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Pharmacognostic and Phytochemical Investigation of *Ficus carica* Linn.

Kalaskar M. G.[1], Shah D. R.[1], Raja N. M.[1], Surana S. J.[1] and Gond N. Y.[2]

[1]R. C. Patel institute of Pharmaceutical Education and Research, Shirpur, Dhule, India
[2]Nanded College of Pharmacy, Nanded, India
mohan.kalaskar@rediffmail.com

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Abstract

Ficus carica Linn. (Syn: *Ficus sycomorous*; family: *Moraceae*) is grows in tropical and subtropical regions of India, used for varity of purpose in traditional medicine. The usefulness of this plant is scientifically evidenced, and different biologically active phytoconstituents were isolated form plant. But no reports are available on morphoanatomy, and phytochemical studies, hence present attempt was undertaken to investigate the microscopical and preliminary phytochemical studies. The study revels the midrib is biconvex and lamina is dorsiventral, shows presence of nonglandular trichome, anomocytic stomata, prismatic calcium oxalate crystals. It shows presence of steroids, triterpenoids, cumarines, flavanoids and glycoside.

Key words*: Ficus carica,* Morphoanatomy, Phytochemical studies.

Introduction

Ficus carica Linn. (Syn: *Ficus sycomorous*; family: *Moraceae*), which is commonly referred as "Fig", grows in tropical and subtropical regions of India (Anonymous, 2002). In traditional medicine the roots are used in treatment of leucoderma and ringworms and its fruits which are sweet, have antipyretic, purgative, aphrodisiac properties and have shown to be useful in inflammations and paralysis (Kirtikar, 1996; Nadkarni and Nadkarni 1995). *F. carica* has been reported to have numerous bioactive compounds such as arabinose, β-amyrins, β-carotines, glycosides, β-setosterols and xanthotoxol (Gilani *et al*., 2008; Vaya and Mahmood, 2006, Ross and Kasum, 2002.). Earlier chemical examination of this plant have shown the presence of psoralen, bergapten, umbelliferone (Seong-Kuk *et al*., 1995; Louis *et al*., 2000), campesterol, stigmasterol, fucosterol, fatty acids (Jeong and Lachance, 2001.), 6-(2- methoxy-Z-vinyl)-7-methyl-pyranocoumarin and 9,19-cycloarlane triterpenoid as an anticancer (Weiping *et al;* 1997, Weiping *et al;* 1997.) and antiproliferative agent: 6-O-acyl-*β*-Dglucosyl -*β*-sitosterol (Shai *et al;* 2001), calotropenyl acetate, and lupeol acetate (Saeed and Sabir, 2002).

In addition, several therapeutic effects have been shown for different parts of *Ficus carica*, such as hypoglycemia[Serraclara *et al;* 1998], cancer suppressive[Rubnov *et al;* 2000.], anthelmintic [De-Amorin *et al;* 1999], hypotriglyceridemia [Asadi *et al;* 2006, Perez *et al;* 1999a,] hypocholestrolemia[Perez *et al;* 1999b] and bovine papilomatosis [Hemmatzadeh *et al;* 2003]. The chloroform extract obtained from a decoction of *Ficus carica* leaves improved the blood cholesterol status in streptozotocin induced diabetic rats [Canal *et al;* 2002].

This study was aimed at providing the pharmacognostical standards of *F. carica* (figs) which will be helpful for distinguish it from other species of *Ficus.*

Materials and Methods

1. Plant material collection

The plant material was collected from Botanical garden of R. C. Patel Institute of Pharmaceutical and research, Shirpur, Dhule, India. in Oct 2009. The plant was authenticated (RCP-10) and speciman herbarium were preserved at institute herbarium library. The leaves part were separeted form other parts, washed, cleaned and dried for further use.

2. Analysis

The external leaf morphology was observed and studied. Fresh mature leaves transverse and longitudinal freehand sections were taken. Whereas dried leaf powder material was used for the determination of ash values, extractive values, and phytochemical constituents. All the reagents used were of analytical grade obtained from Sigma Chemical Co, St. Louis, USA or Fine Chemicals Ltd., Mumbai, India. The results were registered by botanical illustration and photos taken by means of the Motic digital microscope (Motic instrument Inc, Canada) fitted with 1/3" CCD camera imaging accessory with motic image 2000 image analysis software.

Results and Discussion

1. **Leaf morphoanatomy**

Ficus carica (Fig. 1) has simple leaves, broadly shape, acute apex and subcordate base, more or less irrgular deeply cut into 3 – 5 palmate, coarsely irregular margin, measuring 6–18 cm long and 5–15 cm wide, petiolate. The lamina texture is rough and the venation is multiconvergent reticulate. In transection (Fig. 2A), the blade epidermis is single-layered (Fig. 2A) and coated with a thin and smooth cuticle. The epidermis shows presence of anomocytic stomata (Fig. 2B), Non-glandular trichomes occur predominantly on leaf epidermal cell surface. The mesophyll is dorsiventral, consisting of about two layers of palisade parenchyma and four strata of spongy parenchyma, prismatic crystals of calcium oxalate are seen The midrib (Fig. 3A and B), in transverse section, is biconvex. The epidermis is uniseriate and has non-glandular trichomes similar to

the blade. They are seldom unicellular and uniserrate. The trichome apex is acute and pointed (Fig. 3B). Adjacent to the epidermis, angular collenchyma occur, comprising approximately eight to ten rows on the dorsal side and twelve to fourteen on the ventral one. Embedded in the ground parenchyma, one to two collateral vascular bundles arranged nearly as a closed arc are present. The calcium oxalate prisms are found in spongy parenchymatous tissue.

Fig 1. Vegetative apical branches of *Ficus carica* Linn.

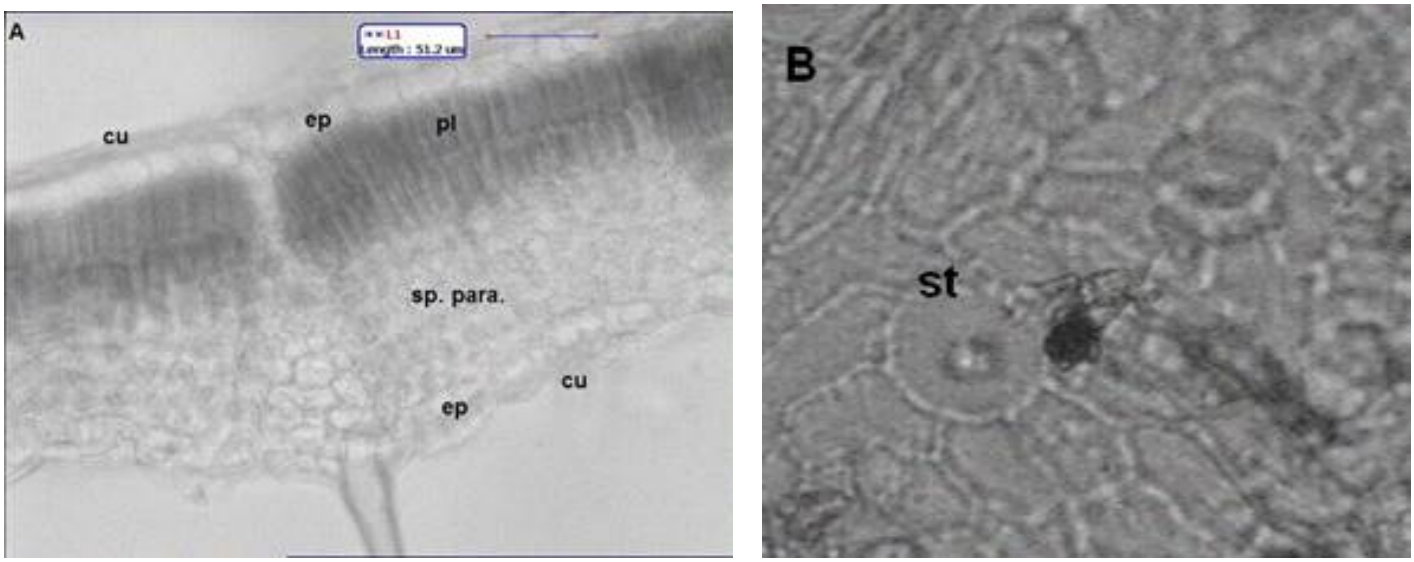


Fig 2. (A) Transverse section shows leaf is dorsiventral cu: cuticle, ep: epidermis, pl: palisade, sp. Para: spongy parenchyma (B) st: anomocytic stomata.

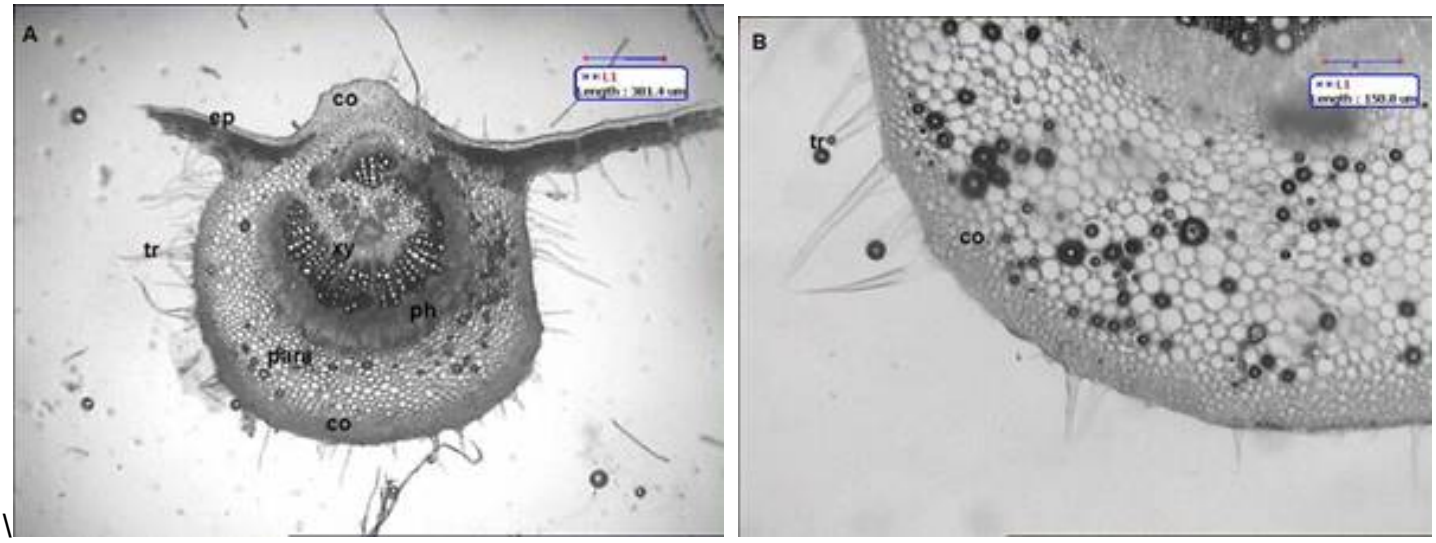


Fig 3. midrib structure of Ficus carica Linn. (A) Transection of the midrib, showing collateral vascular bundles arranged as closed arc; (B) trichomes in the midrib; co: collenchyma; ep: epidermis; para: ground parenchyma; ph: phloem; tr: trichome, ph: phloem ; xy: xylem.

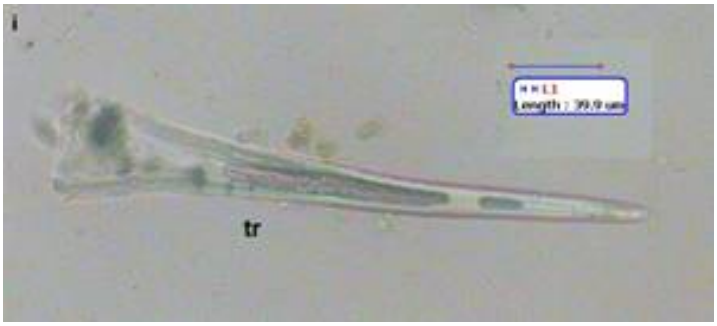
1. **Powder analysis (Figure 4)**

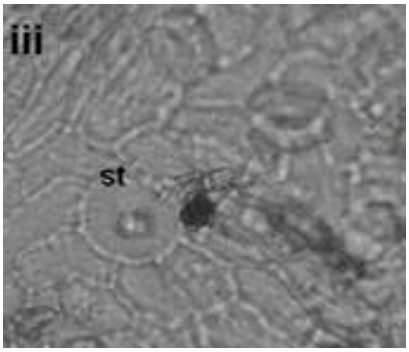
a) Unicellular, uniserrate covering trichomes are abundant, pointed toward the apex and broader at base, thin measure 240 - 415 microns in length. (fig 2, i).

b) Fragments of paranchyamatous tissue containing spiral vascular strands measures 25 – 48 micron in diameter. (fig 3, ii).

c) Numerous anomocytic stomata meaning thereby that the cells surrounding the stomatal pores are irregularly arranged. (fig 3, iii).

d) The prismatic calcium oxalate of 7 – 10 microns in diameter are less abundant and observed as free or in fragments of parenchymatous cells. (fig 2, iv).





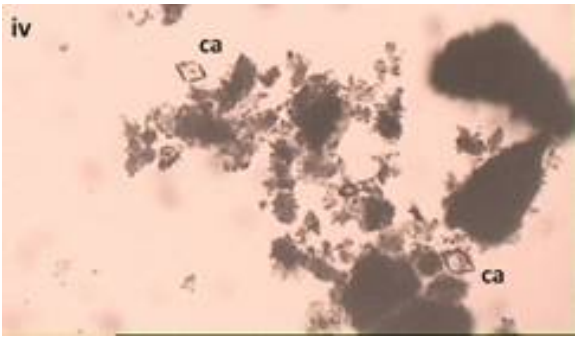


Fig 4. Powder analysis (i) unicellular uniserratenon-glandualr trichomes (ii) spiral lignified xylem vessel (iii) anomocytic stomata (iv) prismatic calcium oxalate crystals**.**

2. **Histochemical color reactions**

The different histo-chemical color reactions were performed on the leaf transverse sections to differentiate the different cell compositions and identification (Trease and Evans, 1986) and results were given in Table 1.

Table 1. Histochemical color reactions of *Ficus carica* leaf powder.

Reagents	**Constituent**	**Color**	**Histological zone**	**Degree of intensity**
Aniline So4 + H2SO4	Lignin	Yellow	Xylem,	++
Phloroglucinol + HCl	Lignin	Pink	Xylem, Sclerenchyma	+++
Conc. H2SO4	Cellulose	Green	Mesophyll	+
Weak Iodine solution	Starch	--	--	--
Millons reagent	Proteins	White	Spongy paranchyma	+
Dragendorffs reagent	Alkaloids	---	--	--
H_2So_4	Ca. Oxalate	Needles	Mesophyll, and midrib paranchyma	+
SbCl3	Steroids/ Triterpenoids	Reddish pink	Mesophyll	+++
5% Aq. KOH	Anthraquinone glycosides	--	--	--

+++ High, ++ Moderate, + Slight, - Negative.

3. **Behavior of powder with chemical reagents**

Behavior of leaf powder with different chemical reagents was studied to detect the presence of phytoconstituents with color changes under daylight by reported method (Pratt and Chase, 1949) and the results were shown in Table 2.

Table 2. Behavior of *Ficus carica* leaf powder with different chemical reagents.

Regents	Color/ppt	Constituents
Picric acid	No precipitations	Alkaloids absent
Conc. H_2SO_4	Reddish brown	Steroids/triterpenoids present
Aq. $Fecl_3$	No change	Tannins absent
Iodine solution	No change	Starch absent
Ammonia present	No change	Antroquinone glycosides absent
5% Aq. KOH	No change	Antroquinone glycosides absent
Mayer's reagent	No perception	Alkaloids absent
Spot test	Stains observed	Fixed oils present
Aq. $AgNo_3$	No precipitation	Proteins absent
Aq. NaoH	Yellow	Flavonoids present
Mg – Hcl	Magenta	Flavonoids present
Dragendroff's reagent	No ppt	Alkaloids absent
Aq. Lead acetate	No change	Tannins absent
Liberman Burcherd's test	Reddish green	Steroids and tannins are present

4. **Ash values**

Total ash, acid-insoluble ash, water-soluble ash, and sulphated ash values of the fruit powder were done as per the reported methods (Anonymous, 1985) and the results are tabulated in Table 3.

Table 3. Ash values of *Ficus carica* leaf.

Types of ash value	% w/w
Total ash	5.89

Acid insoluble ash	1.84
Water soluble ash	1.26
Sulphated ash	6.42

5. **Extractive values**

Extracts were prepared with various solvents by reported method (Kokashi *et al*;1958). Percentages of the extractive values were calculated with reference to air-dried drug (Table 5). Color and consistency of extracts (Pratt and Chase, 1949) are given in Table 4.

Table 4. Extractive value of of *Ficus carica* leaf.

Type of solvent	**%w/w**
Petroleum ether 60-80^0	2.04
Ethyl acetate	1.98
Alcohol	10.29
Water	8.64

6. **Fluorescence analysis of extracts**

All the leaf extracts are examined in daylight, short and long UV to detect the fluorescent compounds by the reported method (Kokashi *et al*; 1958). The observations are given in Table 5.

Table 5: Fluorescence analysis of *Ficus carica* leaf.

Color reaction	**Day light**	**Uv light 365nm**
Powder + NaOH	Green color	Greenish yellow fluorescence
Powder + Methanol + nitrocellulose	Reddish green	Redissh green fluorescence
Powder + nitrocellulose	Grayish green	Strong yellow fluorescence
Powder + NaOH in water	Green	Faint green fluorescence
Powder + nitrocellulose +Hcl	Grayish green	Faint green color

Powder + Hcl	Yellowish green	Dark brown with faint yellow fluorescence
Powder + H_2SO_{-4}	Blackish	Black
Powder + HNO_3	Brownish black	Black
Powder	Green	greenish florescence

7. **Qualitative phytochemical screening**

Freshly prepared leaf extracts were tested for the presence of phytoconstituents using reported methods (Farnsworth, 1966) and the results are given in Table 6.

Table 6. Qualitative phytochemical analysis of of *Ficus carica* leaf extract.

Constituents	***Pet. Ether***	***Ethyl acetate***	***Ethanol***	***Aqueous***
Alkaloids	-	-	-	-
Carbohydrates	-	-	-	+
Cumarines	-	+	+	-
Flavonoids	-	+	+	-
Fixed oils	+	-	-	-
Glycosides	-	-	-	+
gums and resins	-	-	-	-
Mucillages	-	-	-	-
Proteins and amino acids	-	-	-	+
Saponins	-	-	-	-
Steroids and sterols	+	+	-	-
Tannins	-	-	-	-
triterpenoids	+	+	-	-

+ present - absent

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