RESEARCH ARTICLE

# Pharmacognostic evaluation and development of quality standards of *Ficus carica* (Moraceae) L. Leaves

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## Abstract

**Background:** *Ficus carica* Linn. (Moraceae) is commonly known as edible fig. It has been cultivated by humans for over 5000 years. In India, it is cultivated in many parts of North India for its fruits. **Aim:** Due to the useful effect of leaves in skin diseases, pharmacognostical standardization of *F. carica* leaves was carried out. **Material and Methods:** Morphological examination showed that leaves are long, palmate-shaped, and dark green in color. The leaves powder had characteristic odor and taste. Transverse section of leaves showed upper and lower epidermis with covering and glandular trichomes, and midrib showed arc-shaped vascular bundle. **Results:** Successive extractive value was highest (23.60%) in case of aqueous extract. Mean ash values (%) were 23.04 (total), 6.48 (acid insoluble), and 12.69 (water soluble). Loss on drying was 5.9107%. Resin content was found 1.33%. Phytochemical screening of leaves powder showed the presence of carbohydrates, phenolic compounds, flavonoids, steroids, tannin, resin, and acidic compounds. **Conclusion:** Further work is needed to isolate, characterize, and quantify active constituents present in the leaves of *F. carica* by sophisticated techniques.

**Key words:** *Ficus carica*, high-performance thin-layer chromatography, pharmacognostical standardization

## INTRODUCTION

*Ficus carica* Linn. (Moraceae) is a small or moderately sized deciduous tree, 15–30 ft in height, irregularly branched tree or large straggling bush.[1] Branches are numerous, cylindrical, with a smooth reddish or pale-gray bark, marked, while young, with the scars of the petiole and fallen stipules, the youngest twigs downy.[2] The name is very similar in French (figue), German (feige), and Italian and Portuguese (figo). It has been cultivated by humans for over 5000 years. In India, it is cultivated in many parts of North India for its fruits. Since ancient times, the fig has been used for human consumption, but recently its nutritive and pharmacological value has been investigated.[1] Medicinally, leaves, roots, fruits, and latex are used.[3-5] A decoction of the leaves is stomachic. The leaves are also added to boiling water and used as a steam bath for painful or swollen piles. It has also an analgesic effect against insect sting and bites. Milky juice of leaves is very acrid and has been used in some countries for raising blisters.[3] The juice of fig leaves has long been used to treat vitiligo due to the presence of furanocoumarins principally psoralen and daidzein.[6-8] The present work was undertaken to standardize the leaves of *F. carica*.

## MATERIALS AND METHODS

### Materials

All the chemicals and reagents used were of analytical reagent grade and purchased from Sigma chemical co. (St Louis, MQ, USA) and Merck (Darmstadt, Germany). The plant materials (leaves) were collected from Jamia Hamdard, residential block A, Prahaladpur, New Delhi. The plant parts were

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authenticated identified by Dr. M. P. Sharma, taxonomist, the Department of Botany, Faculty of Science, Jamia Hamdard, New Delhi, India.

### Morphological Studies

The morphological studies were carried out for shape, size, color, odor, taste, and fracture of the *F. carica* leaves.

### Microscopic Studies and Powder Analysis

The transverse section (T.S) of leaf was prepared by the standard method. Slides of powdered leaf material were also prepared and studied. Microphotography on different magnifications was carried out with compound and digital microscopic unit.[9]

### Quantitative Microscopy

Leaf constants such as stomatal index, stomata number, vein islet, vein termination, and palisade ratio of the drug were determined according to the reported method.[1]

### Physicochemical Standardization

The various physicochemical values of leaves such as ash values, extractive values, and loss on drying were determined according to the pharmacopoeial method.[10]

### Phytochemical Screening

The phytochemical screening of drug was carried out as per the method described by Harborne.[11] Previously dried powdered leaves (10 g) were extracted in a Soxhlet apparatus with methanol. The extract was evaporated to dryness under vacuum. The extract was used for the analysis of different phytoconstituents such as alkaloids, carbohydrates, phenolics, flavonoids, proteins, amino acids, saponins, mucilage, and resins.

### Fluorescence Analysis

The fluorescence nature of powder drug was analyzed with different chemicals, and the observations were also recorded.[12]

## RESULTS AND DISCUSSIONS

### Macroscopical Evaluation

The leaves of *F. carica* were subjected to macroscopical evaluation, and observations were recorded. The proper examination of the leaves was carried out under sunlight and artificial source similar to daylight. The leaves of *F. carica* were long, palmate-shaped, and dark green in color. The results of macroscopical evaluation are presented in Table 1.

### Microscopical Evaluation

The T.S of *F. carica* leaves showed upper and lower epidermis showed single-layered cell with covering and glandular trichomes, and midrib showed arc-shaped vascular bundle. T. S. of leaf shows the following characters.

#### *Lamina*

##### *Upper epidermis*

Single-layered cells more or less rectangular with outer walls cuticularized. Both covering and glandular trichomes emerged from the upper epidermal cell. Covering trichomes are 2–4 celled, thick-walled and pointed. Glandular trichomes are with unicellular stalk, having unicellular terminal gland [Figure 1b].

##### *Mesophyll*

Mesophyll is differentiated being a dorsiventral leaf into upper palisade layer and lower spongy parenchyma, and vascular strands can be seen in the mesophyll tissue.

##### *Palisade*

It was two-layered, compact, and individual cells radially elongated.

##### *Spongy parenchyma*

2–5 layered, loosely arranged with intercellular space.

#### *Lower epidermis*

Lower epidermis resembles the upper epidermis but for the presence of more number of trichomes and stomatal pores.

#### *Midrib*

The upper and lower epidermal layers of lamina are continuous over the midrib. However, relatively more trichomes appear on the epidermal layers of the midrib. A 2–4 layered collenchyma can be clearly below upper and above

**Table 1:** Macroscopical characters of leaf of *F. carica*

| Description of the macroscopic structure | Observation |
|---|---|
| External Color | Dark green |
| Size | 12–25 cm |
| Shape | Long, palmate |
| Odor | Characteristic |
| Taste | Characteristic |
| Others | Alternate, deciduous, petiolate, subcordate |

*F. carica: Ficus carica*

the lower epidermis. The rest of the midrib occupied by the cortical parenchyma with the vascular bundle embedded in the middle. Vascular bundle is arc-shaped. Collateral with xylem toward upper epidermis and phloem toward lower epidermis. A patch of vascular bundle is in the central portion of the midrib [Figure 1a].

## Powdered Microscopy

The microscopic examination of powdered leaf material was performed to detect and established various identifying microscopic characters which will be helpfull in the differentiation of the substitute of the drug supplied in the form of dried powder. The photomicrographs of the identifying features of the plant material are shown in Figure 2. Microscopical characters of powder are shown as follows.

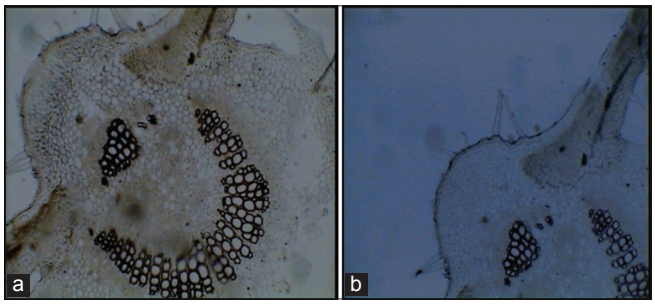


**Figure 1:** (a) Transverse section of normal leaf of *Ficus carica* showing magnified view of vascular bundle (5 × 20), (b) Transverse section of *F. carica* showing covering and glandular trichomes (10 × 10)

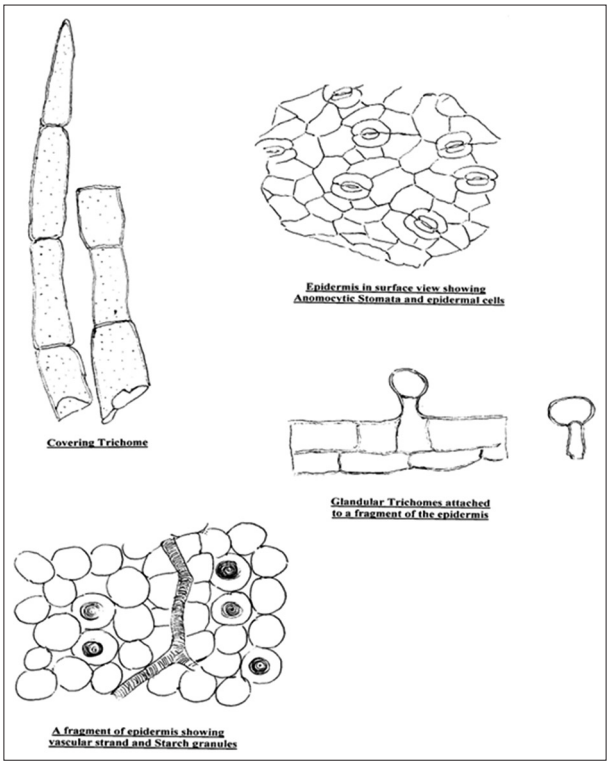


**Figure 2:** Microscopical characters of powder of *Ficus carica* leaf

### *The fragment of lamina in surface view*

The epidermal cells contained numerous mucilage granules. The upper epidermis is composed of fairly larged polygonal cells with moderately thickened walled. Stomata are present at particular interval.

### *Trichomes*

Covering and glandular trichomes are present

1. Covering trichomes: Covering trichomes are multicellular, 2–6 celled, and pointed and nonlignified.
2. Glandular trichomes: Glandular trichomes are nonlignified and consist of single-celled stalk and single-celled head.

### *Stomata*

Stomata are anomocytic (subsidiary cells and epidermal cells are identical) (Table 2).

### *Starch granules*

Abundant starch granules are present. Starch granules are spherical and showing hilum and striations.

## Physicochemical Standardization of Leaves

The air-dried powdered leaf materials were subjected for the determination of various physicochemical standardization parameters as per the WHO guidelines.

## Extractive Value

Extractive values determine the amount of the active constituents in a given amount of plant material when extracted with a particular solvent. It is employed for material for which no chemical and biological assay method exists. The compositions of phytoconstituents in a particular solvent depend on the nature of the drug and solvent used. Extractive value also gives the information regarding the quality of the drug (whether the drug is exhausted or not).

## Determination of Cold Extractive Values

The air-dried coarse drug powder (20 g) is macerated with solvent (petroleum ether, acetone, chloroform, alcohol, and water) of volume 100 ml in a closed flask for 24 h, shaking frequently during 6 h and allowing standing for 24 h. It is filtered rapidly, taking precaution against loss of solvent, the filtrate evaporated to dryness in a tarred flat bottom dish and dried at 105°C, to constant weight and weighed. Results of cold extractive values are shown in Figure 3.

## Determination of Hot Extractive Values

The powdered material of the drug (20 g) is packed in a Soxhlet apparatus separately for each solvent such as petroleum ether,

chloroform, alcohol, and water. Each extract is evaporated to dryness, and constant extractive value is recorded. Results of hot extractive values are shown in Figure 4.

### Determination of Successive Extractive Values

The dried and coarsely powdered material (20 g) is subjected to successive extraction in a Soxhlet apparatus with different solvents such as petroleum ether, chloroform, and alcohol. The extracts are evaporated to dryness, and their constant extractive values are recorded. Results of Successive extractive values is shown in Figure 5

### Fluorescence Analysis

The fluorescence behavior of powder drug was observed under ultraviolet. and visible light. Different chemicals such as $H_2SO_4$, $HNO_3$, and NaOH showed different reactions with the drug. Table 3 showed a detail fluorescence behavior of crude drug powder.

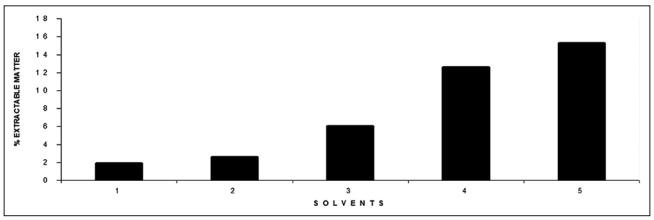


**Figure 3:** The percentage of cold extractive values, 1 - Petroleum ether extract, 2 - Chloroform extract, 3 - Acetone extract, 4 - Methanol extract, 5 - Aqueous extract

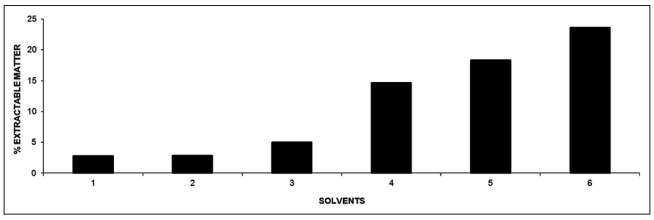


**Figure 4:** The percentage of hot extractive values, 1 - Petroleum ether extract, 2 - Chloroform extract, 3 - Acetone extract, 4 - Methanol extract, 5 - Hydroalcoholic extract, 6 - Aqueous extract

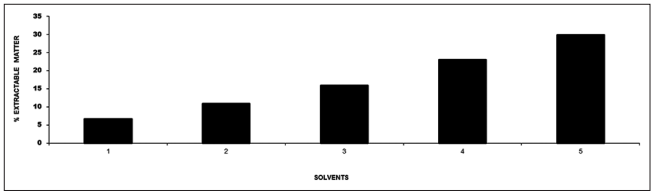


**Figure 5:** The percentage of successive hot extractive values, 1 - Petroleum ether extract, 2 - Chloroform extract, 3 - Acetone extract, 4 - Methanol extract, 5 - Aqueous extract

### Phytochemical Screening

The methanolic extract was subjected to preliminary chemical tests to detect the presence and absence of various phytoconstituents. Alkaloids, glycosides, proteins and amino acids, saponins, and mucilage were absent. Methanolic extract showed the presence of phenolic compounds, flavonoid, resin, sterols, steroid, fats, and lipids. Table 4 shows the presence and absence of various phytoconstituents in the methanolic extract. Phytochemical evaluation of the plant extracts may provide the information regarding various types of phytoconstituents present. The presence or absence of particular types of phytoconstituents in the plant of the interest may be helpful, partly in the development of analytical profile and in the differentiation of contravention plants.

### Determination of Ash Values

The percentage of loss on drying, total ash values, water soluble ash, acid insoluble ash, and resin content was determined. The results noticed were loss on drying (5.9107%), total ash values (23.04 %), water-soluble ash values (12.69%), acid insoluble (6.48%), and resin content(1.33). This parameter can be used for the determination of inorganic materials, such as carbonates, silicates, oxalates, and phosphates. Heating causes the loss of organic material in the form of $CO_2$ leaving behind the inorganic components. Ash value is an important characteristic of a drug, and with the help of this parameter, we can detect the extent of adulteration as well as establish the quality and purity of the drug. There is a considerable difference in the ash values of different drugs, but mostly the difference varies within narrow limits in case of the same drug. The acid insoluble ash consists mainly of silica and high acid insoluble ash thereby indicating the contamination with earthly materials. The water-soluble ash is used to estimate the amount of inorganic elements. The total ash value, acid insoluble ash value, and water-soluble ash values were determined as per the WHO guidelines. The results and observation are presented in Table 5.

## CONCLUSION

*F. carica* is an important medicinal plant in the traditional system of medicine. It is one of the most important components

**Table 2:** Quantitative microscopy of leaf of *F. carica*

| Plant | Vein termination | Vein islet | Stomatal number | Stomatal index | Palisade ratio |
|---|---|---|---|---|---|
| *F. carica* | 103.5 | 86.1 | 6–10 | 17.64 | 8.125 |

*F. carica: Ficus carica*

**Table 3:** The effect of different chemical reagents on the fluorescence behavior of crude drug powder

| Treatment | Daylight | UV light 254 nm | UV light 366 nm |
|---|---|---|---|
| Powder as such | Yellowish Green | Dark brown | Yellowish green |
| Powder treated with distilled water | Green | Dark green | Green |
| Powder treated with Concentrated HNO3 | Black | Fluorescent green | Brownish yellow |
| Powder treated with H2SO4 | Black | Greenish black | Dark blue |
| Powder treated with 50% H2SO4 | Black | Brownish green | Green |
| Powder treated with concentrated HCl | Black | Greenish brown | Dark green |
| Powder treated with acetone | Black | Light green | Light brownish green |
| Powder treated with chloroform | Black | Light green | Yellowish green |

UV: Ultraviolet

**Table 4:** The phytochemical screening of methanolic extract

| Constituents | Observation |
|---|---|
| Alkaloids | – |
| Carbohydrates | + |
| Glycosides | – |
| Phenolic compounds | + |
| Flavonoids | + |
| Protein and free amino acids | – |
| Resin | + |
| Acidic compounds | + |
| Mucilage | – |
| Steroid | + |
| Saponin | – |
| Tannin | + |
| Sterol | + |
| Lipids/fats | + |

–: Absent, +: Present

**Table 5:** Percentage of loss on drying, ash values and resin contents of *F. carica*

| Parameters | *F. carica* (%) |
|---|---|
| Loss on drying | 5.9107 |
| Total ash | 23.04 |
| Water-soluble ash | 12.69 |
| Acid insoluble ash | 6.48 |
| Resin content | 1.33 |

*F. carica: Ficus carica*

of various marketed preparations used in liver and skin diseases. The present study is an attempt in the direction of standardization and preliminary phytochemical screening of *F. carica.* In the present investigation, an attempt has been made to standardize the leaves of *F. carica.* However, further work is warranted to isolate and quantify active constituents present in the leaves of *F. carica* by sophisticated techniques.

## REFERENCES


1. Anonymous. The Wealth of India, A Dictionary of Indian raw Materials and Industrial Products. New Delhi: CSIR, Publication and Information Directorate; 2002. p. 26-31.
2. Bentley R, Trimen H. *Ficus carica* In: Medicinal Plants. Vol. 4. Dehradun: International Book Distributers, Book Sellers and Publishers; Published By Prashant Gahlot; 2002. p. 228-9.
3. Kirtikar KR, Basu BD. *Ficus carica* In: Indian Medicinal Plants. Dehradun: International Book Distributers, Book Sellers and Publishers; 1992. p. 2329-31.
4. Hemmatzadeh FA, Amini F. Therapeutic effects of fig tree latex on bovine Papillomatosis. J Vet Med 2003; 50:473-6.
5. Amorin A, Borbab HR, Carautta JP, Lopez D. Anthelmintic activity of the latex of *Ficus* species. J Ethnopharmacol 1999;64:255-8.
6. Soobrattee MA, Neergheen VS, Luximon-Ramma A, Aruoma OI, Bahorun T. Phenolics as potential antioxidant therapeutic agents: Mechanism and actions. Mutat Res 2005;579:200-13.
7. Abu-Mustafa EA, El-Tawil and Fayez E. *Ficus carica* and its constituents role in management of diseases. Phytochemistry 1964;3:701-3.
8. Shetty BV, Singh V. Flora of India (Series-II). Flora of Rajasthan. Vol. 2. Calcutta: Botanical Survey of India; 1991. p. 453-80.
9. Trease GE, Evans WC. Pharmacognosy. London: Bailliere Tindall; 1985. p. 258-60.
10. Sharma BR, Sharma P. Constituents of *Aegle marmelos*. Planta Med 1980;43:102-3.
11. Harborne JB. Phytochemical methods In: A Guide to Modern Techniques of Plant Analysis. 3rd ed. U.K.: Chapman and Hall, ICMR; 1998. p. 56-99.
12. Woltering EJ, Van Doon WG. Role of ethylene in senescence of petals-morphological and taxonomical relationships. J Exp Bot 1988;39:1605-16.


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