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Analysis of Phytochemical and Anti-microbial Efficacy of Pithecellobium Dulce

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ABSTRACT:

Pithecellobium dulce is a species family *Fabaceae* that is native to the India. *Pithecellobium dulce* have a found secondary metabolism. It is have used as medicinal plant. The extract of jungle jalebi was obtained by decoction process extractor with the help of heating mantle. The identification of different chemicals constituents was analysis by phytochemical test of chemicals and perform the thin layer chromatography while in the laboratory. This main aim of this work is analysis of phytochemical and antimicrobial activity of chloroform, sulfuric acid, ethyl acetate, methanol and distilled water is used to chemicals and identifies some changes of the tests. The macroscopical characters of the fruits (Red & white), leaves, consistency, pH, extractive values with different solvents, analysis of anti-microbial activity, anti-bacterial activity, anti-inflammatory, and some pharmacological parameters for fruits of *Pithecellobium dulce*. Preliminary phytochemical study on different extracts of the fruits & also perform thin layer chromatography.

Keywords: Pithecellobium Dulce; Decoction extraction; Thin layer chromatography

Introduction

Pithecellobium dulce benth is a type of plant that is a member of the Fabaceae family. The fruit of the species have gathered in the Durg District, Chattisgarh. The data have collected in accordance with the study plan. Each species' fruit extract was made using a decoction extraction process. The technique of thin layer chromatography is used to separate individual bioactive chemical molecules from compound mixtures [1]. *Pithecellobium dulce* is a small to medium-sized, evergreen, spiky tree that grows to a height of 20 metres and is native to and grown all across India. 'Ganga imli' and 'Jangli jalebi' are its Hindi names [2]. Sweet *Pithecellobium* Numerous chemicals that can be used to treat chronic and infectious diseases are found in the plants used in traditional medicine. Indian traditional medicine utilises medicinal herbs [3]. *P. dulce* is a significant species; its common name is manila tamarind. The plant also goes by the names "jungli jalebi" and "Ganga imli" since it naturally produces ingredients for the Indian dessert "jalebi". To treat toothaches and discharge, the bark and mash of the Manila tamarind are used [4] .Gallic acid, mandelic acid, rutin, quercitrin, and naringenin are the main phenolics in the fraction of *P. dulce* that exhibits antioxidant, hepatoprotective, and greater inhibitory activities. Analysis of the chemical and nutritional, antioxidant, antihyperglycemic (inhibition of glucosidase and amylase), and antimutagenic properties of *P. dulce* red and white arils have the aim of the research [5]. The Pithecellobium dulce benth main aim of the present study have to perform phytochemical constituents, thin layer chromatography, in vitro antioxidant activity, and anti-Microbial of *P. dulce Benth* in different solvents according to their polari [6]. *P. Dulce* is primarily found in the Indian states of Delhi, West Bengal, Rajasthan, Andhra Pradesh, and Chhattisgarh. From the end of April to June, the tree produces coiling fruits. The fruit is a pod with tasty and slightly astringent red and white arils that cover black seeds that fix some nitrogen, depending on the tree [7]. The seed oil is utilised in the production of soap as well as food. The seeds have been found to include polysaccharides, lipids, saponins, glycosides, antioxidant steroids, and antioxidant steroids with anti-diabetic properties [8].

P dulce leaf, fruits and seed extract larvicidal and ovicidal on Cx. Quinquefasciatus. The first report on mosquito larvicidal and ovicidal activities of the *p. dulce* plant extract against the mosquitoes was reported [9]. According to reports, the plant's bark can be used as an astringent for eye inflammation, dermatitis, and dysentery. According to reports, the leaves have astringent, emollient, and anti-diabetic qualities. The fruits have been found to contain a steroid saponin, lipids, phospholipids, glycosides, glycolipids, and polysaccharides [10]. *Pithecellobium dulce benth*. bark is used as an astringent in dysentery, a febrifuge, and a treatment for dermatitis and irritation of the eyes [11]. The plants are mostly used as agricultural crops for food for people and animals as well as for oil, fuel, fertilisers, medicines, chemicals, and horticultural variants. Checking *P. dulce's* antibacterial properties is the goal of this investigation [12]. It is additionally employed in folk medicines as an anodyne, emollient, abortifacient, and larvicidic [13]. For the synthesis of silver nanoparticles, environmentally friendly materials like plant extract, bacteria, and fungi have a number of advantages over toxic chemicals because they are compatible with pharmaceutical and biomedical applications [14]. Fruits from the genus *P. dulce* are useful in terms of their importance for maintaining good health since they include a variety of bioactive substances, including flavonoids, saponins, alkaloids, antioxidants, phenolics, etc [15]. *P. dulce* seeds contain an antifungal activity in addition to the inhibitory action against trypsin, chymotrypsin, and papain that has been found in the

extracts of *P. dulce* fruits extract [16]. *Pithecellobium dulce (Roxb.) Benth.* which belongs to family *Leguminosae* and sub family *Mimosae.* It includes the evaluation like physicochemical parameters like preliminary phytochemical screening, total ash, water soluble ash, acid insoluble ash and extractive values in different solvents which are also required in correct identification of crude drug [17]. The quest for new drugs from natural sources, as well as the physical, chemical, biochemical, and biological characteristics of drugs, drug substances, or potential drugs or drug substances of natural origin. The current investigation focuses on *Pithecellobium dulce benth* Plant [18]. The field of disease prevention and treatment greatly benefits from the use of medicinal plants. Natural products are a source of bioactive fruits substances, and there is growing interest in medications derived from *Pithecellobium dulce* plants, which form an essential class in the fight against disease [23]. It is commonly known as Manila Tamarind and resembles tamarind. It is an acidic edible organic fruit that is primarily used in cooking, has a high nutritional value, and offers a number of health benefits. In addition to being a viable natural remedy, it is less expensive than the expensive medications found in hospitals and rehabilitation facilities [19].

The *Pithecellobium dulce* based on study of analysis the effect of electromagnetic exposure on the *P.dulce* seeds and its effect on parameters of seeds growth, plant physiology, reducing sugar, total protein, and amylase activity. *Pithecellobium dulce* were grown perform under laboratory conditions and identification [20]. There are between 100 and 200 species of *P. dulce* (Family: Leguminosae, Subfamily: Mimosoideae) in this genus. The only species that has spread outside of its original range and is used for health purposes is *Pithecellobium dulce* [21]. The investigation to ascertain the antibacterial effectiveness of the phytochemical components of *P. dulce* plants can be applied to the management of bacterial infections [22]. The Mimosaceae family includes the leaves, seeds, and bark of the shrub *Pithecellobium dulce*. Perform bioactive molecule isolation and characterisation from fruit peel [23]. In India, seeds have been used as a source of food and as a feed for animals. have been used in alternative medicine to treat a variety of illnesses, such as anti-ulcer medications and gastrointestinal issues [24]. *Pithecellobium dulce* is a plant component utilised for a variety of purposes, including anti-inflammatory, antifungal, and antibacterial properties [25]. *P. dulce's* fruit includes essential nutrients. The *Pithecellobium dulce* plant contains vitamins C (antioxidant activity), E (delays ageing), thiamine, riboflavin (contributes to skin and hair health), and various vital amino acids such lysine, phenylalanine, tryptophan, and valine [26]. The plant *Pithecellobium dulce*, also referred to as Ganga imli or Manila Tamarind, has anti-microbial qualities that can kill a variety of harmful microorganisms [27] The isolated component in P. dulce fruits was identified using NMR and MS spectroscopic data [28]. *P. dulce* fruit extracts were successful at killing C. quinquefasciatus in a laboratory setting. This is the initial study on the effectiveness of the solvent extracts from the selected plan as a mosquito repellent [29]. *Pithecellobium dulce* components, such as fruits and others, are a fantastic source of biologically active compounds linked to both high nutritional value and used in pharmaceutical applications because they contain a higher amount of polyphenols [30]. They have historically been utilised as folk treatments for a variety of diseases [31]. The fruit extract of *P. dulce* was used to separate specific lipids using thin-layer chromatography. Since lipids are involved in so many different processes, including the production of mycotoxins, vitamins, and polyaromatic hydrocarbons [32], [33] .The plant is well known for its edible fruits, which have traditionally been used to treat a variety of illnesses. The fruits are curved, linear legumes (pods) that are 10 to 13 cm long. The pod divides on both edges. These studies' novel findings would probably open the door for the clinical use of the traditional medicine Pithecellobium dulce in contemporary evidence-based medicine [34]. *P. dulce* fruits powder significantly inhibited the growth of Alternaria sp., Fusarium oxysporum, and Pestalotiopsis sp. In other investigations, dipping fruit in *P. dulce* extracts greatly decreased postharvest rots of yellow and red mombin (Spondias purpurea) produced by R. stolonifera [35].

Methodology

Collection of plant material:

In the month of March 2023, District-Durg (Chhattisgarh) gathered *Pithecellobium dulce* fresh fruits. The plant's optimally cooled dried fruits and a dried powder sample.

Preparation of dried powder:

The fruits of the *Pithecellobium dulce* plant are first cleaned with distilled water to get rid of any dirt or dust, and then they are left to dry in the shade. The dried plant material was crushed into a fine powder and kept in sealed containers at room temperature until further usage. Each procedure was used to 100 g of *P.* dulce powder.

Fig.1: Dried powder of Pithecellobium dulce.

Preparation of extract:

Pithecellobium dulce dried 25g powder weight and 250ml distilled water are combined in a round bottle flask, and the decoction extraction method is used to draw out the chemical components of the extract. using a heating mantle to bring the mixture to a boil at 50 C. The mixture is filtered using filter paper after boiling for 30 minutes.

Determination of percentage yield of plant extract:

The percentage yield of the plant extract has obtained using the formula,

Percentage yield (%) = w1×100/w2 where, w1=Weight of dried crude plant extract (after extraction)

W2=Weight of the dried plant material (before extraction).

The percentage yield of the plant extract obtained has 264*100/ 1000 = 26.4%

Preliminary phytochemical analysis of the Extract:

The initial screening of phytochemicals is an important step in identifying the bioactive components contained in medicinal plants, which may then lead to the discovery and development of new drugs. In the current study, the major phytoconstituents of *P. dulce* medicinal plants from various families were chosen, and their presence was linked to the bioactivities of the plants [36-38]. In addition to therapeutic substances, medicinal plants are a great source of knowledge for a wide range of chemical components that might be created as medications with perfect selectivity. A preliminary phytochemical study has been conducted using the usual methodology in order to qualitatively evaluate the chemical composition of the different extracts. These techniques have examined the existence of many phytochemicals including alkaloids, saponins, terpenoids, tanin, flavonoids, and anthraquinones.

Test for alkaloids:

10 ml of 1% HCl and 5g of plant extract were combined, then the liquid was warmed and filtered. Separately, 4 ml of filtrate were treated with a few drops of the Dragendorff reagent. Both of these reagents' turbidity or precipitation have been accepted as proof of the presence of alkaloids.

Test for saponin:

25 ml of distilled water was added to 5g of each extract before boiling and filtering. A further 10ml of distilled water was added to the filtrate, which was then violently agitated for 15 minutes. Warming-induced foaming was thought to be proof of saponin presence, although no saponins are present during this process.

Test for terpenoids (Salkowski test):

To 5g of each extract, 10 ml of chloroform have added, followed by a further addition of 5 ml of concentrated sulfuric acid (H2 SO4) to form a layer. A Reddish -Brown coloration of the interface indicated the presence of terpenoids.

Test for flavonoids (ferric chloride test):

About 5 g of each extract has boiled with 15 ml of distilled water and then filtered. To 5 ml of this filtrate, a few drops of 25% ferric chloride solution were added. A green-blue or violet colouration indicated the presence of a phenolic hydroxyl group.

Test for anthraquinones:

5 g of the extract were taken as an aliquot, heated with 10 ml of H2SO4, and then filtered while still hot. 15 ml of chloroform have been shaken with the filtrate. Three millilitres of diluted ammonia were added after the chloroform layer was pipetted into a different test tube. The final solution has been checked for colour variations.

Fig. 2: Result of various phytochemicals tests.

Thin Layer Chromatography

Thin-layer chromatography (TLC) is frequently employed in food analysis labs around the globe. control over both quantity and quality. TLC has also been frequently employed to analyse agricultural mobile phase; the capacity to repeat detection and confirmation without influence from goods and vegetation. The dispersion of biomolecules between two immiscible phases forms the basis of the TLC type of chromatography. In TLC, silica gel, which includes -OH groups, serves as the stationary phase. It is a polar absorbent.

Requirement

Chemicals – Silica Gel, Ethyl Acetate, methanol, distilled water.

Appratus – TLC Plate, beaker, measuring cylinder, Petri dish.

Other requirement- Micropipette, Hot air over/ Incubator

Procedure:

Preparation of sample and plate for the experiment. Cut the TLC plate in 10*10 dimensions. Mark the plate with a pencil at 70 mm. Marks the sample application area with pencil and start the spotting process. Development of plate. The plate was kept in a solvent system as a mobile phase. After development is finished. Air dry the plate and observed the separated compound. The compounds observed in light can be seen by naked eye.

Analysis of the result and calculation

Collection of plant-

The fresh Pithecellobium dulce fruits were procured from the Durg District village of Jevra Sirsha. *Pithecellobium dulce's anti*-fungal activity was studied using fruits that were used in the fungus development process.

Preparation of bread fungus media –

When bread is stored in an environment with high relative humidity and high relative temperature, bread becomes moldy. Depending on the species and level of sporulation, the colour of bread moulds can range from white to golden yellow to green-gray. This decision to determine the types of fungi present and how the temperature and type of flour affected the bread. The two varieties of bread used in the study were white flour bread and bread fortified with fibres. We employed development of Genus: Rhizopus and Species is Rhizopus Stolonifer fungus. To carry out the dead fungal zone of inhibition by scale, a mold's height is 4 cm and its breadth is 8 cm. were taken off the stale bread [39-42].

Procedure for analysis of antifungal activity:

The two bread have been the source of mould. Water-based spore suspensions were prepared. The *Pithecellobium dulce* extract was incorporated into bread using pipette. Incorporate 2 ml of Pithecellobium dulce extract into the first loaf, then inject 4 ml into the second bread. For two days, the bread was placed in the incubator, with day being kept at 37 °C. The mould spores that had grown inside the bread after two days.

Fig. 3: Anti-fungal resistance test on bread.

Results

Phytochemical analysis of plant extracts –

In addition to therapeutic substances, medicinal plants are a great source of knowledge for a wide range of chemical components that might be created as medications with perfect selectivity.

Table 1. Phytochemical test

S. No.	Phytochemical Tests	Observation	Identification
1.	Alkaloids	Turbidity/ppt	Presence
2.	Terpenoids	Reddish brown colour	Presence
3.	Anthraquinones	Colour changes	Presence
4.	Flavonoids	Green- blue colour	Presence
5.	Saponins	Frothing	Absence

Thin Layer Chromatography –

RF (Starting materials) = 3/10 = 0.3 RF (product) = 5/10 = 0.5

RF = Distance molecule travelled/ Distance solvent travelled 0.3/ 0.5 = 0.

Analysis of antifungal efficacy -

Fig. 4: Fungus Developed in bread.

Fig. 5: The fungus analysis after test of P. dulce extract.

Discussion

The present study is Analysis of Phytochemicals and Antimicrobial efficacy of *Pithecellobium dulce*. Plants produce a variety of secondary metabolites such as flavonoids, alkaloids, Tannins and Anthraquinones and represent a promising source of antifungal with antimicrobial agents. While current pharmaceuticals are linked to renal and liver dysfunctions, medicines made from plants and fruits have no adverse effects and are less expensive. The fruits extracts of *P. dulce* showed antioxidant and antifungal activities in the current study against human pathogenic microorganisms. *Pithecellobium dulce* use in traditional medicine shows that it offers a cost-effective and secure alternative for treating common infectious disorders. *Pithecellobium dulce* micropropagation. This is the first account of a successful organogenesis-based protocol for *P. dulce* regeneration. Antibacterial activity that has been seen may provide new opportunities for medication development and the management of antibiotic-resistant pathology. Therefore, past research suggests that *P. dulce* has antioxidant, antibacterial, and antifungal properties. Alkaloids, flavonoids, saponins, and terpenoids are only a few examples of the biologically significant phytoconstituents that phytochemical screening reveals are present. The methanolic extract of *P. dulce* plants effectively inhibited both pathogenic Fungus. Generally speaking, we found that the level of fungicidal or fungi static action varied during the sampling season.

Conclusion

Ganga imli, also known as *Pithecellobium dulce Benth*., is a plant with significant therapeutic value and serves as a substitute food source for both people and animals. It has been discovered that the *P. dulce* plant, particularly the seeds, is a rich source of proteins, fatty acids, and necessary elements. *P. dulce* possesses antimicrobial, antibacterial, or analgesic activities. It has been noted that the fruits of *Pithecellobium dulce* contain a variety of phytochemical compounds, including alkaloids, saponins, anthraquinones, glycosides, terpenoids, tannins, and flavonoids. The *Pithecellobium dulce* extracts, which are useful for the creation of new antimicrobial medicines, are used to treat infections caused by the pathogens utilised in this study.

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