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Original Article

Phytochemical Screening of Jamun Seed (Syzygium Cumini)

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ABSTRACT

Fruits contain a diverse assonment of bioactive compounds such as alkaloids, tannins, anthocyaning, flavonoids, phenolic acids, procyanidins that possess many functional properties such as antioxidant, anti-inflammatory, anti-diabetic, anti-carcinogenic properties and also protects against various degenemtive and chronic diseases. These compounds are known to exhibit many health benefits and disease-preventive characteristics. The extraction of these phytochemicals fmm plant involves the use of-various extraction techniques. Sy-zygium cumini (synonym Eugenia jambo,iana) or Jamun plant is; known to possess diverse phytochemicals, most ofwhich are observed to be of health benefits. The seeds are the most studied plant part. Polyphenols are present inherently in lots of fruits, which act as natural antioxidants and possess antioxygenic pmperty with the advantage of low toxicity. The Antioxidant activity of phenolics in fruits is mainly because oftheir redox properties, which permit them to act as a reducing agent. The present study aims at screening various phytochemicalg present in Jamun seeds extracted using different extraction methods both qualitatively and quantitatively.

Keywords: Phytochemicals, Jamun seeds, polyphenols, extraction

INTRODUCTION

Biochemical reactions occurring during biological processes such as respiration results in the generation of reactive oxygen species which when present in excess or are not eliminated properly leads to a condition called oxidative stress which initiates many diseases such as coronary heart diseases, stroke, diabetes, hypertension. Recently, there is an increasing interest in using natuml antioxidants to protect human beings from the damage caused during the condition of oxidative stress Many plant constituents possess the antioxidant pmperty and oxygen scavenging activity as a metabolic response to endogenously generated free radicals during the various biochemical process (Gmssmann et al., 2002) Among the diverse assortment of plant bioactive compounds, Phenolic compounds are known to possess good antioxidant pmperty. The extraction of these phytochemicals fmm plant involves the use of various conventional extraction techniques such as Soxhlet extraction, maceration. The modern methods include microwave-assisted extraction (MAE), Ultrasonication assisted extraction (UAE), superuitical fluid extraction (SFE), solid phase micmextraction (SPME), Soxhwave]. Syzygium cumini (synonym Eugenia jambolana) is a very large evergreen tropical tree belonging to the family Myrtaceae. India is the second largest producer ofthe jmmun seeds in the world and contributes 15.4% in the world production of 13.5 million tonnes- Amongst the [indian states, Mahamshtra is the largest jamun producer followed by Uttar Pmdesh, Tamil Nadu, Gujarat, Assam, and others (Patil et al., 2012) [[10]]. Jamun plant is known to possess a diverse group of phytochemicals, most of which are observed to be of health benefits. The seedss are the most studied plant part and are reported to contain jambosine, gallie acid, ellagic acid, corilagin, 3,6hexahydmxy diphenoylglucose, 4,6-hexahydroxydiphenoylglucose,1- galloylg\ucoge, 3galloy\glucose, quercetin, ß-sitogterol (Rastogi & Mehrotra 1990) [1]. The present study was undertaken to screen various bioactive compounds present in jamun seeds using three different methods of extraction namely soxhlet extraction, microwave-

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assisted extraction and ultrasonication assisted extraction. Phytochemical characterization of three extract variants was conducted both qualitatively and quantitatively for the presence of various bioactive compounds. Phytochemical Screening of Syogi:cm cumini (Synonym Eugenia jambolaua) Syzygium cumini, also known by its synonym Eugenia jambolana, is a tropical tree native to the Indian subcontinent. It is commonly known ag jambolan, black plum, or Java plum and is Midely distributed across Asia, Africa, and South America. The plant belongs to the Myrtaceae family and hag been an integral part of Traditional medicine for centuries. The fmit, leaves, seeds, and bark of Syzygium cumini are used in various forms for their potential therapeutic properties, which range from anti-inflammatory to antidiabetic effects. The rich pharmacological value of Syzygium cumini is attributed to the presence of a diverse range of phytochemicals, including alkaloids, flavonoids, tannins, saponins, and phenolic compounds. Phytochemical screening of this plant has revealed its potential as a source of bioactive molecules with significant medicinal benefits- Understanding the chemical composition of Syzygium cumini is essential for its effective utilization in modern medicine. Phytochemicals are naturally occurring compounds found in plants that have been shown to possess various biological activities. Syzygium cumini, being a rich reservoir of these compounds, has garnered substantial interest in the field of pharmacology- and ethnomedicine. The fruit, in particular, has been used traditionally for its medicinal properties, such as lowering blood sugar levels and improving digestion. More recently, studies have focused on the phytochemical constituents in the leaves, seeds, and bark of the plant, providing a clearer under3tanding of its health-pmmoting properties. The diver3ity of compounds found in Syzygium cumini underlines its importance as a pharmacologically active plant. The wide range of health benefits attributed to Syzygium cumini is closely linked to the bioactive compounds found in its various parts. These compounds include flavonoids, alkaloids, tannins, terpenoids, saponins, and phenolic acids, each of which contributes to the plant's thempeutic efficacy. Syzygium cumini hag been traditionally used to treat ailments such as diabetes, hypertension, liver diseases, and gastrointestinal disorders. For instance, its seeds are known to have antidiabetic effects, while its leaves are recognized for their antioxidant and antimicrobial pmpertieg. This plant's complex chemical makeup makes it an important candidate for the development of new medicines. One of the most significant bioactive compounds found in Syzygium cumini ig ellagic acid, a potent antioxidant that helps neutralize free radicals in the body. Studies have demonstrated that ellagic acid, along with other flavonoids and phenolic compounds, contributes to the plant's antioxidant activity. These antioxidant properties are essential for preventing oxidative stress, which is linked to the development of chronic diseases such as cancer, cardiovascular diseases, and neurodegenerative disorders. As a result, Syzygium cumini is considered a valuable source of natural antioxidants with potential therapeutic applications. In addition to its antioxidant properties, Syzygium cumini has demonstrated significant anti-inflammatory effects. Chronic inflammation is a precursor to many health conditions, including calliiovascular diseases, arthritis, and diabetes. The anti-influmnatory• potential of Syzygium cumini has been attributed to the presence of flavonoidg, tannins, and other polyphenolic compounds. These compounds modulate inflammatory pathways in the body, reducing the levels of pro-inflammatory cytokines and enzymes. By reducing inflammation, Syzygium cumini helps manage conditions like afihritis and inflammatory bowel disease. Moreover, Syzygium cumini has been studied for its antimicrobial activity. The plant extracts exhibit strong antimicrobial effects against a range of bacteria, fungi, and viruses. The antimicrobial activity is primarily attributed to the presence of tannins, flavonoids, and alkaloids. These compounds disrupt the cell walls of pathogens, preventing their growth and replication. Syzygium cumini has shown promise as a natural remedy for treating infections such as skin infections, urinary tmct infections, and gastrointestinal infections. Given the rise in antimicrobial resistance, plants like Syzygium cumini present an alternative source of antimicrobial agents. The antidiabetic properties of Syzygium cumini are among its most well-documented health benefits. Traditionally, the seeds and fruit of the plant have been used to regulate blood sugar levels in diabetic patients. The plant's ability to lower blood glucose is attributed to the presence of

bioactive compounds such as alkaloids, flavonoids, and anthocyanins. These compounds help improve insulin sensitivity and glucose uptake by the cells. Clinical studies have confirmed the effectiveness of Syzygium cumini in controlling blood sugar levels, making it a potential adjunct therapy for managing type 2 diabetes. The liver-protective effects of Syzygium cumini have also been widely explored- The liver plays a critical mle in detoxifying the body, and liver diseases such as hepatitis and cirrhosis can æsult in severe health complications. Phytochemicals found in Syzygium cumini, such as flavonoids and tannins, have been shown to protect the liver from damage caused by toxins and oxidative stress. Animal studies have demonstrated that Syzygium cumini extracts can enhance liver function and protect liver cells from damage caused by chemicals like carbon tetrachloride. This hepatopmtective activity suggests that Syzygium cumini could be used as a complementmty treatment for liver diseases. In addition to the aforementioned properties, Syzygium cumini bas demonstrated neumprotective effects. Neurodegenerative diseases, such as Alzheimer's and Parkinson's, are associated with oxidative stress and inflammation in the brain. The phytochemicals in Syzygium cumini, particularly the flavonoids and phenolic acids, help reduce oxidative dm, mage and inflatmnation in the central nervous system. These compounds protect neurons from degeneration and improve cognitive function. As such, Syzygium cumini holds promise as a natural remedy for preventing or delaying the onset of neumdegenerative diseases. Srinivasan et (2019). The antioxidant, anti-inflammatory, antimicmbial, antidiabetic, hepatoprotective, and neumprotective properties of Syzygium cumini make it a valuable plant in traditional medicine. Phytochemical screening of Syzygium cumini has provided substantial evidence of its therapeutic potential. Studies have shown that the plant's bioactive compounds exert a wide range of biological activities that contribute to its medicinal value. Further research is needed to isolate and identify the specific compounds responsible for these effects and to explore their potential clinical applications. In conclusion, the phytochemical screening of Syzygium cumini has uncovered a variety of bioactive compounds that contribute to its diverse medicinal properties. These include antioxidants, anti-inflammatory agents, antimicrobial agents, and compounds with antidiabetic, hepatoprotective, and neuropmtective effects. The growing body of research on Syzygium cumini highlights its potential as a natural remedy for various health conditions- Given its rich phytochemical pmfile, Syzygium cumini offers promising avenues for further research and development of new therapeutic agents. The continued study of this plant will help unlock its full potential in modern medicine.

MEDICINAL PROPERTIES

Jan-mn geed has gastro-protective properties mainly through promotion of mucosal defensive factors and antioxidant status and decreasing lipid peroxidation. Jamun also has anti-cancer and anti-viral potential. Jamun fruit extract and breast cancer Eugenia jambolana Lam. berry extract inhibits growth and induces apoptosis of human breast cancer but not non-mmorigenic breast cells. J Agric Food Chem. 2009 February. Li L, Adams LS, Chen S, Killian C, Ahmed A, Seeram NP. Department of Biomedical and Pharmaceutical Sciences, Bioactive Botanical Research Laboratory, College of Pharmacy, University of Rhode Island, Kingston, Rhode Island, USA. The ripe purple berries of the native Indian plant Eugenia jambolana Lani, known as Jamun, are popularly consumed and available in the United States in Florida and Hawaii. Despite the growing body of data on the chemo preventive potential of edible berry extracts, there is paucity of such data for Jamun fruit. Therefore, our labomtory initiated the current study with the following objectives: to prepare a standardized Jamun fruit extract for biological studies and to investigate the antiproliferative and pro-apoptotic effects of Jmmun fruit extract in estrogen dependent/aromatase positive (MCF -7mro), and estrogen independent (MDA-MB-231) breast cancer cells, and in a normal/nontumorigenic (MCF-IOA) breast cell line. Jamun fruit extract was standardized to anthocyanin content 3.5% anthocyanins (as cyanidin-3-glucoside equivalents) which occur as diglucosides of five anthocyanidins / aglycons: delphinidin, cyanidin, petunidin, peonidin and malvidin. In the prolifemtion assay, our studies suggest that Jamun fruit extract may have potential beneficial effects against breast cancer. Jamun has antiviral activity in vitro antiviral activity of plant extracts on goat pox virus replication. Indian J Exp Biol. 2008 Feb; Bhanu Prakash V, Hosamani M,

Balamurugan V, Gandhale P, Naresh R, Swamp D, Singh RK. Division of Virology, Indian Veterinary Research Institute, Mukteswar 263 138, India.

Four plants having known medicinal properties were screened for inhibition of goatpox virus (GITV) replication in vitro. Of the 4 plants, extract of Acacia arabica (Babul) and Eugenia jambolana (Jamun) leaves had inhibition (%) 99.70 and 99.92 at their maxixnum non-toxic concentrations, 99.93 +/- 0.38 and 1999.73 +/- 0.50 microg/ml, respectively in all cytopathic effect (CPE) inhibition assays. Results indicated that the extract of Acacia ambica and Jamun leaves inhibited GTPV replication in vitro. Insomnia cures herbs ror sleep

AYURVEDIC PROPERTIES

Decoctions or tinctures from the seeds are used to treat diarrhea and colic. The fruit and seeds are used in the treatment of diabetes. Research has shown that it has significant hypoglycemic action in both the urine and blood and, therefore, of value to diabetics. A number of herbal medicines are proving helpful in this area, including the bilberry, as well as iambul. Tests show that even small amounts of iambul will rapidly reduce blood and urine sugar levels. The reason that this plant is not used more extensively for this purpose is because it seems to work only in a smail percentage of diabetics. in indie, powdered iambul seeds, or occasionally the tincture, are given for diabetes and the frequent urination that accompanies it. In Ayurvedic medicine, iambul is ground with mango seeds and taken to Treat diarrhea and dysentery. An effective remedy for indigestion, soothing stomach cramps and dispersing gas. In parts of Southeast Asia, the roots are sometimes given as a treatment for epilepsy. There are many related species that are also valued for their therapeutic properties, including cloves for digestive problems and infections, E chequeri, from Chile, and E gerrodi from South Africa are used to treat coughs and congestion. From Brazil, E. unf/ora is used to help repel mosquitoes and other insects.

Diabetes:

The jambul fruit is regarded in traditional medicine as a specific against diabetes because of its effect on the panc1eas.The fruit as such, the seeds and fruit juice are all useful in the treatment of this disease. The seeds contain a glucose 'Jamboline' which is believed to have the power to check the pathological conversion of starch into sugar in cases of increased production of glucose. They are dried and powdered. This powder in doses of three grams should be given three- or four-times day mixed in water. It reduces the quantity of sugar in urine and allays the unquenchable thirst. [n Ayurveda, the inner bark of the jambul tree is also used in the treaünent of diabetes. The bark is dried and burnt, which produces an ash of white color. This ash should be pestled in the mortar, strained and bottled. The diabetic patient should be given 65 mg. of this ash on an empty stomach with water in the morning and 135 mg. each time in the afternoon and in the evening, an hour after meals, if the specific gravity of the urine is 1.02 to 1.03. If the specific gravity ranges between 1.035 and 1.055, the ash should be given thrice daily in the quantity of about 2 gm. at a time. [3] Polyuria The powder of the seeds is valuable in Polyuria or production of excess urine. It should be taken in dose of I gm. in the morning and evening.

Diarrhoea and Dysentery

Powder of the seed is an effective remedy for diarrhoea and dysentery. About 5 to 10 gm. of this powder should be taken with butterä ‘milk in these conditions- An infusion of the tender leaves, which contain a high concentration of gallic and tannic acid is also given as a medicine in diarrhoea and dysentery. This infusion, prepared from 30 or 60 gm. of leaves, should be given twice or thrice daily. A decoction of the bark taken with honey is also an useful medicine for chronic diarrhoea and dysentery.

Piles

The jarnbul fruit is an effective food remedy for bleeding piles. The fruit should be taken with salt every morning for two or three months in its season. The use of the fruit in this manner in every season will effect radical cure and save the user from bleeding piles for entire life. Fresh jambul fruit taken with honey is also an effective medicine for bleeding piles.

Liver Disorders

Natuml acids in the jambul Emit play an important mie in the secætion of digestive enzymes and sti_rnulate the liver fianctions. Chamka, the well-known physician of the ancient India, used this fruit in the treatment of enlargement of the liver.

Female sterility

An infusion of the fresh tender leaves of jambul fruit, taken with honey or butter-milk, is an effective remedy for sterility and miscarriage due to overian or endometrium functional disorder. The leaves presumably stimulate the secretion of progrestrone hormone and help absorption of vitamin E.

Precautions:

The jambul fruit should not be consumed in excess. Its excessive use is bad for throat and chest It may cause cough and accumulation of sputum in the lungs.

2. Plant Profile:

Table no.1

Family	Myrtles
Cown,f0n	Jamun
Division	Magnoliophyta
Class	Magnoliopsida
Genus	Syzygium

MATERIAL AND METHOD:

EXTRACTION:

Isolation & Extraction of Jamun Seed:

The jamun seed (Syzygiumcumini) were collected from the market. The collected plant materials (jamun seed) were brought to the laboratory. Plant samples were washed with water & air-dried at room temperature for 7 days, oven dried at 50°C to remove the residual moisture. The dried seeds were powdered using a mixer grinder & stored in air-tight container for future use. Use the decoction method for collecting extracts. Mix the desired amount of jamun seed powder with distilled water (50gm jamun seed powder in 500ml water). Heat the mixture for 80-100 minutes at 80-90°C temperature. Cool the extract to room temperature, filter the extract through filter paper.

PHYTOCHEMICAL SCREENING:

The microscopic and phytochemical studies are essential to authentify this ayurvedic preparation considering the requirement powdered microscopy, preliminary phytochemical tests. The test where done to fine the presence of active chemical constituents such as alkaloids, glycosides, terpenoids, flavonoids, saponin and tannins

Glycoside Test

Borntrager Test:-The drug is boiled with dilute sulphuric acid, filtered filtrate, benzene or ether or chloroform is added and shale. The organic layer is separated to which ammonia is add. The ammoniacal

layer shows pink to red due to presence anthraquinone glycosides.

Keller-Kilinai Test:

Dry ml ofthe above extract on a water bath and dissolve the residue in 3 ml of concentrated R-acetic acid. Add 1 dmp of R-iron (Ill) chloride test solution to the liquid and carefully transfer it on concentrated R-sulphuric acid. A reddishbrown ring forms at the interface, the upper acetic acid layer soon turns bluish green.

Alkaloidal Tests:

Wagner Test (Iodine solution):

Take extmct of senna and add wagner reagent it gives a brown or reddish-brown pecipitate. Which shows the presence of alkaloids.

Hager test (a saturated solufion or picric acid in cold water):

Take extmct of senna and add It gives characteristic crystalline precipitate with many alkaloids.

Dragendorrrs Reagent (Potassium iodide + bismuth nitrate):

Take extract of senna and add Dragendorffs Reagent it forms orange coloured precipitate with the reagent.

Tannins Tests

Ferric chloride Test: Crude extract were mixed with 2ml of 2% solution of FeC13. A bluegreen or black coloration indicated the presence of tannins.

Flavonoid test

Zinc Hydrochloride Test: Sample solution is added in mixture of Zinc dust and Concentrated HCL solution, Deep Magnita color is obtained .

Saponin Test

Frothing test: 0.5mi of extmct was treated with 5ml of distilled water and fmthing persistence indicates the presence of saponins.

Terpenoid test

•Salkowaskis Test

Four mg of extract was treated with 0.5 ml of acetic anhydride and 0.5 ml of chloroform. Then concentrated solution of sulphuric acid was added slowly and red violet color was observed for the presence of terpenoid.

RESULT AND DISCUSSION

The present study revealed that the various phytochemical components such as flavonoids, saponins, tannins, glycosides and alkaloide present in the leaves of Banaba Lagergtroemia speciosa.

Table no.2

Phytoconstituent	Test performed	Result
Glycoside test	Borntrager test	Present
Alkaloidak test	Dragondroff test Hager Wagner test	Present
Tannin test	Ferric chloride Gelatin test	Present
Flavonoid test	Lead acetate test Zinc hydmchloride test	Present
Saponin test	Frothin test	Present
Terpenoid test	Salkowskis test	Present

SUMMARY & CONCLUSION:

The Syzygium cumini also known as the jamun plant contains diveme assortment ofsecondary metabolites i.e. alkaloids, flavonoids, terpenoids, steroids, tannins, saponins and reducing suga_ß that play a vital role in preventing various diseases. The antidiabetic, anti-inflammatory, antiviral, anti- bacterial, antianalgesia, anti-oxidant, anti-abortifacient of the various parts of plants is due to the presence of diverse secondary metabolites. The phytochemical analysis ofthe plants is also important and pharmaceuticals companies for the novel drugs for the treatment of various diseases. The present study compares

different methods for phytochemical* extraction. It alsoreveals various medicinally important bioactive compounds present in jamun seeds and justifies their use as a conventional medication for treatment of different diseases. Further purification, identification, and characterization of the bioactive chemical lconstituent's compounds would be our priority in future studies. Efforts should be geared up to exploit the biomedical applications of these screened fruit seeds due to the presence of a certain class of phyto compounds for their full usage

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