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Review Article

Formulation And Evaluation of Antibacterial Gel from Ficus Religiosa Bark Extract

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ABSTRACT

In India, herbal remedies have long been the mainstay of medicine. The existence of several complex chemical compounds with varying compositions that are secondary plant metabolites in one or more plant sections gives medicinal plants their therapeutic qualities. Ficus religiosa, also referred to as pepal, is a member of the Moraceae family and has long been used as an antidiabetic, antibacterial, and antiulcer, and to treat skin conditions and gonorrhea. The Bo tree, F. religiosa, provided refuge to the Buddha as he revealed the "Truths." [1].

INTRODUCTION

For thousands of years, plants have been used to preserve human health and enhance the quality of human existence. They are also useful ingredients in beverages, cosmetics, medicines, flavors, and dyes. The foundation of herbal medicine is the idea that plants have inherent compounds that can both prevent and treat disease. Globally, there has been a recent surge in interest in plant study, and a substantial amount of data has emerged demonstrating the enormous potential of medicinal plants utilized in a variety of traditional systems. The usage of herbal treatments is becoming increasingly popular among the general people. Ficus religiosa's historic use and therapeutic potential are highlighted in this review. [2] Among herbal plants, Ficus religious, also known as peepal, holds a significant position. Herbal medicines are made from almost every part of this tree, including the leaves, bark, seeds, and fruits. In the Indian subcontinent, the peepal tree is revered as the "World Tree" or the "Tree of Life." Another name for the peepal tree is Ficus religiosa. It is a variation of the fig tree known as the bodhi tree. The word ‘Ficus’ in Latin refers to ‘fig’, the fruit of the tree and the word ‘Religiosa’ refers to ‘religion’, as it is sacred in both Buddhism and Hinduism. Also, for this reason, it is named ‘Sacred fig’. It is a huge tree often planted near

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holy places and temples. [3] For thousands of years, medicinal plants have been used to preserve human health and enhance the quality of human existence. They are also used as useful ingredients in beverages, cosmetics, medicines, flavors, and dyes. Many plants produce compounds that are beneficial for maintaining both human and animal health. New medications with more potent and desired activity and fewer or no adverse effects against certain diseases are being developed today with the goal of expanding the vast range of therapeutic uses. With about 800 species and 2000 variations, the genus Ficus (Moraceae) is one of the largest angiosperm genera. It can be found in the majority of tropical and subtropical forests across the world. Traditional medicine heavily relies on herbal medicines. [4]

Image no.1 Ficus religiosa plant

Image no.2 Branches of Ficus religiosa

History:

The most well-known species in the genus Ficus, Ficus religiosa, usually referred to as peepal, has over 150 different names. In Indian culture, Ficus religiosa has mythological, religious, and therapeutic significance. Numerous ancient sacred scriptures, including the Arthasastra, Puranas, Upanishads, Ramayana, Mahabharata, Bhagavadgita, and Buddhistic literature, make reference to Ficus religiosa [6]. Before Gautama Buddha sat under its branches to meditate and become enlightened, the fig tree Ficus religiosa was already renowned as the bodhi tree. Considered the fabled 'World Tree' or the 'Tree of Life' of the Indian subcontinent, it is the oldest tree ever portrayed in Indian literature and art. The name 'Sacred Fig' was given to this plant because it is revered by adherents of Buddhism, Jainism, and Hinduism. It is said that Siddhartha Gautama was "enlightened" (Bodhi) or "awakened" (Buddha) while seated beneath a bo tree. Bo trees are so widely recognised as symbols of joy, wealth, longevity, and good fortune [7] The bo-tree, or Ficus religiosa, is a well-known emblem of luck, longevity, prosperity, and happiness. Because it is revered by adherents of Buddhism, Jainism, and Hinduism, it was given the moniker "Sacred Fig" [8]. The sacred fig, also known as the peepal tree, is a huge deciduous tree. It is frequently grown close to temples and other sacred locations. One tree in Sri Lanka is reportedly over a thousand years old, making it one of the longest-living trees. This tree develops quickly, and its roots are affixed to the trunk like pillars to sustain it. The soil must be deep enough to allow the roots to spread out widely, and the tree requires plenty of room. Kalpvruksha is another name for it [9]. According to the Brahma and Padma Puranic stories, Vishnu once hid in the peepal after the demons vanquished the gods. Therefore, a peepal can be offered in spontaneous devotion of Vishnu

without the necessity for a temple or representation of him. The peepal, a representation of Vishnu, is also taken into account in the Skanda Purana. It is thought that he was born beneath this tree. According to some, the tree contains the Trimurti, with the foliage representing Shiva, the trunk representing Vishnu, and the roots representing Brahma. This tree is linked to spiritual wisdom because it is thought that the gods have their discussions beneath it. Krishna is also strongly associated with the peepal. He states in the Bhagavad Gita: "I am the Ashvattha among trees." The current Kali Yuga is claimed to have started after Krishna is said to have perished beneath this tree. In India, five trees (Panchavat) are revered. Fig trees, a wild fig (Sycamore) tree (Gular), banana trees, pakar (citron-leaved) trees, Indian fig trees, and mango trees are the first five. The Skanda Purana states that a peepal should be considered a son if one does not have one. The family name will endure for as long as the tree survives. Cutting down a peepal is seen as a sin that is akin to killing a Brahmin, which is one of the Panchapataka, or five fatal sins. The Skanda Purana states that doing so condemns a person to hell. [10]

Taxonomy / Botanical Classification [11]

Domain: Eukaryota
Kingdom: Plantae
Subkingdom: Viridaeplantae
Phylum: Tracheophyta
Subphylum: Spermatophytina
Infraphylum: Angiospermae
Class: MagnoliopsidaBrongniart.
Subclass: Dilleniidae.
Super order: Urticanae
Order: Urticales
Family: Moraceae
Division: Magnoliophyta
Tribe: Ficeae
Genus: Ficus (FY-kus) Linnaeus
Specific epithet: religiosa L.

Phytochemical Screening Tests:[12]

a) Test for Carbohydrates:

Benedicts test: To 1ml of extract solution, add 2ml of Benedict's reagent and heat on a water bath for 10-15minutes. Observe the colour change in the test tube.

b) Test for Alkaloids: -

Dragendorff's test: To 2 ml of the extract added 1 ml of Dragendorff's reagent along the side of the test tube. Formation of orange or orange reddish brown precipitate indicated the presence of alkaloids.

c) Test for Tannins:

Ferric chloride test: This detection was based on blue colour formed by the addition of few drops of 5% ferric chloride solution to 2 ml of the extract solution.

d) Test for Flavonoids:

Shinoda test: A few magnesium turnings and 5 drops of concentrated hydrochloric acid was added drop wise to 1 ml of the extract solution. A pink, scarlet, crimson red or occasionally green to blue colour appeared after few minutes confirm the presence of flavonoids.

e) Test for Saponins:

Foam test: 5 ml of the extract was taken in a test tube was shacked well for five minutes. Formation of stable foam indicates the presence of saponins.

f) Test for Glycoside:

Kellar killani's test : Dissolve the crude extract in water with glacial acetic acid, ferric chloride and

add concentrated sulphuric acid, presence of brown ring at the junction indicates the presence of glycosides.

g) Test for phenols:-

Folin ciocalteu test: To the extract solution add Folin ciocalteu reagent. The formation of blue color indicates the presence of phenols.

Antibacterial And Antifungal Activities:[14]

Numerous secondary metabolites, including flavonoids, alkaloids, terpenoids, and tannins, are abundant in medicinal plants. These phytochemicals are what provide the plant its wide range of pharmacological and antibacterial properties. Numerous infections have been observed to be becoming more resistant to widely used synthetic antibiotics. To combat the different ailments brought on by these resistant pathogens, a number of medicinal plants have been sought out and screened for possible antibacterial action. For instance, in developing nations, diarrhea is a prevalent cause of morbidity and mortality among infants and children. The majority of human gut flora is non-pathogenic. On the other hand, some strains, such as Enterotoxigenic E. Coli (ETEC), are extremely harmful. According to Uma et al. (2009), ETEC is the most common kind of diarrhoeagenic E. coli in India. The quest for therapeutic plants that contain different natural chemical compounds that impede the growth of these infections is therefore quite intense. It has been discovered that different portions of Ficus religiosa have antibacterial action against a variety of bacterial and fungal species because of some of these bioactive compounds. The microbiological assay, which gauges an antibiotic's activity that is, its capacity to stop the growth of microorganisms has been the subject of a great deal of research, and many reports have been released to date. In order to examine Ficus religiosa's antibacterial properties, Ramakrishnaiah and Hariprasad measured the zone of By measuring the zone of inhibition (ZoI) created by two different solvent extracts methanol and diethyl ether extracts of bark and leaves on three bacteria two Gram negative bacteria (E. coli and Pseudomonas aeruginosa), one Gram positive bacteria (Staphylococcus aureus), and one fungus (Aspergillus niger) Ramakrishnaiah and Hariprasad examined the antimicrobial activity of Ficus religiosa. The experiment employed methanol and diethyl ether extractions of F.religiosa bark and leaves at varying concentrations (100, 200, 300, and 400 mg/ml). The experiment was conducted using the disc diffusion technique. Three microorganisms were susceptible to the antibacterial activity of the bark and leaf methanol extracts. Methanol extracts exhibited reduced antibacterial activity at lower doses and increased activity against the three tested microorganisms at 400 mg/ml. Methanol extracts from leaves and bark produced ZoI of 2.8 and 2.2 mm in S. aureus and 2.4 and 1.8 mm in E. coli, respectively. P.aeroginosa produced a tiny ZoI (2.2 and 1.1 mm) in leaf and bark methanol extracts. However, very little effect against fungus (A. niger) was seen at higher concentrations (40 mg/ml), whereas no activity was seen at lower concentrations. The leaf and bark diethyl ether extracts exhibited varying levels of antibacterial activity against the three tested bacteria, but A. niger exhibited no action at any concentration. The bacteria exhibited inhibition and noactivity on P. aeroginosa and A. niger in the diethylether extract of bark, with E. coli ZoI measuring 1.0 and 0.9 mm and S. aureus measuring 1.4 and 1.2 mm. Leaf extracts in diethyl ether demonstrated no effect against A. niger but inhibitory activity against three tested microorganisms. According to the aforementioned findings, A. niger was not affected by the diethyl ether extract of leaves and bark at any of the tested concentrations. According to the

findings, Ficus religiosa leaf and bark methanol extracts significantly inhibited the activity of the tested bacteria compared to leaf and bark diethyl ether extracts.[15]

MATERIAL AND METHOD:

The plant Ficus religiosa's root bark was gathered. After being carefully cleaned with tap water and allowed to dry in the shade, the root bark was ground into a fine powder. For future research, it is kept in an airtight container. Chemicals include distilled water, petroleum ether, methanol, chloroform, and hexane. Tools: heating mantle, soxhlet device, hot air oven, and weighing balance. [16]

Preparation Of Extracts:

The root bark was gathered, cleaned, and any foreign objects that stuck were taken out. For two weeks, the root bark was then shade-dried. The crude medication was powdered and kept for later use in a closed jar. 50 grams of crude drug were precisely weighed and placed in a thimble of Soxhlet equipment. For 72 hours, 250 milliliters of solvents in increasing polarity order—hexane, pet ether, chloroform, methanol, and water—were used to extract the drug. In order to concentrate each extract, the solvent was first distilled off and then evaporated until it was dry enough to form residue. Next, determine the extract's yield %. [17]

Phytochemical Screening Tests:[18]

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Nutritional Composition: [19]

The tree of F. religiosa has significant nutritional composition in its all parts. The fruits are rich in macronutrients and micronutrients. Fruits of F. religiosa are a healthy source of carbohydrates, protein, fat Dietary fiber, calcium and iron which is used in fresh or dried form (Bhogaonkar et al., 2014 ; Verma and Gupta, 2015). Besides fruit, leaves and bark of F. religiosa are also rich in carbohydrates, proteins and fat (Wangkheirakpam and Laitonjam, 2012).

Active Constituents: [20]

The term "phytochemistry" refers to the chemistry of natural products that are used as innovative medications. According to preliminary research, F. religiosa is abundant in cardiac glycosides, wax, flavonoids, terpenoids, tannins, and saponins. Bergapten, lanosterol, β-sitosterol, stigmasterol, lupen-3-one, β-sitosterol-d-glucoside, leucocyanidin-3-0-β-D-glucopyranoside, leucopelargonidin3-0-β-D-glucopyranoside, lupeol, ceryl behenate, lupeol acetate, and α-amyrin acetate are all abundant in the barks of F. religiosa (Swami et al., 1996; Swami et al., 1989; Ambike et al., 1967; Singh and Goela, 2009). Campesterol, α-amyrin, lupeol, tannic acid, n-nonacosane, hexacosanol, and n-octacosane are all abundant in peepal leaves (Panda et al., 1976; Verma et al., 1986; Behari et al., 1984). (e)-β-ocimene, α-thujene, α-pinene, α-terpinene, limonene, α-ylangene, α-copaene, β-caryophyllene, α-humulene, γ-cadinene, and δ-cadinene are all present in the fruit portion.

Phytochemical Constituents:[21,22,23]

Preliminary phytochemical screening of F. religiosa barks, showed the presence tannins, saponins, flavonoids, steroids, terpenoids and cardiac glycosides.

Constituents of the bark:

From the petroleum ether and alcoholic extracts of the bark of F. religiosa, phytosterols such as lanosterol, β-sitosteryl Dglucoside, bergapten, bergaptol, and stigmasterol have been identified. About 8.7% of F. religiosa's total tannin content is found in its bark. Phenolic components, acid detergent fiber (ADF), neutral detergent fiber (NDF), acid detergent lignin (ADL) and saponins have been identified in the inner bark of F. religiosa. The bark also contains tannin, wax, saponin, leucocyanidin-3-0-β-D-glucopyrancoside, leucopelargonidin- 3-0-β-Dglucopyranoside, leucopelargonidin-3-0-α-L-rhamnopyranoside, lupeol, ceryl behenate, lupeol acetate, α-amyrin acetate, leucoanthocyanidin and leucoanthocyanin. [24]

Constituents of the fruits :

The two most prevalent amino acids in F. religiosa fruit pulp are asparagine and tyrosine. Flavonoids, specifically kaempeferol, quercetin, and myricetin, as well as other phenolic components, are abundant in the fruits of F. religiosa. 24 The components of leaves α-amyrin, lupeol, tannic acid, arginine, serine, aspartic acid, glycine, threonine, alanine, proline, tryptophan, tryosine, methionine, valine, isoleucine, leucine, nonacosane, n-hentricontanen, hexa-cosanol, and n-octacosan are among the compounds that are found in leaves.[25]

Constituents of the seeds:

β-sitosterol and its glycoside, phytosterolin, albuminoids, carbohydrates, fatty matter, coloring matter, and caoutchoue (0.7 5.1%) are all present in the seeds. The following lists the key structures of the active ingredients found in F. religiosa. Lanosterol β-sitosterol sigmastrol Kaempferol [26,27]

CONCLUSION:

Ficusreligiosa is a rich source of nutrients as well as phytochemicals. Richness in vital components make it a wholesome tree with several medicinal and health properties. It has been used traditionally to cure many diseases and is also an important ingredient of Ayurveda herbs. Animal based studies have proved its effectiveness to prevent and cure various diseases and hence strengthened its claim of herbal medicine. The use of F. religiosa in the food preparations can help to meet the demands of nutraceuticals and functional foods.

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