Studies on Phytochemical Evaluation of Ficus Benghalensis

Dr. A. SwaroopaRani[1], Dr.A.Kiran Kumar[2]
[1]Dept of Bio-Technology
[2]Dept of Chemistry
[1] JNTUA-OTPRI, Anantapuramu, Andhra Pradesh-515001, India.
[2]University College of Technology, Osmania University-500007, Telangana, India.

Abstract- *Medicinal plants are now more focused than ever because they have the capability of producing many benefits to society indeed to mankind, especially in the line of medicine and pharmacology. Medicinal plants are in use for thousands of years and are renowned for their effectiveness in various treatments. The medicinally usable plants were identified and extracted for biochemical profile and characterized for finding functional groups. Ficus benghalensis is a large evergreen tree, belongs to the family Moraceae. It is commonly known as "Indian Banyan Tree ". Phytochemical screening of Ficus benghalensis bark were performed to qualitative and quantitative screening using standard procedures. Phytochemicals constituents were abundant.*

Keywords- Ficus benghalensis, solvent extracts, phytochemicals, TLC

I. INTRODUCTION

The world is fertile with natural and medicinal plants. The medicinal power of these plants lies in phytochemical constituents that cause definite pharmacological action on human body. Ficus benghalensis (Moraceae) is one of them and it is a large evergreen tree 23–34 m tall[1]and widely cultivated plant. Various studies show that different parts of this plant can be effective as traditional medicine because of the presence of different chemical constituents such as triterpenoids, flavonoids, tannin, different glucosides, steroids, resin, albumin, and malic acid[2]. This plant has antipyretic activities, analgesic effects,[3] antitumor activities,[4] and anti-inflammatory activities[5]. Some of the most significant bioactive phytochemicals are alkaloids, flavonoids, tannins, saponins, glycosides, phenolic compounds and many more. These natural compounds form the foundation of modern prescription drugs as we know today. Phytochemical is a natural compound occur in plants such as medicinal plants, vegetables and fruits, that work with nutrients and fibers to act against diseases or more specifically to protect against diseases. Phytochemicals are mainly divided into two groups, which are primary and secondary constituents according to their activity in plant metabolism. Primary constituents contain common sugars, amino acids, proteins and chlorophyll while secondary constituents comprise of alkaloids, flavonoids, saponins, tannins, phenolic compounds.

II. METHODOLOGY

2.1 Collection of Plant Material

Theselected plant extract was collected from a healthy and mature plant at the early hours. Then the barks were thoroughly washed with water to remove the latex and other dirt's. The lichens present on the surface of the barks were removed by scrapping.After cleaning the barks they were cut into pieces with the help of scissors and knives. They were left for shade drying on the floor above the newspapers for ten days. After that the bark pieces were powdered by mixer for further experiment.

2.2 Solvent Extraction

The Plant material was extracted in four different solvents such as; Methanol[6], Ethanol, Acetone and Ethyl acetate. One gm of plant extract is dissolved in 10ml of solvent as mentioned above and kept in rotary shaker at 200 rpm for 36 hours at 31-35°c. The solvent extract was subjected to centrifugation at 3500 rpm for 10 min, where in the supernatant was collected and and the solvent was evaporated and this extract was used for further evaluation of*Ficus benghalensis.*

2.3 Phytochemical Screening

Photochemical examinations were carried out for the extracts as per the standard methods. Chemical tests for the screening and identification of bioactive chemical constituents in the medicinal plants under study were carried out in extracts using the standard procedures as described[7-9]. Freshly prepared extracts were subjected to standard photochemical analyses to find the presence of the following phyto-constituents proteins, phenols, flavanoids, alkaloids, quinones, glycosides, tannins,

saponins coumerins,resins anthrocyanides terpenoids and steroids.

Reagents used for phytochemical screening:

Mayer's Reagent, Wagner's Reagent, Molish's Reagent, Benedict's Reagent, Fehling's Reagent, Dilute sulfuric acid solution, Ferric chloride solution, Sodium hydroxide solution.

Qualitative phytochemical screening of plant extracts:

The crude extract of plant was subjected to chemical tests for the identification of various active constituents such as alkaloids, flavonoids, phenolic compounds, terpenoids, Steroids, amino acids and proteins[10-14]. Along with carbohydrates, proteins, Reducing Sugars, Anthocyanidins, Anthraquinones, Saponins, Tannins, quinines, Coumerins, Gums and Resins.

2.4 Thinlayer Chromatography

TLC was performed for four different solvents of plant extract on silica gel sheets. The plant extract were dissolved in respective solvents and made up to 10mg/ml concentration. Different solvent systems are prepared and determined such as:

Solvent system 1: Benzene: Chloroform-7:3
Solvent system 2: Benzene: Chloroform: Ethyl acetate-4:2:1
Solvent system 3: Formic acid: Toluene-5:5
Solvent system 4: Formic acid: Toluene: Methanol-2.5:2.5:1
Solvent system 5: Toluene: Benzene-5:5

The samples are spotted on TLC plate and plate was kept in solvent system until it reaches 3/4th of the plate. Allowed to dry and spots are detected under UV light and Iodine vapours and Retention factor values are calculated.

The Rf value can be calculated as:

$$Rf = \frac{distancetraveledbythesolute}{distancetraveledbythesolventfrontTLCplate}$$

In addition to that, TLC has also been carried out by using other mobile phases like Chloroform: Ethyl acetate, Toluene: Ethyl acetate etc; having different ratios whereas the results are not encouraging and hence discarded.

III. RESULTS AND DISCUSSION

Phytochemical analysis

In the present investigation, preliminary phytochemical screening has been done in the various extracts of *Ficus benghalensis* bark using various tests as described in the methodology showed the presence of phytochemical constituents namely proteins, alkaloids, flavonoids, steroids, glycosides, phenolic compounds, tannins, resins, terpenoids are present in all four solvent plant extract[15]. Reducing sugars, phlobatannins, gums, anthraquinones, saponins are absent in all four solvent plant extracts. Anthrocyanides are present in three solvent extract except acetone extract, quinones are absent in methanol extract were coumerins are present in acetone and ethyl acetate extracts (Table 1).

Table 1: The analysis of phytochemicals in the different organic extracts of *Ficus benghalensis* stems bark. ('+' → Presence; '–' → Absence).

S.No	Phytoconstituents	Acetone	Ethyl Acetate	Methanol	Ethanol
1.	Proteins	+	+	+	+
2.	Alkaloids	+	+	+	+
3.	Flavanoids	+	+	+	+
4.	Steroids	+	+	+	+
5.	Glycosides	+	+	+	+
6.	Phenolic compounds	+	+	+	+
7.	Tannins	+	+	+	+
8.	Quinones	+	+	-	+
9.	Coumerins	+	+	-	-
10.	Reducing Sugars	-	-	-	-
11.	Resins	+	+	+	+
12.	Phlobatannins	-	-	-	-
13.	Gums	-	-	-	-
14.	Anthraquinones	-	-	-	-
15.	Saponins	-	-	-	-
16.	Anthrocyanides	-	+	+	+
17.	Terpenoids	+	+	+	+

In present study out of four extracts ethyl acetate extract showed maximum number of plant constitutents. Different phytochemicals have been found to possess a wide range of activities, which may help in protection against several pathogens and therefore could suggest the use traditionally for the treatment of various illnesses. The presence of contained alkaloids, flavonoids, steroids, tannins and triterpenoid and also have various medicinal values such as anti□inflammatory, anti□diabetic and analgesic activities and for central nervous system activity.

Anthocyanins helps the human immune system to work more efficiently to protect against viral infections.Various studies have been demonstrated that coumarin is a potential antioxidant and its antioxidant activity is due to its ability to scavenge free radicals and to chelate metal ions.The growth of many fungi, yeasts, bacteria and viruses was inhibited by tannins. Terpenoids and tannins are attributed for analgesic and anti-inflammatory activities. Apart

from this tannins contribute property of astringency i.e. faster the healing of wounds and inflamed mucous membrane. It is noted that steroidal compounds are of importance and of interest in pharmacy due to their relationship with sex hormones. In present study the presence of bioactive compounds indicate the medicinal value of the plants.

TLC analysis also suggests the presence of different kinds of phytochemicals in *F.benghalensis* extract. Table 2 reports the Rf values for various extracts and Fig .1 shows photographs of the studied TLC slides. TLC of plant extract reports spots for various phytochemicals. The reported spots are separated with enough space and having various Rf values showing the presence phytochemicals in extract.

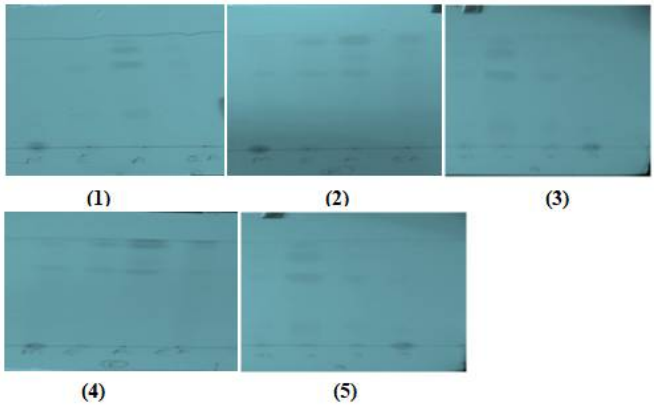

Figure 1: Photographs of TLCs of *F.benghalensis*,of different solvent systems (SS) with different rations **(1)** SS-1(B: C-7:3); **(2)** SS-2(B: C: EA-4:2:1); **(3)** SS-3(FA: T-5:5); **(4)** SS-4(FA: T: M-2.5:2.5:1); **(5)** SS-5(T: B-5:5)

Table 2: Retention factor (Rf) values of TLC plates of plant extract

Name of the extracts / Solvent Systems	Methanol		Ethanol		Acetone		Ethyl acetate	
	No. of spots	Rf value	No. of spots	Rf value	No. of spots	Rf value	No. of spots	Rf value
B: C (7:3)	2	0.209 0.65	2	0.279 0.697	4	0.27 0.69 0.83 0.906	3	0.604 0.720 0.860
B: C: EA (4:2:1)	2	0.65 0.93	3	0.639 0.75 0.81	4	0.627 0.767 0.90 0.95	2	0.60 0.93
FA: T (5:5)	1	0.756	1	0.768	3	0.756 0.90 0.95	2	0.78 0.90
FA: T:M (2.5:2.5:1)	2	0.708 0.958	2	0.708 0.937	3	0.687 0.79 0.937	2	0.687 0.937
T: B (5:5)	2	00.16 0.625	4	0.2 0.65 0.825 0.925	5	0.2 0.425 0.675 0.85 0.925	2	0.65 0.825

A large number of solvent systems were tried to achieve a good resolution. Finally, five solvents systems were used. Thin layer chromatographic studies of the methanol extract of *F.benghalensis*. In Solvent system-1 Benzene: Chloroform (7:3), 2 spots were visible with Rf values 0.209 and 0.65; In Solvent system-2 Benzene: Chloroform: Ethyl acetate (4:2:1), 2 spots were visible with Rf values 0.65 and 0.93; in Solvent system-3 Formic acid: Toluene (5:5), 1 spots were visible with Rf values 0.756; In Solvent system-4 Formic acid: Toluene: Methanol (2.5:2.5:1), 2 spots were visible with Rf values 0.708 and 0.958; In Solvent system-5 Toluene: Benzene (5:5), 2 spots were visible with Rf values 0.16 and 0.625.

Ethanol extract of *F.benghalensis*. In Solvent system-1 Benzene: Chloroform (7:3), 2 spots were visible with Rf values 0.279 and 0.697; In Solvent system-2 Benzene: Chloroform: Ethyl acetate (4:2:1), 3 spots were visible with Rf values 0.639, 0.75 and 0.81; In Solvent system-3 Formic acid: Toluene (5:5), 1 spots were visible with Rf values 0.768; In Solvent system-4 Formic acid: Toluene: Methanol (2.5:2.5:1), 2 spots were visible with Rf values 0.708 and 0.937; In Solvent system-5 Toluene: Benzene (5:5), 4 spots were visible with Rf values 0.2, 0.65, 0.825 and 0.925.

Acetone extract of *F. benghalensis a*. In Solvent system-1 Benzene: Chloroform (7:3), 4 spots were visible with Rf values 0.27, 0.69, 0.83 an 0.906; In Solvent system-2 Benzene: Chloroform: Ethyl acetate (4:2:1), 4 spots were visible with Rf values 0.627, 0.767, 0.90 and 0.95; In Solvent system-3 Formic acid: Toluene (5:5), 3 spots were visible with Rf values 0.756, 0.90 and 0.95; In Solvent system-4 Formic acid: Toluene: Methanol (2.5:2.5:1), 3 spots were visible with Rf values 0.687, 0.79 and 0.937; In Solvent system-5 Toluene: Benzene (5:5), 5 spots were visible with Rf values 0.2, 0.425, 0.675, 0.85 an 0.925.

Ethyl acetate extract of *F.benghalensis*. In Solvent system-1 Benzene: Chloroform (7:3), 3 spots were visible with Rf values 0.604, 0.720 and 0.860; In Solvent system-2 Benzene: Chloroform: Ethyl acetate (4:2:1), 2 spots were visible with Rf values 0.60 and 0.93; In Solvent system-3 Formic acid: Toluene (5:5), 2 spots were visible with Rf values 0.78 and 0.90; In Solvent system-4 Formic acid: Toluene: Methanol (2.5:2.5:1), 2 spots were visible with Rf values 0.687 and 0.937; In Solvent system-5 Toluene: Benzene (5:5), 2 spots were visible with Rf values 0.65 and 0.825

TLC profiling of all four extracts gives an impressive results for five different solvent systems that directing towards the presence of number of phytochemicals. Various phytochemicals gives different Rf values in different solvent system. This variation in Rf values of the phytochemicals provides a very important clue in understanding of their

polarity and also helps in selection of appropriate solvent system for separation of pure compounds. Mixture of solvents with variable polarity in different ratio can be used for separation of pure compound from plant extract. The selection of appropriate solvent system for a particular plant extracts can only be achieved by analyzing the Rf values of compounds in different solvent system. Different Rf values of the compound also reflect an idea about their polarity. This information will help in selection of appropriate solvent system for further separation of compound from these plant extracts.

IV. CONCLUSION

The present study includes preliminary qualitative phytochemical constituents and quantitative phenolic and flavonoid content of extracts. Phytochemicals can be used for the formulation of compound drugs. These plants have a great medicinal value as it has been reported to have versatile phytochemical constituents including flavonoid, phenols, tannins, proteins, alkaloids, steroids, glycosides, quinones, coumerins, resins, terpenoids etc. The TLC profiling of plant extracts of five solvent systems confirms the presence diverse potent bio molecules in this plant. TLC analysis provide an idea about the polarity of various chemical constituents, in a way such that compound showing high Rf value in less polar solvent system have low polarity and with less Rf value have high polarity.

V. ACKNOWLEDGMENT

The author thanks the University Grants Commission (UGC) for the financial support.

REFERENCES

[1] NY Elias “Antimicrobial Activity of Ficus benghalensis in Cosmetic Application”. Thesis of industrial utilization of medicinal and aromatic plants of the University of Sri Jayewardenepura pp. 10□91. 2010.

[2] M. Govindaraja “Larvicidal efficacy of Ficus benghalensis L. plant leaf extracts against Culex quinquefasciatus say, Aedes aegypti L. and Anopheles stephensi L. (Diptera: Culicidae)” Eur Rev Med Pharmacol Sci.vol.14, pp. 107□11, 2010.

[3] V.Vikas, BS Patil, SB Narkhede, NM Jawle, VR Patil. “Analgesic and antipyretic activities of Ficus benghalensis bark”. Int J Pharm Res vol.2, pp. 526 2010

[4] R Shukla , S Gupta , JK Gambhir , KM Prabhu , PS Murthy . “Antioxidant effect of aqueous extract of the bark of Ficus benghalensis in hypercholesterolaemic rabbits”. J Ethnopharmacol vol. 92, pp. 47□51, 2004

[5] VV Patil , RB Pimprikar , VR Patil . “Pharmacognostical studies and evaluation of anti□inflammatory activity of Ficus bengalensis Linn.” JYP. ;vol.1, pp.49□53, 2009

[6] M Aswar, U Aswar, B Watkar, M Vyas, A Wagh, KN Gujar. “Anthelmintic activity of Ficus benghalensis.” Int J Green Pharm, vol.2:pp.170-172, 2008

[7] A Sofowora “Medicinal Plants and Traditional Medicine in Africa” Spectrum Books Ltd., Ibadan, Nigeria , pp. 191-289, 1993.

[8] GE Trease, WC , Evans “Pharmacognosy” W.B Scandars Company Ltd. London 14: PP. 269- 300, 1989.

[9] J.B. Harborne “Phytochemical Methods” Chapman and Hall Ltd., London pp 49-198, 1973.

[10] K Das, RKS Tiwari, DK Shrivastava. “Techniques for evaluation of medicinal plant products as antimicrobial agent: Current methods and future trends.” J Med Plants Res vol.4, pp.104-11, 2010

[11] P Tiwari , BK Mandeep , G Kaur , H Kaur “Phytochemical screening and extraction” A review Int Pharm Sci. Vol.1, pp.98-106, 2011

[12] JB Harborne . “Phytochemical Methods” A Guide to Modern Technique of Plant Analysis.. New York: Chapman and Hall Co, ed. 3, pp. 1-302, 1998

[13] K Sahira Banu, L Cathrine “General techniques involved in phytochemical analysis”. Int J Adv Res Chem Sci vol 2 pp.25-32, 2015.

[14] N Jaradat, F Hussen, A Al Ali. “Preliminaryphytochemical screening, quantitative estimation of total flavonoids, total phenols and antioxidant activity of Ephedra alatadecne”. J Mater Environ Sci vol.6, pp.1771-78, 2015.

[15] SJ Anarthe, A Pravalika, E Malavika, MG Raju. “Assessment of immunomodulatory activity of Ficus benghalensis Linn. aerial roots” Int J Pharmtech Res;vol 9,pp.153-63, 2016