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Pharmacognostical evaluation of medicinally important *Ficus retusa* (Leaves and bark)

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ABSTRACT

Ficus retusa (*F. retusa*) belongs to family *Moraceae* is a large and extensively growing tree across Indian continent. It's commonly known as Chilkan and Marabuten. This tree is claimed to have medicinal properties. The aim of present study is to investigate the pharmacognostical characters of important medicinal plant, *F. retusa* L. The pharmacognostic studies were carried out in terms of macroscopical, microscopical characters, standardization, phytoconstituents and chromatographic analysis of *F. retusa* leaf and bark. Various standard methods were adopted to carry out the investigation.

1. Introduction

India has an ancient heritage of traditional medicine. Indian traditional medicines based on various systems including *Ayurveda*, *Siddha*, *Unani* and *Homeopathy*. Since the beginning of the mankind plants have been the major source of medicinally important phytoconstituents in Indian system of medicine and other ancient systems in the world. The evaluation of these constituents is primarily based on phytochemical, pharmacological and analytical approaches. There are number of plants used as medicinal plants[1].

The genus *Ficus* belongs to family *Moraceae*. This genus includes some 750 species of woody plants and is remarkable for the large variation in the habits of its species. In India, the some important species of *Ficus* includes *Ficus bengalensis* (*F. bengalensis*), *Ficus* religiosa (*F. religiosa*), *Ficus* carica (*F. carica*), *Ficus* racemosa (F. racemosa) and *Ficus* elastic (F. elastic). *Ficus retusa* (*F. retusa*) is a rapidly-growing, rounded, broad-headed, evergreen shrub or tree that can reach 15 metres (49 ft) or more in height with an equal spread. The smooth, light grey trunk is quite striking, can grow to around 1 metre (3.3 ft) in diameter, and it firmly supports the massively spreading canopy. The glossy, dark green, leathery leaves are densely clothed on large, somewhat weeping branches and are usually infested with thrips. *F. retusa* have been used traditionally as aphrodisiac, antihypertensive, anticancer, antioxidant, hepatoprotective, gastroprotective, antidiabetic, anthelmintic, antimalarial, anti-inflammatory, analgesic and antimicrobial[2-10]. Root, barks and leaves of *F. retusa* are used in wounds and bruises. Dried roots are mixed with salt are applied to decaying or aching tooth. Roots are also used in the treatment of liver diseases[11]. These beneficial effects of plant materials typically result from the combinations of numerous phytoconstituents. These phytoconstituents are synthesized and deposited in specific parts or in all parts of the plant[12]. This research is an attempt to identify these medicinally important phytoconstituents as well as to standardize the plant

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material in terms of various pharmacognostic parameters.

2. Material and methods involved in *F. retusa* research

2.1. Processing of plant material

The Plant material *F. retusa* (Leaves and bark) was collected from Poanta Sahib, Himachal Pradesh, India and identified by the Botanist Dr. R. M Painuli, Incharge GUH, Harbarium Department of botany, H. N. B. Garhwal University (A Central University) (U.K.) India. The leaves and bark is separately dried in shade and preserved in air tight container. The dried leaves and bark is than powdered in mixture grinder.

2.2. Plant extracts chemicals and reagents

The powdered mixture (Leaves and bark) was extracted successively with petroleum ether, chloroform, acetone, methanol and water. All the extracts thus obtained and kept in desiccators for future use. All the other chemical and reagents used in this study are analytical grade and used without further purification.

2.3. Development of standard analytical parameters[10]

Macroscopical evaluation, microscopic studies, physical parameters such as foreign matter, ash values, fluorescence analysis, extractive value, moisture content and preliminary phytochemical analysis of various extracts of *F. retusa* were performed according to the standard official methods[13,14].

Thin layer chromatography analysis of petroleum ether, chloroform, acetone, ethanol and aqueous extracts were carried out in various solvents according to the standard protocols[15-17].

3. Results involved in *F. retusa* research

3.1. Foreign organic matter

Foreign organic matter means the material consisting of material not coming from the original plant source or not covered by definition of the herbal drug. It also includes insects, moulds and other animal contamination, parts of the organ or organs from which the drug is derived. The results of foreign matter were recorded in the form of % w/w (Table 1).

Table 1
Foreign organic matter.

Foreign matter %
0.9

3.2. Extractive values

This method determines the amount of active constituents extracted with solvents from a given amount of medicinal plant material. It is employed for materials for which as yet no suitable chemical or biological assay exists. The air dried, accurately weighed drug was treated with solvents: petroleum ether, chloroform, acetone, ethanol and water. The values were recorded in Table 2.

Table 2.
Extractive values.

Water soluble extractive value (%)	Alcohol soluble extractive value (%)
5.21	6.42

3.3. Ash value

Ash value is used to determine quality and purity of a crude drug. It contains inorganic radicals like phosphates, carbonates and silacates of sodium, potassium, magnesium, calcium etc. The results of ash values were given in Table 3.

Table 3.
Ash value.

Total ash (%)	Water soluble ash (%)	Acid insoluble ash (%)
10.25	3.98	3.02

Table 5.
Fluorescence studies.

S. no	Treatment	Visible light	UV 254 nm	UV 365 nm
1.	As such	Green	Dark green	Dark green
2.	Methanol	Pale green	Pale green	Yellowish green
3.	10% NaOH	Light green	Dark green	Dark green
4.	Conc. HCl	Yellowish brown	Dark brown	Yellowish brown
5.	Conc. HCl + H_2O	Yellowish brown	Dark brown	Yellowish brown
6.	Conc. nitric acid	Yellowish brown	Dark brown	Yellowish brown
7.	Conc. sulphuric acid	Brownish green	Brownish green	Brownish green
8.	Ethanol	Yellowish green	Green	Yellowish green
9.	Distilled water	Yellowish green	Dark green	Yellowish green
10.	5% Iodine	Dark blackish green	Dark blackish green	Dark blackish green
11.	Toluene	Light green	Dark green	Light green
12.	Ferric chloride solution	Dark blackish green	Dark blackish green	Dark green
13.	Ammonia solution	Green	Dark green	green

3.4. Determination of moisture (loss on drying)

The most common method for the determination of moisture is to heat the drug till one gets constant weight at 100 ℃. For the substances which undergo change with consequent loss of weight at a temperature of 100 ℃, other methods are used. A result of the total moisture contant of the crude drug is given in Table 4.

Table 4.
Loss on drying.

Loss on drying %
1.6

Table 6.
Preliminary phytochemical screening.

S. no	Test	Pet. ether	Chloroform	Acetone	Methanol	Water
1.	Alkaloids					
a)	Dragendroff´s test	−ve	−ve	−ve	−ve	−ve
b)	Mayer´s test	−ve	−ve	−ve	−ve	−ve
c)	Wagner´s test	−ve	−ve	−ve	−ve	−ve
2.	Tannins and phenolic compounds					
a)	5% Ferric chloride	−ve	−ve	−ve	−ve	−ve
b)	Lead acetate	+ve	+ve	+ve	−ve	−ve
c)	Gelatin	−ve	−ve	−ve	−ve	−ve
d)	Bromine water	−ve	+ve	−ve	−ve	−ve
e)	Acetic acid	−ve	−ve	−ve	−ve	−ve
f)	Dil. $KMnO_4$	+ve	+ve	+ve	−ve	−ve
g)	Pot. dichromate	−ve	−ve	−ve	−ve	−ve
h)	Dil. iodine	−ve	+ve	+ve	−ve	−ve
i)	Dil. Nitric acid	−ve	−ve	−ve	−ve	−ve
3.	Flavonoids					
a)	Lead acetate test	−ve	−ve	+ve	+ve	+ve
4.	Proteins					
a)	Million´s test	−ve	−ve	−ve	−ve	−ve
b)	Biuret test	−ve	−ve	−ve	−ve	−ve
c)	Protein containing sulfur	−ve	−ve	−ve	−ve	−ve
d)	Precipitation test	−ve	−ve	−ve	−ve	−ve
5.	Amino acid					
a)	Ninhydrin test	−ve	−ve	−ve	−ve	−ve
b)	Test for tyrosine	−ve	−ve	−ve	−ve	−ve
c)	Test for cysteine	−ve	−ve	−ve	−ve	−ve
6.	Fat and oil					
a)	Solubility test	+ve	+ve	−ve	+ve	+ve
b)	Filter paper test	+ve	+ve	+ve	+ve	−ve
7.	Steroids					
a)	Salkowski test	+ve	+ve	+ve	−ve	−ve
8.	Saponin					
a)	Foam test	+ve	+ve	−ve	−ve	−ve
9.	Cardiac glycoside					
a)	Deoxysugar	+ve	−ve	−ve	−ve	−ve
10.	Volatile oil					
a)	Solubility test	−ve	−ve	+ve	−ve	−ve
b)	Filter paper	−ve	−ve	−ve	−ve	+ve

3.5. Fluorescence analysis

The drug powder was taken and treated with various chemical reagents like sulphuric acid, hydrochloric acid, nitric acid, 5% iodine solution, 10% sodium hydroxide solution, picric acid and ammonium solution, Methanol, Ethanol, Chloroform, Petroleum ether, Distilled water and the color obtained was visualized under ordinary light, short UV light (254 nm) and Long UV light (366 nm) in UV chamber. The results were recorded in Table 5.

Figure 1. *F. retusa* (whole plant).

3.6. Phytochemical screening

The various extracts of stem bark of *F. retusa* were subjected to qualitative chemical examination for the presence or absence of alkaloids, carbohydrates, flavanoids, proteins, saponins and tannins, phenolic compounds and glycosides. The results of preliminary phytochemical screening were recorded in Table 6.

3.7. Thin layer chromatography

TLC studies of the petroleum ether, chloroform, acetone, ethanol and aqueous extracts were carried out in various solvents at 30 ℃ using silica gel G as adsorbent[17]. The solvent systems, developer used and the R_f values are given in Table 7.

Table 8.
Macroscopical characteristics *F. retusa* Bark.

Particulars	Bark
Condition	Dried
Colour	Outer surface — Greenish to dark brown
	Inner surface —Yellowish
Odour	Fruity
Taste	Slightly bitter
Texture	Rough and irregular
Fracture	Brittle with fibrous
Size	Length — 5 to 8 cm
	Thickness — 0.3 to 1.0 cm

Table 7.
Chromatographic studies.

S. No	Solvent system	Developer	R_f values
1.	Petroleum ether	5% concentrated sulphuric acid in methanol	1, 0.95, 0.87, 0.27, 0.07
2.	Chloroform	5% concentrated sulphuric acid in methanol	1, 0.96, 0.94, 0.3, 0.17
3.	Acetone	5% concentrated sulphuric acid in methanol	0.88, 0.84, 0.69, 0.57, 0.46, 0.4, 0.32, 0.21, 0.12, 0.06
4.	Methanol	5% concentrated sulphuric acid in methanol	0.11, 0.09, 0.07

Table 9.
Macroscopical characteristics of *F. retusa* leaves.

Particulars	Leaves
Condition	Dried
Surface	Glabrous
Odour	Fruity in fresh leaves
Taste	Bitter
Texture	Smooth
Fracture	Brittle with fibrous
Size shape	Length – 6 to 10 cm
	Width – 4.0 to 5.0 cm Oblong

4. Conclusion

It has been identified that pharmacological studies that have been carried out on various medicinal plants were conducted using uncharacterized crude extracts. Thus, it is difficult to reproduce the results of these studies and that's why it is very difficult to identify the phytochemical responsible for the activity. Hence, there is a need of phytochemical standardization and bioactivity-guided identification of phytochemicals. We are hoping that the outcome of such pharmacogonostic and phytochemical studies may further help in determining the therapeutic potential of *F. retusa*.

Conflict of interest statement

We declare that we have no conflict of interest. The authors alone are responsible for the content and writing of the paper.

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