata are abundant. The covering trichomes are found scattered and attached to fragments of the epidermis. They are unicellular or multicellular, conical, dagger-shaped. The groups of lignified vessels showing spiral thickening. Abundant cluster crustals of calcium oxalate are also found scattered in the powder (Fig. 4).

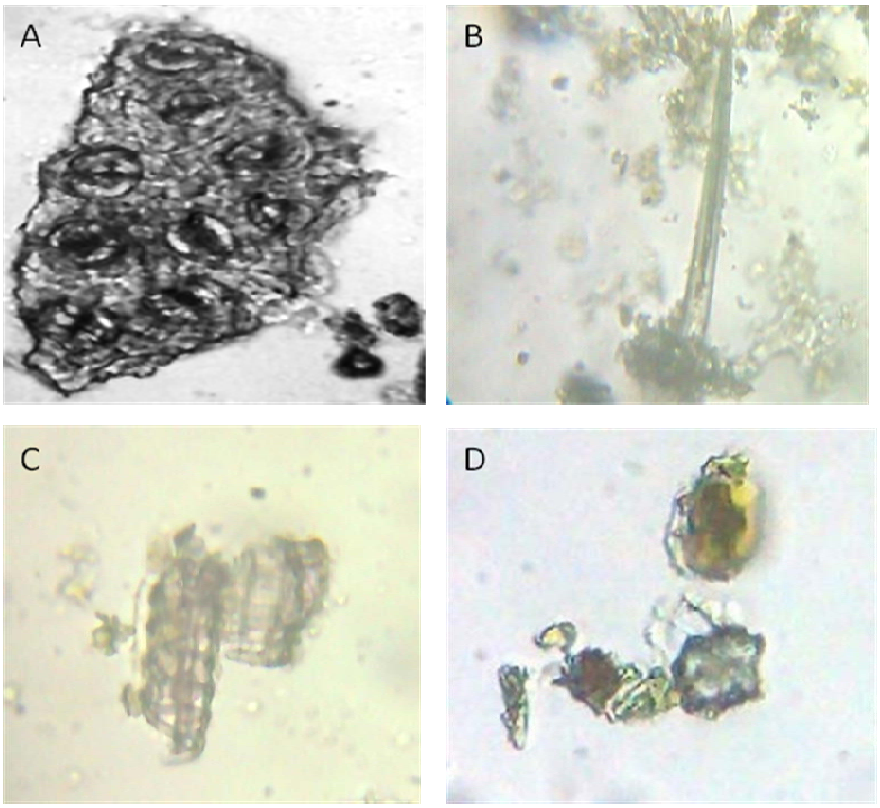

Fig. 4. Powder study (x450)
A, Anomocytic stomata; B, Covering trichome; C, Spiral xylem vessels; D, Cluster crystal of calcium oxalate

Table 1. Quantitative Microscopy

Leaf constant	Mean value ± SD
Stomatal Number	
Upper surface	6±1
Lower surface	16±1
Stomatal Index	
Upper surface	9.11±0.5
Lower surface	16.90±0.5
Vein islet number	5±1
Vein termination number	16±1
Cluster crystal diameter	11.38µ – 22.46µ – 36.5µ
Length of trichome	21.44µ – 43.37µ – 87.84µ

Table 2. Phytochemical Screening

Phytoconstituent	Test	Result
Alkaloids	Dragendorff's test	+ve
	Wagner's test	+ve
	Mayer's test	+ve
	Hager's test	+ve
Flavonoids	Shinoda test	+ve
	Lead acetate test	+ve
Sterols & Triterpenoids	Salkowski test	-ve
	Libermann Buchardt test	-ve
Cardiac glycosides	Legal's test	+ve
	Baljet test	+ve
	Keller Killiani test	-ve
	Kedde's test	+ve
Anthraquinone glycosides	Borntrager test	-ve
	Modified Borntraget test	-ve
Saponin glycosides	Foam test	+ve
Tannins	Ferric chloride test	+ve
	Folin ciocalteu test	+ve
Carbohydrates	Fehling's test	+ve
	Molisch test	+ve

4. Discussion

Ficus krishnae has been claimed to have several pharmacological actions. However, no pharmacognostic work has been done on it so far, thus serving as a basis for this work. A striking feature of the leaves is that they have a pocket-like base. Main characters of the transverse section are the presence of hypodermis, bilayered palisade and crescent-shaped stele. Diagnostic powder characters are anomocytic stomata, spirally-thickened xylem vessels, dagger-shaped covering trichomes and calcium oxalate clusters. Preliminary phytochemical screening showed the presence of alkaloids, cardiac glycosides, saponins, flavonoids, tannins and carbohydrates. This study, including quantitative microscopy, can be very useful in evaluation and detection of adulteration of the leaves of this species.

References

1. Anonymous. Wealth of India: Raw Materials Vol. IV. New Delhi: CSIR; 1956, p. 25.
2. Biswas K. Observations on the systematic position of *Ficus krishnae*. *Curr Sci*. 1934; 3(8): 424-7.
3. Unnikrishnan K, Hema KS. Development of back-pocketed leaf in *Ficus krishnae* C. DC. *Phytomorphology*. 1990; 40(1): 151-7.
4. Kirtikar KR, Basu BD. Indian Medicinal Plants Vol. III. Dehradun: International Book distributors; 2005, p. 2312.
5. Mohana Lakshmi S, Saravana Kumar A, Srikanth S, Tejo Vidyulatha K, Jyothi G, Mounica Choudari D, Lavanya O . Anti-Diabetic and Antihyperlipidemic Activity of *Ficus krishnae* L. in Alloxan-induced Diabetic Rats. *Pre-clinical Journal*. 2005; 1(1):14-8.
6. Parveen M, Sohrab Khan M, Ilyas M. Chemical constituents of *Ficus krishnae*. *J Ind Chem Soc*. 1993; 70(6): 785-8.
7. Ilyas M, Parveen M, Shafiullah, Khan MS. Phenolic Constituents of *Ficus krishnae*. *J Ind Chem Soc*. 1996; 73(11): 632-3.
8. Parveen M, Ali A, Malla AM, Silva PS, Silva MR. A halogenated coumarin from ***Ficus krishnae***. *Chemical Papers*. 2011; 65(5): 735-8.
9. Khandelwal KR, Kokate CK, Gokhale SB. Practical pharmacognosy techniques and experiments. Pune: Nirali Prakashan; 1996, pp. 45-95.
10. Feigl F. Identification of individual organic compound. In: Spot tests in organic analysis. London: Elsevier; 1956, pp. 237-45.
11. Fishcher R. Praktikum der pharmakognosic. 3rd Ed. Berlin: Springer Verlag; 1952, pp. 55-125.
12. Geissman A. Modern methods of plant analysis Vol III. Berlin: Springer Verlag; 1955, pp. 75-80.
13. Harborne JB. Phytochemical methods. 2nd Ed. London: Chapman & Hall; 1973, pp.25-189.
14. Robinson T. The organic constituents of higher plants, their chemistry and interrelationships. Minneapolis: Burgers; 1964, pp. 35-138.