ANNALS OF PHARMACY AND PHARMACEUTICAL SCIENCES
Volume 1 Issue 2 (October, 2010) Page : 80-84

● *RESEARCH ARTICLE* ●

Accepted : *July, 2010*

Phytochemical investigation of *Ficus racemosa* Bark - an Ethanomedicinal plant

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ABSTRACT

Ficus racemosa Linn belonging to the family moraceae occurring throughout the world. These are used by local people as folk remedies to cure the nerve weakness moreover many medicinal constituents has been isolated from this species. The medicinal values of this plant are described in ayurvedic literature in *Vanausadhi Chandroday*, it is claimed to have multiple medicinal value as antidiabetic, antipyretic, anti-inflammatory, analgesic, muscle relaxant, and several other therapeutic activities either in parts of plant itself or in combination with other herbs or minerals. Phyto-chemical investigation of the plant was done to explore the ground base of its medicinal usage. Alcoholic and ethereal extract of the plant was analysed for the presence of carbohydrates, glycosides, fixed oils and fats, proteins and fats, phenolic compounds, tannins, phytosterols, alkaloids, flavonoids, saponins, gums and mucilages.

Key words : Fig, Phyto-chemical screening, Goolar*, Ficus racemosa*

INTRODUCTION

In our country, there are several medicinal plants used traditionally for treatment of ailments but only a few of them are tapped for biological and biochemical profiling to rationalize scientifically their medicinal usage (Sachan, 2010). The plant *Ficus racemosa* is a moderate to large sized spreading laticiferous, deciduous tree without much prominent aerial roots, leaves dark green, ovate of elliptic, fruits receptacles 2 – 5 cm in diameter subglobose or pyriform in large clusters on short leafless branches arising from main trunk or large branches. Figs are smooth or rarely covered with minute soft hairs, when ripe they are orange, dull reddish or dark crimson. They have a pleasant smell resembling that of cidar apples. The bark is rusty brown with a thickness from 0.5 – 2 cm according to the age of trunk or bark. The surface is with minute separating flakes of whitish tissues, texture homogeneous leathery (Kumar, 2005). Traditionally, all parts of the plant are cooling, sweet, acrid, vulnerary, anti-dysenteric, useful in 'kapha', biliousness, diseases of vagina. The root is useful in hydrophobia. Bark is cooling, acrid; galactogogue, good for gravid uterus. The unripe fruit is acrid; astringent to bowels, tonic, styptic, allays, thirst, useful in 'kapha', biliousness, leucorrhoea and blood diseases. The ripe fruit is acrid, sweet, cooling, and useful in blood diseases, biliousness, burning sensations, fatigue and menorrhea, nose bleeding and intestinal worms. The leaves, barks and fruits are employed in native medicines. Bark is given as astringent and washes for wounds; it removes poison from wounds made by tiger or cat. Root is useful in dysentery and fluid obtained from root incision is administered as powerful tonic. The milky juice is administered in piles and diarrhea and in combination with other herbs in diabetes and urinary disease. The fresh juice of the ripe fruit is used as an adjunct to a metallic preparation which is given in diabetes and urinary diseases (Paarakh, 2009). In Bombay, the sap is a popular remedy, which is locally applied to mumps and inflammatory glandular enlargements and is used as constituent with sugar and cumin for gonorrhea. Bark is given to cattle suffering from rinderpest. It is ground with onions, cumin and coconut spathes and mixed with vinegar, it is also a very good nutraceutical (Ahmed *et al.,* 2010; Kirtikar and Basu 1984). The ayurvedic literature in '*Vanausadhi Chandroday'* also mention its usefulness in *madhumeha i.e.* diabetes (Sachan *et al.,* 2009). These ethano-medicinal usages sound the rational for different qualitative phytochemical studies to know the presence of different secondary metabolites/phytoconstituents responsible for the therapeutic values of the drug. The efficacy of the drug is directly related to percentages of active constituents present in it and it varies from plant to plant (Agrahari *et*

Nikhil K. Sachan and Yatindra Kumar (2010). Phytochemical investigation of *Ficus racemosa* Bark - an Ethanomedicinal plant, *Ann. Pharm. & Pharm. Sci.,* **2** (10) : 80-84

al., 2010). Therefore, present investigation was planned to identify the different phyto constituents with powder analysis in the powder of *Ficus racemosa*.

MATERIALS AND METHODS

Materials:

Petroleum ether and methanol (Merck, India), double glass distilled purified water, and shade dried bark of *Ficus Racemosa Linn.*

Collection and authentication of plant material:

The plant material was collected from wild sources around tehsil Sikandara Kanpur-Dehat, authenticated by the taxonomist at department of botany Annamalai University, and the voucher specimens were deposited in the departmental herbarium for future reference. The bark was cut into the pieces and shade dried at room temperature; the dried bark were subject to size reduction to a coarse powder by using a dry grinder (Philips, India) and passed through the sieve before being stored in a closed vessel for further use.

Preparation of extract:

The preparation of various extracts was done using different solvents of increasing polarity. About 250g of dried powder was extracted with petroleum ether at 60^0C - 80^0C by continuous hot percolation using the soxhlet apparatus. The extraction was continuous for 72 hours. The petroleum ether extract was filtered and concentrated to dry mass using the vacuum distillation. The dark green waxy residue so obtained was obtained in a quantity about 22.6g. The mark left after petroleum ether extract was taken up for further extraction using methanol. Methanolic extract was filtered, concentrated and treated similarly to dry mass. The extracts were dried in a rotary vacuum evaporator and successively in a hot air oven till solid to semisolid mass. Aqueous extracts were prepared by using distilled water as solvent for the experiment. Extracts were stored in an airtight container in refrigerator below 10^0C (Mandal *et al.,* 1999).

Preliminary phyto-chemical evaluation:

All the dried extracts of *Ficus racemosa* were subjected to the qualitative phytochemical tests for compounds which include carbohydrates, glycosides, flavonoids, alkaloids, saponins, fixed oils, amino acids and proteins, tannins and phenolic compounds, and gums and mucilage in accordance with the standard analytical procedures for phyto-constituents as below, for detection their presence in of various plants extracts (Chandira *et al.,* 2010).

Detection of carbohydrates:

Extracts were dissolved separately and were tested with Molisch reagent, Fehling's reagent, Bendict solution, and Barfoed's test for detection of carbohydrates.

Molisch's test:

To the filtrate, added few drops of alcoholic alpha nepthol and 2ml of concentrated sulfuric acid slowly through the side of test tube; presence of carbohydrate produce a violet colour ring at the junction of two layers.

Fehling's test:

A little fraction of filtrate treated with Fehlin's solution I and II and then heated on a water bath. A brick red precipitate is indicator for reducing sugars.

Bendict's test:

Small quantity of filtrate treated with equal quantities of Bendict's reagent, heated subsequently on a water bath result to formation of a brown precipitate in presence of reducing sugars.

Barfoed's test:

The different extracts were treated with Barfoed's reagent. Monosaccharides, if present, produce a brick red precipitate.

Detection of Glycosides:

Glycosides were confirmed by subjecting the acid hydrolysed extract to Legal's test, Borntrager test and Libermann-Burchard's test.

Legal's test:

Hydrolysate was dissolved in pyridine and sodium nitro-prusside solution, added sodium hydroxide; a colour change result in presence of glycosides.

Borntrager's test:

A few milliliters of hydrolysate treated with chloroform, decanted off chloroform layer, added equal quantity of dilute ammonium solution. A pink colour is produced in ammonical layer in presence of glycosides.

Libermann-Burchard's test:

Hydrolysate treated with chloroform, to this added Libermann-burchard reagent; a colour change result in presence of glycosides.

Detection of Fixed oil and fats:

Saponification test:

Few drops of 0.5N potassium hydroxixe along with

one or two drops of phenolphthalein were added to various extracts, heated on a water bath for 1-2 hours. Saponification or no saponification indicates the presence or absence of oil and fats.

Detection of Protein and Amino acids:

The extracts were Million's test reagent, Biuret test reagent, and Nin-hydrin test reagent, presence of amino acids and proteins is indicated by production of red, violet and blue colour, respectively.

Detection of Phenolic compounds and Tannins:

All the dry extracts were dissolved in minimum amount of water, filtered and subject to Ferric chloride test, Gelatin test. Filtrate on addition of few drops of ferric chloride produce a violet colour precipitate in presence of tannins. A white precipitate is resulted in presence of tannins on addition of 1ml 1% solution of gelatin to the filtrate.

Detection of Phytosterols:

Small quantity of the dry extracts dissolved in about 5ml of the chloroform and subjected to Salkowski's test and Libermann-Burchard's test.

Salkowski's test:

One ml of the chloroform solution, prepared as above was added with few drops of concentrated sulfuric acid; green colour is the indicative of phytosterols.

Libermann-Burchard's test:

The chloroform solution, prepared as above was treated with few drops of concentrated sulfuric acid followed by one ml of acetic anhydride. Presence of phytosterols is confirmed by the production of a bluish green colour.

Detection of Alkaloids:

Small fractions of solvent free extracts were separately stirred with a milliliters of dilute hydrochloric acid and filtered, the filtrate is tested with Mayer's reagent, Wagner's reagent, Hanger's reagent, Dragendroffs reagent to confirm the presence or absence of alkaloids as indicated by production of cream, reddish brown, yellow or brown colour, respectively with these reagents in presence of alkaloidal substances.

Detection of Flavonoids:

Shinoda's test:

Small quantity of the extract was dissolved in alcohol, to that pieces of magnesium followed by concentrated hydrochloric acid was added drop wise and heated. Appearance of magenta color shows the presence of flavonoids.

Detection of Saponins:

Foam test:

The extract was diluted with 20 ml of distilled water and it was agitated in a graduated cylinder for 15 minutes. Formation of 1 cm layer of foam shows the presence of saponins.

Detection of Gums and Mucilage:

Small quantity of the extracts were added separately to 25 ml of absolute alcohol with constant stirring and filtered. The precipitate was dried in air and examined for its swelling properties. No swelling was observed indicates the absence of gums and mucilages. Precipitate tested for the swelling and presence of carbohydrate.

RESULTS AND DISCUSSION

The phytochemical analysis conducted on *F. racemosa* extracts revealed the presence of phenolic compounds and tannins, phytosterols, saponins, glycosides in the alcoholic extract; while the flavonoids, fixed oils and fats, proteins alkaloids, reducing sugars and gums and mucilage were absent. The petroleum ether extract showed the presence of carbohydrates, phyto-sterols, gums and mucilages, tannins, and it was devoid of proteins, amino acids, saponins, flavonoids and fixed oils and fats (Table 1). These phytochemical compounds are known to support bioactive activities in medicinal plants and thus responsible for the various claimed therapeutic activities of this plant; extracts can be separately subjected to the pharmacological screening for further such confirmation of true therapeutic

Table 1 : Phytochemical constituents *F. racemosa*

Sr. No.	Test	Petroleum ether extract	Alcoholic extract
1.	Carbohydrates	+	–
2.	Glycosides	+	+
3.	Fixed oil and fats	–	–
4.	Proteins and amino acids	+	–
5.	Phenolic compounds and tannins	+	+
6.	Phyto-sterols	+	+
7.	Alkaloids	–	–
8.	Flavonoids	–	–
9.	Saponins	–	+
10.	Gums and mucilage	+	–

(+) presence of constituents, (–) absence of constituents

activity of such phytoconstituents revealed in this study (Shahabadkar *et al.,* 2010).

Tannins are known to be useful in the treatment of inflamed or ulcerated tissues and they have remarkable activity in cancer prevention and anticancer. Thus, *F. racemosa* containing this compound may serve as a potential source of bioactive compounds in the treatment of cancer as well as in various inflammation mediated disorders (Dharmananda, 2003; Motar *et al.,* 1985; Li *et al.,* 2003). The presence of these phenolic compounds in this plant contributed to their antioxidative properties and thus the usefulness of these plants in herbal medicament (Trease and Evans, 1989; Van Acker *et al.,* 1996; Veerapur *et al.,* 2009). Phenols have been found to be useful in the preparation of some antimicrobial compounds such as dettol and cresol (Scalbert, 1991). This plant is used routinely among many tribes in Africa for the treatment of various diseases. Alkaloid was not detected in this study plant. Alkaloids have been associated with medicinal uses for centuries and one of their common biological properties is their cytotoxicity, and their absence in this plant tend to lower the risk of poisoning by the plant (Shrivastava and Leelavathi, 2010; Aiyegoro and Okoh, 2010).

It is well established that intestinal cholesterol absorption efficiency can be modified by the intake of phytosterol-enriched food and, therefore, have a serum cholesterol-lowering effect. Recent epidemiological and clinical studies have shown that presence of phytosterols at normal diet levels could also be effective on lowering total and LDL serum cholesterol since they affect whole-body cholesterol metabolism even at those moderate doses (Sanclemente *et al.,* 2009*)*. Also, the plant extract was revealed to contain saponins, known to produce inhibitory effect on inflammation and are major ingredients in traditional Chinese medicine and thus responsible for most of the observed biological effects (Just *et al.,* 1998, Liu and Henkel, 2002), and this tend to justify the use of *F. racemosa* in traditional medicine. Glycosides are an important class of bioactive compounds responsible for the specific medicinal values lies in various medicinal plants like digitalis, liquorices, and such other plants. The glycoside molecules contain a sugar is bound to a non-carbohydrate moiety, these play numerous important roles in living organisms; many plants store chemicals in the form of inactive glycosides these can be activated by enzyme hydrolysis. Presence of glycosides in the *F. racemosa* is responsible for its many healing properties (Joy *et al*., 2001). Mucilages are Long chain polysaccharides that become mucus like when mixed with water. Mucilages are present in almost every part of every plant but are often found in significant quantities in specific plants where the concentration of mucilage is high enough to have therapeutic value. Mucilages and gums (Polysaccharides) are hydrophilic, being able to attract and bind with a volume of water that far exceeds the mass of the gum or mucilage. Apart from their propensity to attract water, mucilages and gums are virtually inert and also almost fully indigestible. Generally the small amount of digestion that happens extracts very little sugar and no noteworthy pharmacological effect. Because of this neutrality and indigestibility their value if ingested is that they are demulcent - which means that they coat and protect the lining of the gastric tract, if applied externally they are emollient - which means that they coat and protect the skin (Jones and Smith, 1949; Lawrence, 2003).

Conclusion:

Keeping view of ethanopharmacological importance of *F. racemosa*, this study of phytochemical study was undertaken. Behavior of leaf powder with different chemical reagents was studied to detect the presence of phytoconstituents. Further quantitative phytochemical investigations and specific identification tests may help to establish the scientific ground for folklore claim of its medicinal values. The parameters which are reported here can be considered as distinctive enough to identify and decide the authenticity of this drug in herbal industry/trade and this can be included as phytochemical constituents in Herbal Pharmacopeia.

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