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Review Article

Comprehensive Phytochemical Profiling And Therapeutic Applications Of *Plecosperrum Spinosum Trecul*: An Endangered Medicinal Plant

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ABSTRACT

The Moraceae family includes the medicinal herb *Plecosperrum spinosum* Trecul. In colloquial Tamil, it is called "Korratimul" and is an endangered species of medicinal plant. The goal of the current study was to learn more about this plant's possible medical applications, including as its capacity to fight infections and cure a range of ailments. The antibacterial, antioxidant, and antimicrobial properties of the plant's methanolic extract were evaluated against a variety of pathogens, including *Proteus vulgaris*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, *Escherichia coli*, *Shigella Flexheri*, and *Streptococcius mutants*. Gas chromatography-mass spectrometry (GC-MS) was also used to quantify the plant's phenolic compounds, flavonoids, saponins, tannins, sterols, sugars, and free amino acids. 35 distinct phytochemical components, including flavonoids (164.88, 1.1, and 1.12 mg/mg) and triterpenoids (70.34, 2.1, and 164.28 mg/g) as well as other bioactive phytochemicals, were found in the ethanolic leaf extract after phytochemical screening. The extract's noteworthy medicinal potential is further highlighted by the antibacterial and antioxidant activities found in it. This thorough examination provides a promising route for the discovery of natural cures and the preservation of biological resources, as well as for future research and development.

INTRODUCTION

For thousands of years, plants have been an essential component of conventional medical systems, helping to treat a wide range of diseases all across the world. Between 70 and 80 percent of natural medicines are derived from plants; 92 plant species have produced 122 bioactive potentials

[1]. In developing countries, plants constitute a primary source of medicine, contributing to the development of novel and inventive drugs that address a variety of ailments [1, 2]. Globally, research on medicinal plants and their traditional applications for therapeutic purposes has increased

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during the past few decades. To protect and make use of biological resources, ethnobotanical research needs to document traditional knowledge held by indigenous people. Numerous physiologically active compounds are known to comprise medicinal plants that have been extracted and employed, based on licensed pharmaceuticals from medical plants and ethnobotanical expertise [3]. Approximately 25% of prescribed organic drugs in developed countries come from plant sources, either directly or indirectly [1]. Numerous plants and herbs used in ethnomedicine have a variety of pharmacological and therapeutic qualities [4]. The *Plecosperrum spinosum* Trecul is a large, sprawling shrub that climbs with the help of its powerful, long, straight thorns. It belongs to the Moraceae family and is known as "Korratimul" in colloquial Tamil [1]. *Plecosperrum spinosum* is commonly referred to as "Paper cup flower". The *Plecosperrum spinosum* plant is used to dye silk fabrics. Although the plant's possible medical uses are currently unknown, research is being done in this area. Numerous phytochemicals found in the plant are potent compounds that are actively used to treat a variety of illnesses, including diabetes, cancer, myocardial infarction, and others [5, 6]. Plants are known to produce a wide range of secondary metabolites as a defense mechanism against a number of illnesses. Previous research indicates that the plant extracts' higher antibacterial qualities may have been attributed to the presence of bioactive metabolites in the extracts [1]. Investigating this plant's possible medical applications, such as its capacity to fight infections and cure a range of ailments, is the aim of this study.

TAXONOMICAL CLASSIFICATION



Plecosperrum spinosum plant



Plecosperrum spinosum leaves

Name of plant: *Plecosperrum spinosum* trecul.

Kingdom: Plantae

Phylum: Tracheophyta

Class: Magnoliopsida

Family: Moraceae

Genus: *Plecosperrum*

Species: *Spinosum*

Synonym: *Maclura Spinosa*, *Tropis Spinosa*, *Cudrania Spinosa* [7].

Other names:

Vernacular name: Palkattanji

Common: Ekkimullu, Gumbenfong, Palkattanji, Katuthimbol, Achingudi.

Tamil: Korrataimul, Kattanimul, Koratti, Vennikodi, Ekki mullu, Parankolachedi, Paal kaattaanchi.

Malayalam: Venninkodi

Karnataka: Bendaka, Benduga.

Telugu: Koriti, Kodiari, Giriga, Koriti, Kodiari, Dayamulla, Alasale, Kokinta, Potti murda chettu.

Orisa: Berakanta, Banabanka, Banabana [8-10].

Part used: leaves [11]

CULTIVATION AND COLLECTION

Plant this one in either full sun or partial shade for best results. The soils must not drain poorly since it grows in a wide range of conditions and soil types. Through seeds, the species is spread. A 24-hour soak in water is required for the germination process of seeds. From the coastal lowlands up to 1300 meters, it is harvested in dry evergreen forests. The plant in question is dioecious. Monosexual blooms (either only male or only female flowers) are found on different plants in this species. Plants do not generate ovules and pollen separately. Fruit-eating birds and mammals scatter the seeds while a wide range of insects pollinate the plant [12].

DISTRIBUTION

Plecosperrum Spinosum Trecul. is distributed throughout the following areas: Bangalore, Chickamagalur, Chitradurga, Davanagere, Dharwad, Hasan, Kodagu, Kolar, Mysore, Shimoga, Tumkur, Andhra Pradesh, Chattisgarh, Odisha, Uttar Kannada, Mattuvil, Eastern Ghats, Vellimalai, Devanoor, Kollimalai Hills, Perumakkai Shola, Vengodai Shola, Mottukkada Shola, Coromandal Coast, Oorani, Puthupet, Pachamalai Hills, Thiruvallur, Ramanathapuram, and Pushpavanam are located in Nagapattinam District, Jambavanodai is located in Thiruvarur District, and Kollam is located in Kerala It can also be found in the Deccan and Eastern Himalayas. Kannada State's Kolar district; Tamil Nadu State; Andhra Pradesh State's West Godavari, Srikakulam, Visakhapatnam, Kurnool, and Chittoor districts; Odisha State's Cuttack, Ganjam, Karlapat Wildlife Sanctuary, Kalahandi district, and Similipal Hills districts (Mayurbhanj district) [11, 13–16]

DESCRIPTION

Habitat:

The plant either has a canopy-reaching habit in mature stands or a more dispersed habit of straggling over adjacent plants. It grows quickly, has lovely foliage, and is useful for fences.

Leaves:

Scandent shrub, glabrous, sub coriaceous, pubescent inflorescence, leaves elliptic or obovate, obtuse or shortly acuminate, cuneate to 95×45 cm. The leaves are 6–10 cm long and 3–4 cm wide, oriented inversely. During the green foliage, leaves began to fall.

Flowers:

Sessile, grouped in groups of thirteen, axillary, pedunculate, capitates clusters; peduncle to 1 cm; staminate and pistillate flowers sessile. Staminate: blooms interspersed with bracteoles at the basal region. Ovalanceolate, tepal 4. Pistillode is small and hairy, Stamens 4 are inflexed in buds, and anthers reflex later. Pistillate: Four toothed tepals that converge into a fleshy head. This plant flowers from March through June [17].

Fruit:

The fruit is golden in color and belongs to the berry category. Simple style; ovary sunken. A few anthocarps are surrounded by irregularly shaped, somewhat inclined syncarps that are up to 1 cm broad, with the achenes submerged. This plant ripens from July to September [18].

Seed:

The ellipsoid or reniform, light brown, hairy seed of Plecospermum spinosum is produced. About 6–8 mm long and 5–6 mm broad make up the seeds.

Bark:

Thin, orange-colored bark with long, thick thorns grows on it. Latex has a milky color. It is straggling, evergreen, with prickly bark that is straight [17, 18].

PHYTOCHEMISTRY

There are several natural substances found in this genus that are major phytochemicals, including alkaloids, phenols, terpenoids, flavonoids, and tannins, among many others that are still to be



discovered. Regarding its phytochemistry and biological function, nothing is now known about this endangered species of medicinal plant. Flavonoids are a significant chemical component of *Plecosperrum Spinosum* [19].

CHEMICAL COMPOSITION

This genus's primary phytochemicals are a variety of naturally occurring substances, primarily alkaloids, phenols, terpenoids, flavonoids, and tannins.

ETHNOBOTANICAL AND MEDICINAL USES

Aerial Portions effective for treating diabetes [10]. In addition to being used for toothaches, the latex's stem is also used to curdle milk [20]. This plant's dried wood powder is combined with coconut oil and used on wounds [21]. Cholera can be cured by using stem thorn [22]. Yellow dye is produced from the bark and heart wood, and it is used to dye silk textiles [8]. Ayurvedic remedies for colds, coughs, and syphilis include root decoction [23]. The plant's many phytochemicals are active chemical substances that have been shown to be beneficial in the treatment of conditions like cancer and myocardial infarction [24]. The herb is employed in a range of general foods, according to the results of an ethnobotanical investigation of medicinal plants in the Pammala Hills [25]. Plants in the Moraceae family are thought to have a large amount of cardiac glycosides, which are useful in the treatment of heart-related conditions [26–28]. This plant contains phytoconstituents such as phenols, which are utilized for bacterial activity [29]. Terpenoids are a sign that a plant contains some pharmacologically active groups, like steroids and cardiac glycosides [30]. Flavonoids show that this plant has the ability to scavenge free radicals and cause oxidative cell damage, which suggests that they are involved in the ant cancer activity of the plant. Tannins are a part of the plant's defense mechanism, and the presence of

alkaloids can be used as effective pharmaceutical stimulants [31].

PHARMACOLOGICAL ACTIONS

Antibacterial Activity

The pharmaceutical industry has benefited greatly from the use of medicinal plants to treat a wide range of illnesses and conditions since these plants have the potential to have fewer adverse effects than chemical medications. Many plants, including aloe vera, asafetida, and alfalfa, are used to cure skin conditions, ease respiratory issues, and lower cholesterol, respectively. The goal of the current study was to emphasize the pharmacological and phytochemical properties of *Plecosperrum spinosum*, one such herbal plant. A phytochemical screening for *Plecosperrum spinosum* was carried out using methanol extract. To determine the solvent combination that will extract the greatest amount of chemicals from the plant leaf, thin layer chromatography was first used. Furthermore, *Escherichia coli*, *Bacillus subtilis*, *Micrococcus luteus*, *Staphylococcus aureus*, *Shigella Flexheri*, *Streptococcus mutants*, *Proteus vulgaris*, and *Klebsiella pneumoniae* were examined for the ability of the *Plecosperrum spinosum* methanolic extract to inhibit bacterial growth [19].

Antioxidant activity and Antimicrobial activity

The current study assessed the methanolic leaf extract's antioxidant capability using phosphomolybdenum and in vitro free radical scavenging assays. At 100 $\mu\text{g/mL}$ ($86.48 \pm 0.8\%$), the (2,2'-azino-bis(3-ethylbenzothiazoline-6-sulfonic acid)) (ABTS•+) test demonstrated a strong ability to scavenge free radicals. When comparing the development of *Pseudomonas aeruginosa* (9 ± 0.7 mm) and *Echinodontium tinctorium* (12 ± 0.9 mm) with the other pathogens under investigation, the antibacterial activity of the methanolic leaf extract was shown to be significantly lower. For anti-inflammatory activity, the hemolysis (%) was computed, and the



results indicated dose-dependent effects. When 800 g/mL extract was compared to control aspirin ($90.41 \pm 1.3\%$ at the same concentration), the lowest inhibition ($53.08 \pm 1.5\%$) was found. The presence of triterpenoids, flavonoids, saponins, tannins, sterols, sugars, and free amino acids was verified by qualitative phytochemical testing. Gas chromatography-mass spectrometry (GC-MS) was used to identify a total of 35 distinct phytochemical substances. In addition, quantitative estimations were made for the flavonoids (164.28 ± 1.1 mg/g), phenolics (70.34 ± 2.1 mg/g), and other metabolites. These findings showed that the presence of bioactive phytochemicals in *Plecosperrum spinosum* Trecul's methanolic leaf extract contributed to its notable antioxidant and antibacterial properties. *P. spinosum* can be used to separate new bioactive compounds that have possible uses in medicine [1].

CONCLUSION

In summary, *Plecosperrum spinosum* research provides an intriguing exploration of the potential medicinal uses of this plant, shedding light on its traditional, ethnobotanical, agricultural, and medicinal aspects. The plant's phenolic components, flavonoids, and other bioactive phytochemicals have the potential to treat a variety of ailments, including diabetes, cancer, and heart-related issues. The antibacterial, antioxidant, and antimicrobial qualities of the methanolic leaf extract further highlight its immense therapeutic potential. Due to its widespread distribution throughout numerous regions, *Plecosperrum spinosum* is significant and may have an impact. The diverse variety of ethnobotanical and medicinal qualities of this vulnerable species warrant further research to develop novel drugs and cures. This exhaustive inquiry paves the way for future research and development by offering a feasible route for the analysis of natural remedies and the preservation of biological resources.

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