

Chemico-physical analysis and antimicrobial activity of some traditional plant extracts

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ABSTRACT

The present study has been made to investigate the chemical, physical and antimicrobial activity of some selected leaves of ten different traditional plants such as *Ficus bengalensis* (Indian Banyan), *Ficus sycomorus* (umber), *Ficus religiosa* (Peepal), *Terminalia catappa* (Indian almond), *Eugenia jambolana* (Jamun), *Psidium guajava* (Guava), *Mangifera indica* (Mango), *Manikara achras* (Chiku), *Annona squamosa* (Custard apple), and *Tridax procumbens* (Coat button) According to Ayurveda and Unani system the pharmacological actions and medicinal uses of aqueous extracts of these traditional plants leaves in folk medicine of India includes the treatment of various type of gastrointestinal disturbances such as vomiting, diarrhea, abdominal distention and disturbances of the central nervous system such as asthma attacks, cough, cold, and sincere effect for curing the immunity related problems. The chemical parameters carried out were identification of nitrogen, sulphur, chloride, carbohydrates, and titrable acidity. The physical parameters determined were total ash, acid soluble ash, and acid insoluble ash and water extractives. The antimicrobial activity was carried out using water extract and it was performed by nutrient agar method.

Key words: Traditional plants, water extractives; antimicrobial activity, leaf extracts.

INTRODUCTION

The recent trend shows increasing interest in traditional medicines and there has been an increasing demand for more drugs from plant sources. Biologically active compound from natural source has always been of great interest to scientist working on infectious disease. Efficiency of herbal medicines has been proved in Ayurveda. The medicinal value of plants lies in some chemical substances that produce a definite physiological action on human body. Plants used in traditional medicine contain a wide range of ingredients that can be used to treat chronic as well as infectious disease. The most important of these are flavonoids, tannins and phenolic compound. It is a well known fact that plant produces various chemicals for self

defence. These includes alkaloids, long chain aldehydes etc. Hence we decide to extract plant leaves of some medicinal drugs and valueate their antimicrobial activity.

MATERIAL AND METHODS

The chemicals used for analysis were of A. R. Grade and were obtained from S. D. fine, Fischer Loba Chem. All the experimental vessels and storage containers were of Pyrex glass. The titration set was calibrated as described in the literature. ¹Qualitative test for nitrogen, sulphur, chloride and carbohydrate were carried out ash analysis, % carbohydrate and titrable acidity was also determined using standard procedures.

Plant Materials/Collection of plant leaves sample

The ten different traditional plants were selected such as *Ficus bengalensis* (Indian Banyan), *Ficus sycomorus* (umber), *Ficus Religiosa* (Peepal), *Terminalia catappa* (Indian almond), *Eugenia Jambolana* (Jamun), *Psidium guajava* (Guava), *Mangifera Indica* (Mango), *Manikara achras* (Chiku), *Annona sqamosa* (Custard apple), and *Tridax procumbens* (Coat button) were collected from different farms of Fruits Research Centre Himayat Bagh Aurangabad, Maharashtra, (India). Its identification and botanical name was authenticated. The leaves were first washed several times with distilled water and were air-dried in shade then made homogenized to fine powder and stored in airtight bottles.

Preparation of extracts

For aqueous extraction, 25gm of air-dried powder was added to distilled water and boiled on slow heat for 30 min and filtered. The procedure was repeated twice. This filtrate was evaporated by heating it in a boiling water bath till semi-liquid extract formed. Then it is dried in an oven at 100°C till crude dried aqueous³ extractives were obtained and it is used for further chemical and antimicrobial analysis.

Chemical and microbial analysis

The physiochemical parameters of plant extract were determined which include % of total ash, acid soluble ash, acid insoluble ash, water extractive and Qualitative test for nitrogen, sulphur, chloride and carbohydrate. Antimicrobial activity was examined for aqueous extracts from ten traditional plants. The micro-organisms cultured was *E. coli*, *Bacillus megaterium.*, *S. aureus.*, *Salmonella typhi*. The antimicrobial assay was performed by Sterile Nutrient agar in autoclave at 15 lbs pressure at

121°C for 20 minutes. After 24 hrs. of incubation the spread plate were observed for the antimicrobial activity. Zone of inhibition indicate that the plant extract possess antimicrobial activity against a particular microorganism.

RESULTS AND DISCUSSION

Plants selected

The detail description of selected plants is as follow

Ficus benghalensis L. (S-1)

Ficus bengalensis is commonly known as banyan tree belongs to the kingdom Plantae; class Magnoliopsida, family Moraceae, genus Ficus. It is a very large and fast growing tree. It is found throughout India in monsoon and rain forest. It is reported⁴ that the main constitute of *F. bengalensis* is protein, crude fiber, sugars, flavonoids, tannis, etc. The tree is well known in ayurveda and used as anti-atherosclerosis, antioxidant⁵ antidiarrhoeal etc. The bark of banyan tree used in ayurvedic system of medicine for the treatment of diabetes mellitus. It is astringent to bowels useful in treatment of biliousness, ulcers, erysipelas, vomiting, vaginal. Complains, fever, inflammations and according to Unani system of medicine, its latex is aphorisiac, tonic, vulernary, maturant, lessens inflammations; useful in piles, nose-diseases, gonorrhoea etc. Different parts of tree have been found to possess medicinal properties. Leaves are good for ulcers, gonorrhoea, fruits and seeds are used as cooling agent and tonic. The aerial root is useful in syphilis, biliousness, dysentery, inflammation of liver etc. The barks also reported to have antidiabetic activity. Cleaning the teeth with the aerial roots of the Banyan is beneficial in preventing teeth and gum, disorders.

Table 1: Qualitative identification of elements and carbohydrates in water extract of sample

S. No.	Parameters	S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8	S-9	S-10
1	Nitrogen	A	A	A	A	A	A	A	A	A	A
2	Sulphur	A	A	A	A	A	A	A	A	A	A
3	Chloride	A	A	A	A	A	A	A	A	A	A
4	Carbohydrates %	P	A	A	P	P	P	P	P	P	A

A = Absent, P = Present

***Ficus sycomorus* (S-2)**

Ficus sycomorus is commonly known as umber. It belongs to Plantae-kingdom family – Moraceae, Class –Magnoliopsida, and *Ficus* – Genus. It is a tree which grows about 60 feet in height with a pale trunk and wide spread branches. The literature survey reveals that the leaves of *F. sycomorus* contain reducing sugars, Gallic, tannins, saponins, alkaloids and flavonoids. It has medicinal properties the leaves of *F. sycomorus* are used to treat snake bites and Jaundice. The powdered steam bark is soaked in water and aqueous solution is administered to the treatment of ailments such as metal illness diarrhoea and pain relief.

***Ficus religiosa* (S-3)**

Ficus religiosa commonly known as Peepal. It belongs to Plantae- kingdom family- Moraceae, Class-Magnoliopsida, and *Ficus*-Genus. It is medium size tree and has large crown spreading ranches. Peepal tree has vast medicinal applications. The juice of its leaves extracted by holding them near the fire can be suded as the ear drop. Its powder bark has been used to heal the wounds. The bark of the tree is useful in inflammation and glandula swelling of the neck. Its root bark is useful for stomatitis, clear ulcers, and prevents gum diseases. The powdered fruits and leaves are taken for asthma and highly effective in relieving palpitation of the heart and cardiac weakness. Its seeds proved useful in urinary troubles. The leaves are used to treat constipation.

***Terminalia catappa* (S-4)**

Terminalia catappa is commonly known as Indian almond or sea almond. It belongs to Plantae-kingdom, family-Roscega, Class-Magnoliopsida,

and *Prunus*-Genus. This tree has a characteristic pagoda shape because it sends out a single stem from the top centre, it sends out several horizontal branches. It can get very large reaching 30m in ideal conditions. The fruits are almond shaped and green turning brown to purple when ripe the nuts are edible, taste very many like almonds. Unlike the commercial almond, the sea almond can be eaten raw. The medicinal properties associated with sea almonds are as follows. Leaves are applied to rheumatic joints Leaves macerated in oil has been used for tonsillitis. Juice of young leaves used for scabies and other coetaneous diseases, headaches and colic. The sap of young leaves mixed with the kernel oil has been used for treatment of leprosy. The bark is used for gastric ailments, bilious diarrhea. Bark decoction has been used for the treatment of gonorrhoea and stomach cramps.

***Eugenia jambolana* (S-5)**

Eugenia Jambolana is a botanical name of *Jamun*. It belongs to Plantae kingdom, family-Myrraceaeac, Class-Magnoliopsida, and *Syzygium*-Genus. Jamun is an evergreen tropical tree 50 to 100 feet tall with smooth, glossy leaves having a turpentine smell. Most of the plant parts are according to ayurveda is good for digestive, asthma, thirst, blood impurities and to cure ulcer, as per unani systems of medicine they acts as liver tonic, enriches blood strengthens teeth and gums. The seeds are astringent, diuretic and stops urinary discharge. It is also act as a gargle in sore throat, spongy gums etc. and when externally used. Fig: bark shows good wound healing properties, powdered seeds are used as a remedy in diabetes in metrorrhagia cures diarrhea and curd eliminate stones. Flowers of *E. jambolana* contain oleanolic acid, triterpenoids ellagic acid and falvonols isquercetin, quercetin,

Table 2: Physico-chemical parameters of samples selected

S. No.	Parameters	S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8	S-9	S-10
1	Total Ash%	0.65	0.30	0.48	0.30	0.75	0.57	0.9	0.5	0.5	0.60
2	Acid sol Ash%	0.31	0.14	0.2	0.2	0.5	0.37	0.5	0.3	0.3	0.41
3	Acid insol Ash%	0.32	0.15	0.27	0.09	0.24	0.2	0.4	0.2	0.1	0.19
4	Water Extracts%	2.85	3.57	3.62	4.25	8.95	10.8	2.8	2.5	3.0	3.76
5	Carbohydrates %	1.27	-	-	0.8	1.1	1.25	0.09	0.12	1.2	-
6	Titration Acidity gm/10.08	0.12	0.16	0.06	0.6	0.8	0.32	0.64	0.48	0.	

kampferol and myricetin are present in small amounts.

***Psidium guajava* (S-56)**

Psidium guajava is a botanical name of guava. It belongs to Plantae-kingdom, family-Myrtaceae, Class-Magnoliopsida, and *Psidium*-Genus. *Psidium guajava* is the evergreen shrub of small tree to 30ft tall greenish brown bark and green leaves. It contain greenish oval or pear shaped fruits. The fruits contain high % of Vit C, carotene, Vit B₁, B₂, B₆ free sugars, pectin and several flavonoid. The root bark is an astringent and given to children in diarrhea and root.⁹ Preparation with fruit is useful in jaundice. The plant has antibacterial, anti-fungal, antiviral and anti-inflammatory activities, antioxidants, antidiabetic properties.¹⁰ Guava leaves helps in curing loose motions, constipation. Swelling of gums and cures toothache, stomachache and urinary disorders.

***Mangifera indica* (S-7)**

Mangifera indica is a botanical name of Mango. It belongs to Plantae-kingdom family-Anacardiaceae, Class-Eudicots, and *Mangifera indica*-Genus. A large long lived tree generally 20-100 ft tall. Mango cleans the body of the filth within and is an ideal antidote for all toxic effects inside the body. Powder of Mango leaves (dried in shade) with water daily helps in breaking the stones and throwing them out, cures diarrhea, improves nervous system. Using the powder of dried Mango seeds as tooth paste, strengthens the gums and helps in curing dental problems foul smell, pyorrhea. Paste of Mango roots applied on palms and sloes cures fever. *Mangifera indica* is used medicinally to treat ailment such as asthma, cough, diarrhea, dysentery,

teucocohoea, jaundice, pains and malaria the dried mango flower contains Tannin serves as an astringents incases of diarrhea, chronic dysentery, etc. mango extracts of unripe fruits and bark, steam, leave has shown antibiotic activity. The leaf decoction is taken as a remedy for fever, chest complaints, diabetes, hypertension etc. An aqueous bark extract from *M. indica* has been used in Cuba as nutritional supplements.

***Manikara achras* (S-8)**

Manikara achras is commonly known as *Chikoo*. It belongs to Plantae-kingdom family-Sapotaceaa, Class-Magnoliopsida and *Manikara zapota*-Genus. The tree grow slowly up to 60-100 ft height. Leaves are green in color and the fruits are scurfy brown peel. Decoction of the bark used for diarrhea and fever. Fruit used for preventive for fever. Seed kernel oil used as skin ointment. It is used for kidney stone. The seed infusion used as an eye wash. *Manikara achras* has been used in Cuba as nutritional supplements.

***Annona squamosa* (S-9)**

Annona squamosa is commonly known as Custard apple. It belongs to Plantae-kingdom, family-Annonaceae, Class-Magnoliopsida and *Annona*-Genus. The tree ranges from 10-20 ft in height with open crown of branches. The leaves are ever green and fruits are dull green color, it is fragrant, juicy, and sweet. The leaves are used for fainting spells wound leave decoction is used in the treatment of ulcer, cold remedy; clarify the urine and pain relief. The bark decoction is given as a tonic to diarrheas patients. The root is used for drastic treatment for dysentery and other ailments.

Table 3: Evaluation of antimicrobial activity of samples

S. No.	Parameters	S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8	S-9	S-10
1	<i>E. coli</i>	+	+	-	-	+	+	-	-	+	+
2	<i>B. Megaterium</i>	+	+	-	-	+	+	-	-	+	+
3	<i>S. aureus</i>	+	+	-	-	+	+	-	-	+	+
4	<i>Salmonell typhi</i>	+	+	-	-	+	+	-	-	+	+

(+) = Positive test, (-) = Negative test

***Tridax procumbens* (S-10)**

A weed name *Tridax procumbens* (Compositae) present is employed as indigenous medicine. In English it is popularly called as "Coat button" because of appearance of flower it has been intensively used in traditional medicine as anticoagulating antifungal and insect repellent in bronchial catarrh diarrhea and dysentery description of plant. *Tridax procumbens* is a Spread annual herb grow up to 20 cm in height leaves simple opposite serrate or acute fleshy and pubescent flower in head long stalked and whitish seed are numerous small with tuft of silky hair on side for wind dispersal. *Tridax procumbens* is well known Ayurvedic medicinal for liver disorder having also antioxidant properties.

Physico-chemical analysis

The plant leaves extract was tested for various physical properties (total ash, acid soluble ash. Acid insoluble ash, water extract) were determined. The ash content of sample indicates amount of inorganic oxides present in it. The percentage plant material. The maximum ash was found in *Tridax procumbens*, this may be due to the fact that we have taken whole plant for estimation. Among only plant leaves the sequence observed was *A. squamosa* < *M. indica* < *M. achras* < *T. catappa* < *P. guajava* < *F. sycomorus* < *E. jambolana* < *F. religiosa* < *F. benghalensis* < *T. procumbens*.

The water extract of leaves of these samples (Table 1 & 2) shows that, maximum water extract is obtained in *P. guajava* (S-6) and minimum in *M. achras* (S-8). Water extract varies from 2-5 to 10.8%. The residue obtained in the water extract was tested for elemental analysis. It is observed

that nitrogen, sulphur and chloride are not present in the residue. Some of this sample contains carbohydrate. Maximum carbohydrate is present in the extract of banyan tree (S-1) and minimum in the *M. indica* (S-7). Carbohydrates are absent in *F. cycomorous* (S-2), *F. religiosa* (S-3), and *T. procumbens* (S-10).

The titable acidity of water extract residue was determined as g/l of acid. The maximum was observed in *M. achras* (S-8) and minimum in *F. benghalensis* (S-1).

Antimicrobial activity

The plants S-3, S-4, S-7 and S-8 shows negative test for antimicrobial activity. For the present work, leaves of peepal tree (S-3) is used although peepal has many medicinal properties, but its bark powder is used or root bark is used. We observed that water extract of leaves of peepal does not possess such properties. Although sap of young leaves of sea almond (S-4) is used in the treatment not leprosy. Water extract of sea almond leaves does not possess antimicrobial activity. The leaves decoction of mango Indica (S-7) traditionally is used in the treatment of fever, chest complaints, diabetes, hypertension etc. but our present study reveal negative test for antimicrobial activity. Manikara achras (S-8) is also shown negative test for antimicrobial activity. The study reveals that antimicrobial activity of water extract residue does not depend on individual physical or chemical parameter. It is a complex phenomenon, may involves alkaloids and other natural compounds. The antimicrobial activity of all ten plant material is carried out the results are shown in table 3.

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