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PHARMACOGNOSTIC PROFILE AND PHYTOCHEMICAL INVESTIGATION OF *SYZYIUM CUMINI* BARK EXTRACTS

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ABSTRACT

Knowledge of herbs has been handed down from generation to generation for thousands of years. Herbal drugs constitute a major part in all traditional systems of medicines. Plants above all other agents have been used for medicine from time immemorial because they have fitted the immediate personal need and are easily accessible and inexpensive. The medicinal plants find application in pharmaceutical, cosmetic, agricultural and food industry. In last few decades, *Syzyium cumini* is extensively studied for its medicinal properties by advanced scientific techniques and a variety of bioactive compounds have been isolated from the different parts of the plant and were analysed pharmacologically. In our present investigation, pharmacognostic profile and phytochemical screening of *Syzyium cumini* bark has been evaluated for the presence of bioactive compounds. The study revealed the presence of alkaloids, flavonoids, terpenoids, phenolic compounds, sterols, carbohydrates, glycosides and tannins. The results suggest that methanolic extract of *Syzyium cumini* bark has promising therapeutic potential, its pharmacological properties which if properly harness can be used in the management of various diseases and can serve as a base for the development of novel potent drug in ethomedicine.

KEYWORDS: ***Syzyium cumini*, Medicinal plants, Phytochemicals, Ethnomedicine**

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INTRODUCTION

India has a rich culture of medicinal herbs and spices, which includes about more than 2000 species and has a vast geographical area with high potential abilities for Ayurveda, Unani, Siddha, traditional medicines but only very few have been studied chemically and pharmacologically for their potential medicinal value[1,2]. Plants are still an independent source of medication in the contemporary health care delivery system. Their role is twofold in the development of medicines and served as a natural blue print for the development of new drugs, modern medicines, nutraceuticals, food supplements, folk medicines, pharmaceutical intermediates and chemical entities for synthetic drugs[3]. An impressive number of modern drugs have been isolated or derived from natural sources, based on their use in traditional medicine[4]. According to World Health Organization medicinal plants would be the best source to obtain a variety of drugs[5]. Recently much attention has directed towards extracts and biologically active compounds isolated from popular plant species. In the present era of drug development and discovery of new drug molecules, many plant products are evaluated on the basis of their traditional uses[6]. *Syzygium cumini* (L.) Skeels, commonly known as Jamun, is a widely distributed forest tree in India and other tropical and subtropical regions of the world. The synonyms of *Syzygium cumini* are *Eugenia jambolana* Lam., *Myrtuscumini* Linn., *Syzygium jambolana* DC, *Syzygium jambolanum* (Lam.) DC, *Eugenia cumini* (Linn.) Druce and *Eugenia caryophyllifolia* Lam. It is commonly known as jambolan, black plum, jamun, java plum, Indian blackberry, Portuguese plum, Malabar plum, purple plum, Jamaica and damson plum. It belongs to the member of family Myrtaceae. *Syzygium cumini* is a medicinal plant, whose parts were pharmacologically proved to posses hypoglycaemic, antibacterial, anti-HIV activity and anti-diarrhea effects[7,8,9]. Leaves and barks of *Syzygium cumini* have anti-inflammatory activity[10,11]. Leaves have been also used in traditional medicine as a remedy for diabetes mellitus in many countries[12].Phytochemicals are natural and non-nutritive bioactive compounds produced by plants that act as protective agents against external stress and pathogenic attack[13]. Plants are rich in a wide variety of secondary metabolites (phytochemicals), such as tannins, terpenoids, alkaloids, and flavonoids, which have been found *in vitro* to have antimicrobial properties. In many cases, these substances serve as plant defense mechanisms against predation by microorganisms, insects, and herbivores. Some, such as terpenoids, give plants their odors; others (quinones and tannins) are responsible for plant pigment. Therefore, basic phytochemical investigation of plant extracts for their phytoconstituents were also vital. Based on their biosynthetic origin, phytochemicals can be divided into several categories: phenolics, alkaloids, steroids, terpenes, saponins, etc. Phytochemicals could also exhibit other bioactivities such as antimutagenic, anticarcinogenic, antioxidant, antimicrobial, and anti-inflammatory properties[14]. To promote the proper use of herbal medicine and to determine their potential as sources of new drugs, it is essential to study the medicinal plants which have folklore reputation in a more intensified way[15]. In response to the mounting importance of phytochemicals, the present study was carried out in order to reveal the pharmacognostic profile and bioactive compounds present in the bark of *Syzyium cumini*.

MATERIALS AND METHODS

Collection and identification of plant material

The specimen was collected from Thrissur, Kerala and authenticated by Botanical Survey of India, Coimbatore, India (Voucher Number: BSI/SRC/5/23/2015/Tech/223). The bark of *Syzyium cumini* were washed thoroughly 2-3 times with running tap water and once with sterile distilled water, air dried at room temperature on a sterile blotter. After complete drying, barks were powdered well using a mixer. Then the powdered material was weighed and kept in air tight container and stored in a refrigerator for future use. About 10g of this

powdered sample was refluxed with hexane, chloroform, methanol and aqueous in the ratio of 1:10 (w/v). The crude extracts were collected in amber coloured sample bottles and stored. All chemicals and reagents used including the solvents were of analytical grade.

Pharmacognostic Profile
Physico-chemical evaluation
Ash Values
The determination of various physicochemical parameters such total ash, water-soluble ash, alkalinity of water soluble and acid insoluble ash values of the powdered material was determined as per the Indian Pharmacopoeia[16].

Extractive values
Extract of the powdered bark were prepared with different solvents for the study of extractive values[17].

Fluorescence Analysis
A small quantity of dried and finely powdered material was placed in a clean grease-free microscopic slide, treated with 1-2 drops of the freshly prepared reagent solution, mixed gently by tilting the slide and waited for 2-4 minutes. The slide was then viewed day light and ultraviolet radiations (365 nm). The colours observed on application of different reagents in different radiations were recorded[18].

Phytochemical Analysis
Chemical analysis was carried out in the hexane, chloroform, methanolic and water extracts of the bark of *Syzyium cumini* using standard procedures to identify constituents, as described by Trease and Evans (1979), Harborne (1984), Sofowara (1993) and Raaman (2008)[19, 20,21,22].

Test for alkaloids
Dragendroff's test
To 5 mL of the extract few drops of Dragendroff's reagent was added for the formation of orange coloured precipitate.

Mayer's test
To 5 mL of the extract few drops of Mayer's reagent was added for the formation of cream coloured precipitate.

Wagner's test
To 5 mL of the extract few drops of Wagner's reagent was added for the formation of reddish brown coloured precipitate.

Hager's test
To 3 mL of the extract few drops of Hager's reagent was added for the formation of prominent yellow precipitate.

Test for flavonoids
To 3 mL of the extract few magnesium ribbons are dipped and conc. HCl was added over them and observed for the formation of magenta (brick red) colour indicating the presence of flavonoids.

Test for proteins
Biuret test
To 3 mL of the extract few drops of 10% sodium chloride and 1% copper sulphate was added for the formation of violet or purple color. On addition of alkali, it becomes dark violet.

Millon's test
To 3 mL of the extract few drops of Millon's reagent was added for the formation of red colour.

Test for carbohydrates
Molisch's test
To a small amount of the extract few drops of Molisch's reagent was added followed by the addition of conc. H_2SO_4 along the sides of the test tube. The mixture was then allowed to stand for 2 min and then diluted with 5 mL of distilled water. Formation of red or dull violet colour at the inter phase of two layers indicates the presence of carbohydrates.

Fehling's test
The extract was treated with 5 ml of Fehling's solution (A and B) and kept in boiling water bath. The formation of yellow or red color precipitate indicates the presence of reducing sugar.

Test for tannins

A fraction of the extract was dissolved in water and then it was subjected to water bath at 37°C for 1 hour and treated with ferric chloride solution and observed for the formation of dark green colour.

Test for sterols

Liebermann-Burchard test

To a small amount of the extract few drops of chloroform, acetic anhydride and H_2SO_4 was added along the sides of the test tube to observe the formation of dark red or pink colour.

Test for glycosides

Baljet's Test

To 5 mL of the extract few drops of sodium picrate was added to observe yellow to orange colour.

Keller-Killiani test

To 5 mL of the extract few drops of ferric chloride solution was added and mixed, then sulphuric acid containing ferric chloride solution was added, it forms two layer showed reddish brown while upper layer turns bluish green indicates the presence of glycosides.

Test for phenols

Ferric chloride test

A fraction of the extract was treated with 5% ferric chloride solution and observed for the formation of deep blue or black colour.

Test for saponins

Foam test

To a small amount of the extract few drops of distilled water was added and shaken vigorously until persistent foam was observed.

Test for terpenoids

Chloroform test

To 5 mL of the extract few drops of chloroform and conc. H_2SO_4 was added carefully along the sides of the test tube to form a layer and observed for the presence of reddish brown colour.

RESULTS

Ash values

The powdered material was evaluated for its physico-chemical parameters like Ash values, Water soluble ash, Acid Insoluble ash and the results are shown in Table 1.

Table 1
Physico-chemical studies of Syzyium cumini bark

Types of Ash value	Observation (% w/w)
Total ash	5.47
Water soluble ash	3.15
Acid insoluble ash	2.68

Extractive values

Extractive values of the successive extracts of bark of *Syzyium cumini* are given in Table 2.

Table 2
Percentage of successive extracts of Syzyium cumini bark

Solvents	Extract values (% w/w)
Hexane	8.04
Chloroform	28.05
Methanol	12.94
Water	19.36

Fluorescence analysis

The powdered sample of *Syzyium cumini* bark was subjected to fluorescence analysis, results are tabulated in Table 3.

Table 3
Fluorescence analysis of Syzyium cumini bark

Plant sample	Day light	UV light (365nm)
Powder	Brown	Dark green
Powder+ NaOH	Dark green	Light green
Powder+Acetone	Pale green	Yellowish green
Powder+HCl	Light green	Dark Green
Powder+HNO_3	Green	Yellowish green
Powder+Acetic acid	Dark brown	Greenish brown
Powder+$CHCl_3$	Yellowish green	Pale green

Phytochemical Analysis

Powdered *Syzyium cumini* bark were subjected to various qualitative tests for the identification of phytochemical constituents includes tests for alkaloids (Dragendroff's test, Mayer's test, Hager's test, Wagner's test), saponins, glycosides (Baljet's test, Kellar-Killiani test), carbohydrates (Molisch's test, Fehling's test), proteins (Biuret test, Xanthoprotein test, Millon's test), tests for tannins, flavonoids, steroids (Liebermann-burchard test), phenols, terpenoids were performed using specific reagents and results are tabulated in Table 3. Phytochemical screening results of the powdered sample of *Syzyium cumini* bark extracted in aqueous and methanol showed the presence of all the constituents whereas the hexane and chloroform extracts showed the presence of very few bioactive compounds.

Table 4
Phytochemical screening of Syzyium cumini bark in various extracts

Phytochemicals	Hexane	Chloroform	Methanol	Aqueous
Alkaloids	+	-	+	+
Flavonoids	-	+	+	+
Proteins	+	-	+	+
Carbohydrates	-	+	+	+
Tannins	+	-	+	-
Sterols	-	+	-	+
Glycosides	+	-	+	-
Phenols	-	+	+	+
Saponins	-	+	+	+
Terpenoids	-	-	+	-

'+' present, '-'absent

DISCUSSION

Indigenous herbs are used as remedies against various diseases in the traditional system of medicine or in ethnomedical practices. The uses of different parts of several plants are in vogue from ancient times[23]. The phytochemical screening revealed the presence of various bioactive compounds like tannins, flavanoids, steroids, glycosides Phenols, terpenoids, saponins.The various phytochemical compounds found in plant are known to have beneficial medicinal importance. Saponins have the property of precipitating and coagulating red blood cells. Some of the characteristics of saponin include formation of foams in aqueous solutions, hemolytic activity, cholesterol binding properties[24,25]. Flavonoids have been referred to as nature's biological response modifiers, because of their inherent ability to modify the body's reaction to allergies and virus[26]. Tannins bind to proline rich protein and interfere with

protein synthesis[27]. Gopinath *et al*., (2012) reported the presence of phytoconstituents in stem bark of *Syzygium cumini*[28], similarly our study also revealed synergistic presence of the bioactive compounds. Chemical investigation on the different parts of the plant has resulted in the isolation of a large number of novel and interesting metabolites[29]. The millenarian use of *Syzygium cumini* in folk medicine suggests that they represent an economic and safe alternative to treat various diseases. As the pharmacologists are looking forward to develop new drugs from natural sources, development of modern drugs from *Syzygium cumini* can be intended for their better monetary and therapeutic utilization.

CONCLUSION

Medicinal plants are believed to be an important source of new chemical substances with potential therapeutic effects. About 80% of individuals from developed countries use traditional medicine, which has compounds derived from medicinal plants. Therefore, such plants should be investigated to better understand their properties, safety and efficiency. In our prospective study, the methanolic extract of the bark of *Syzygium cumini* has revealed the presence of alkaloids, flavonoids, glycosides, phenols, terpenoids, tannins and carbohydrates. The use of traditional medicine is widespread and plants still present a large source of novel active biological compounds with different activities, including anti-inflammatory and cardioprotective activities. Pharmacologists are increasingly turning their attention to folk medicine, looking for new leads to develop better drugs. The current drugs in the market have several side effects and an effective means to sustain is still a challenge. Several studies have to be conducted with new or modified versions of existing drugs. Hence, the present study confirms the credible of the plant rich source of therapeutic value. Extensive study will provide a good source of medicinally important drugs in the future.

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CONFLICTS OF INTEREST

None declared.

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