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Phytochemical Screening of *Ficus benjamina* (Linn.) Fruit Extracts

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Abstract

Ficus benjamina (Linn.) commonly called as weeping fig, is distributed throughout forests of eastern Himalayas of India, Fego, Travancore and Archipelago and China. It is useful in inflammation, syphilis, dysentery, erysipelas and as general tonic. Traditionally, fruit extract of *Ficus benjamina* has been used in skin disorders, inflammation, piles, leprosy, malaria, cancer, ulcer and as insect repellant. Detection, quantitative and qualitative determination of different classes of phyto-constituents present in any plant is considered important parameters which give an indication of the therapeutically active constituent(s) present in the plant. An extensive literature survey on *Ficus benjamina* showed that sporadic phytochemical reports are available. Therefore, it was considered worthwhile to perform phytochemical screening of various fruit extracts of *Ficus benjamina* which was not evaluated till date. Therefore, the present investigation was planned to investigate phytochemical screening of *Ficus benjamina* fruit extracts. Various extracts were prepared using successive Soxhlet extraction method. Solvents viz. petroleum ether, chloroform, ethyl acetate, ethanol and water in increasing polarity order were used to prepare extracts. Results of the present study showed that ethanol and ethyl acetate extract showed bioactive phytoconstituents like flavonoids, phenolic compounds and coumarins which could be responsible for various biological activities of *Ficus benjamina*.

Keywords: *Ficus benjamina*; Phytochemical Screening; Ethanol Extract; Ethyl Acetate Extract

Introduction

Ficus benjamina (Linn.) commonly called as weeping fig, is distributed throughout forests of eastern Himalayas of India, Fego, Travancore and Archipelago and China [1]. Traditionally, *Ficus benjamina* has been used for the treatment of various ailments. *Ficus benjamina* is useful in inflammation, wound healing, headache, syphilis, dysentery, fever and as tonic [2,3]. Indigenous communities use fruit extract of this plant for inflammation, skin disorders, cancer, leprosy, malaria, ulcer etc. [4,5].

Plants are reported to possess different bioactive phytoconstituents which work together with fibers and nutrients and act as a defense system against various ailments and in stress conditions phytoconstituents may be of primary and secondary metabolites of plant. Carbohydrates, proteins, amino acid and chlorophyll are primary metabolites while secondary metabolites comprise alkaloids, glycosides, terpenoids, tannins, etc. [6]. The fruits of *Ficus benjamina* have potential for pharmacological and phytochemical evaluation. Sporadic phytochemical reports are available on this plant. Therefore, it was considered worthwhile to perform phytochemical screening of various extracts of *Ficus benjamina* fruits.

Material and Methods

Collection and Authentication

Fruits and other parts of *Ficus benjamina* were collected from Forest Research Institute, Dehradun (Uttarakhand) India. Fruits were identified and authenticated at Botanical Survey of India (BSI), Dehradun, Uttarakhand, India vide reference number- 118762. The voucher specimen is available at BSI laboratory for the future reference.

Preparation of Extracts

Successive Soxhlet extraction method using petroleum ether (60-80°C), chloroform, ethyl acetate, ethanol and aqueous was employed for the preparation of fruit extracts. Prior to each extraction, plant material was dried at about 40°C in the oven. Final marc obtained was digested at 50°C with distilled water in order to obtain aqueous fruits extract. All prepared extracts of the fruits of the plant were concentrated in rotary vacuum evaporator. All prepared extracts were stored at 4°C. Finally, the yield of each extract was calculated on the basis of air dried weight.

Phytochemical Screening

Different extracts viz., petroleum ether (60-80°C), chloroform, ethyl acetate, ethanol and aqueous prepared after successive extraction method were phytochemically screened following standard methods. All extracts were screened for different types of phytochemical groups such as carbohydrates, alkaloids, flavonoids, phenols, tannins, proteins, coumarins, lipids, fats, oils etc [7-9].

Alkaloids Test: For alkaloids test, extracts were treated with dilute hydrochloric acid and mixed with following reagents-

- **Mayer's reagent test:** The filtrate after treating the extract with dilute hydrochloric acid was mixed with Mayer's reagent. Cream colored precipitate formation shows that alkaloids are present in the test sample.
- **Dragendorff's reagent test:** Dragendorff's reagent was added to filtrate of sample. Reddish brown colored precipitate formation indicates that alkaloids are present in the test sample.
- **Wagner's reagent test:** Few drops of Wagner's reagent was added to the filtrate. Formation of reddish-brown precipitate formation indicates that alkaloids are present in the test sample.
- **Hager's reagent test:** Hager's reagent was added to filtrate. Formation of yellow colored precipitate shows that alkaloids are present in the test sample.

Flavanoid Test

- **Shinoda test:** In the test solution of drug few fragments of magnesium ribbon were added after that drop wise 2 ml concentrated HCl was added. Appearance of pink scarlet crimson red shows that flavonoids are present in the sample.
- **Zinc hydrochloride test:** Test sample was treated with zinc dust and 2 ml conc. Hydrochloric acid. Red colored formation shows that flavonoids are present.
- **Tollen's reagent test:** Test sample was treated with 2 ml of Tollen's reagent. Appearance of silver mirror shows flavonoids presence in the sample.
- **Ferric chloride test:** 2-3 drops of $FeCl_3$ solution was added to the test solution, appearance of dark green color shows that flavonoids are present in the test drug.

Tannins and phenolics Test

- **Lead acetate test:** 10% lead acetate solution was added to the test sample. Formation of white precipitate shows that phenolic compounds are present in the sample.
- **Ferric chloride test:** 5% $FeCl_3$ solution was added to the test solution. Formation of intense green color shows that phenolics are present in the test drug.
- **Gelatin test:** 10% Gelatin solution was added to the test solution, formation of white precipitates shows that phenolic compounds are present in the test sample.

Glycosides Test

Test for cardiac glycoside

- **Keller-killani test:** Test solution was treated with 2 ml CH_3COOH containing in $FeCl_3$ in H_2SO_4, change of reddish brown color to blue color shows that cardiac glycoside are present in the test sample.
- **Legal's test:** In this test pyridine (2 ml) and alkaline sodium nitroprusside solution (2 ml) was added to the solution of test drug. Formation of blood red color indicates those cardiac glycosides are present in the test drug.
- **Baljet's test:** Test solution was treated with 2 ml picric acid solution. Orange colored formation shows those cardiac glycosides are present in the test sample.

Anthraquinone glycosides Test

- **Borntrager's test:** Test drug was boiled with H_2SO_4 solution (1 ml) for 5 min in a test tube. Filter and filtrate was mixed with organic solvent like ether or chloroform. Organic layer was separated and shaken with dil. NH3 solution. Formation of pink to red color indicates that anthraquinone glycosides are present in the test drug.
- **Modified Borntrager's test:** Test solution was boiled with H_2SO_4 solution (1 ml) for 5 min in a test tube and treated with the solution of 5% $FeCl_3$ followed by shaking with same volume of organic solvent like ether or chloroform. Organic layer was separated and shaken with dil. NH_3 solution. Formation of pink to red color indicates that anthraquinone glycosides are present in

the test drug.

Saponin/steroidal glycosides Test

- **Foam test:** About 2 ml test sample was shaken persistent foam formation shows that saponins are present in the test drug sample.
- **Libermann's-Burchard test:** Test sample was treated with 2 ml acetic anhydride and 2 ml conc. H2SO4, bluish-green color formation shows the presence of steroids in the sample.
- **Salkowski's test:** Test sample was treated with 2 ml chloroform and 2 ml conc. H_2SO_4 after shaking well, greenish color formation in acidic layer while red color formation in chloroform layer shows that steroidal compounds are present in the test sample.

Test for amino acids/proteins

- **Ninhydrin test:** Test sample was boiled with 5% ninhydrin solution. Formation of violet color shows that amino acids are present in the test sample drug.
- **Million's test:** Million's reagent was added to the test solution. White precipitate formation which turns to red after gentle heating shows that proteins are present in the test drug sample.
- **Biuret test:** Test drug sample was treated with 4% NaOH and 1% $CuSO_4$ solution. Development of violet color shows the presence of proteins in the sample.

Carbohydrate Test

- **Molish's test (General test):** 1 ml of test drug sample was treated with α-napthol (alcoholic) then from the side of test tube, few drops of conc. H_2SO_4 was added slowly. Momentary purple to violet colored ring formation at the junction shows that carbohydrates are present in the sample.
- **Fehling's test:** The test solution was boiled with few drops of equally mixed Fehling's A and Fehling's B. Brick red colored precipitate formation indicates that reducing sugars are present in the drug sample.
- **Barfoed's reagent test:** 2 ml Barfoed's reagent was added to the test sample. Red cupric oxide formation indicates that carbohydrates are present in the test drug sample.
- **Bendict's reagent test:** 2 ml Bendict's reagent was mixed with test sample and heated for 5 min appearance of yellow, green or red color indicates presence of various types of carbohydrates in sample.

Test for oil and fats

Sample extract was pressed between two filter papers. If oil is present, it will stain filter paper which indicates presence of oil and fat in the test sample.

Results

Sr. no.	Fruit extract	% Yield (w/w)
1	Aqueous	3.86
2	Ethanol	2.94
3	Ethyl acetate	2.61
4	Chloroform	2.12
5	Petroleum ether	1.84

Table 1: Yield of various *Ficus benjamina* fruit extracts

Phytochemical Screening

Various phytochemical groups like carbohydrates, alkaloids, coumarins, cardiac glycosides, phenols, flavonoids, tannins, steroids, amino acids, proteins, fats and oils were screened following standard methods. The findings of phytochemical screening of various extracts are presented in Table 2.

Sr. no.	Phytochemical-group	Petroleum ether	Chloroform	Ethyl acetate	Ethanol	Water
1.	Alkaloids	-	-	-	-	-
2.	Carbohydrates	-	-	-	+	+
3.	Flavonoids	-	-	++	++	-
4.	Coumarins	-	-	+	+	-
5.	Cardiac glycosides	-	-	-	-	-
6.	Saponins	-	-	-	-	-
7.	Phenols/ Tannins	-	-	++	++	+
8.	Steroids	+	-	-	-	-
9.	Amino acids	-	-	-	-	-
10.	Proteins	-	-	-	-	-
11.	Fats/ Oils	+	-	-	-	-

+: present, - : absent

Table 2: Phytochemical screening of various fruit extracts of *Ficus benjamina*.

Discussion

Identification, quantitative and qualitative determination of the different phytoconstituents classes present in any plant material is considered important parameters which give indication of the therapeutically active constituent(s) present in that plant material. In the present investigation phytochemical screening of the various extracts prepared successively using different solvent was carried out to detect various plant metabolites like carbohydrates, alkaloids, flavonoids, phenols, saponins, tannins, terpenoids, steroids etc. following standard phytochemical screening procedures. All these secondary metabolites are well reported to possess various biological properties like antioxidant, anti-inflammatory, antidiabetic, antihypertensive, antispasmodic, antimicrobial, antifungal, neuroprotective, memory enhancer, anxiolytic, anticonvulsant, antiallergenic, antidiarrheal etc [10].

In the present study various extracts like petroleum ether, ethyl acetate, ethyl alcohol, chloroform and aqueous were prepared. The yields of all the extracts are shown in Table 1. All extracts were phytochemically screened following standard procedures. Steroids, fat and oil found present in petroleum ether extract. In ethyl acetate extract coumarins, flavonoids and phenols were detected. Ethanol extract showed flavonoids, phenolics and coumarins where as in aqueous extract carbohydrates and tannins were present.

Conclusion

Findings of the current investigation showed that ethanol and extract showed bioactive phytoconstituents like flavonoids, phenolic compounds and coumarins which could be responsible for therapeutic potential of *Ficus* benjamina fruits. Presently, authors are planning to isolate these phytoconstituents and evaluate for various biological activities.

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