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Review

Review on medicinal activities of *Phyllanthus reticulatus*

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	Abstract
Published on: 11 Feb 2025	<p>Medicinal plants occupy a very important place throughout the world. There are multipotential plants like <i>Phyllanthus reticulatus</i>, which has the capacity to cure many ailments. Herbals are a safer and more effective way to cure various problems in society. <i>Phyllanthus reticulatus</i> (Phyllanthaceae), commonly known as pancoli or karineli is a large genus and widely distributed in the tropical and subtropical zones like tropical Africa, tropical America, India, Sri Lanka, Southeast Asia, China, and Malaysia are all home to the plant. Scientific proof supporting the pharmacological actions of several sections of <i>Phyllanthus reticulatus</i> is now available after in vitro and in vivo studies. Analgesic, antibacterial, antifungal, anti-human immunodeficiency virus-1, anti-inflammatory, anti-plasmodial, hepatoprotective, and antifungal activity are among the pharmacological activities of the leaf, aerial, root, and stem. They have been used in India and have a beneficial role in Ayurveda for the treatment of digestive genitourinary, respiratory and skin diseases; Hepatitis B, hypertension, dropsy, and sore throat, jaundice, renal calculus, and malaria. The plant contains tannic acid, alkaloids, terpenoids, flavonoids, phenolic compounds, and glycosides as main chemical constituents. The goal of this article is to provide an overview of this plant pharmacological activities. When we evaluate <i>Phyllanthus reticulatus</i> pharmacological and therapeutic activities, we can see that it is a very good and important medicinal plant.</p>
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INTRODUCTION

Herbal medicine has been an integral part of healthcare systems across the world for centuries, providing essential therapeutic options derived from plants. However, the global uptake of herbal remedies is often hindered by insufficient documentation, inadequate quality assurance, and a lack of scientific validation. Traditional systems of medicine, such as Ayurveda, Traditional Chinese Medicine, and African ethno-medicine, heavily rely on the pharmacological potential of medicinal plants to address a range of diseases. Among these, *Phyllanthus reticulatus* (P. reticulatus), a member of the Phyllanthaceae family, has emerged as a versatile plant with notable

therapeutic applications. Despite its significance, the pharmacological properties of this plant remain underexplored in scientific literature, warranting a systematic review to bridge this knowledge gap.

Botanical and Geographical Overview

Phyllanthus reticulatus is a large, straggling, or climbing shrub that can grow up to 8–10 feet in height. The plant is widely distributed across tropical and subtropical regions, including the Malay Islands, China, Bangladesh, and India [1]. The shrub is commonly found in hedges, waste areas, and the edges of forests, thriving in a variety of climatic conditions. Morphologically, the plant is characterized by pubescent stems, alternate ovate-elliptic leaves, and unisexual flowers. Its fruits are small, fleshy, and globose, turning purple-black upon ripening. These attributes not only contribute to its adaptability but also play a role in its medicinal applications.

Pharmacological Properties

Extensive research has revealed the plant's pharmacological versatility. Extracts from different parts of *P. reticulatus* exhibit significant antidiabetic [2], anti-plasmodial [3], hypocholesterolemic [4], hepatoprotective [5], antibacterial [6], antihyperglycemic [7], analgesic, and anti-inflammatory activities [8]. These effects are attributed to the presence of bioactive compounds such as tannic acid, alkaloids, flavonoids, phenolic compounds, and glycosides. For instance, the hypoglycemic effects of the plant have been demonstrated in studies involving alloxan-induced diabetic mice, showing improved glucose metabolism at various doses of plant extracts [2].

Traditional Applications in Medicine

Historically, *P. reticulatus* has been an essential component of traditional medicinal practices. In India, the plant is used to treat liver disorders, jaundice, and bleeding gums. Decoctions made from the dried bark and leaves serve as diuretics and are also used for smallpox treatment in Ayurveda [9]. Similarly, in African traditional medicine, powdered leaves are applied to sores and burns, while roots are used as purgatives and for dyeing purposes. The therapeutic potential extends to Southeast Asia, where the bark decoction is employed as an astringent, and the fruits are used to manage bowel inflammation [10]. In China, the plant has been used to treat smallpox and syphilis, while its fruit serves as a nutritional resource during periods of scarcity in East Africa [11].

Cultural and Regional Significance

The widespread use of *P. reticulatus* in different cultural contexts highlights its importance as a medicinal resource. For example, in the Philippines, ripe fruits are processed to prepare ink and are also used to treat inflammation and bowel diseases. Similarly, traditional remedies in Japan employ dried leaves and bark for digestive and hepatic disorders, while in Bangladesh, decoctions of aerial parts are used for respiratory conditions and diarrhoea [12]. These diverse applications underline the plant potential to address a broad spectrum of health issues.

Rationale for Review

Despite its prominent role in traditional medicine, only medicinal properties of the fraction have been validated through scientific studies. Existing research has primarily focused on specific pharmacological activities, leaving a significant gap in understanding its comprehensive therapeutic potential. Additionally, variations in preparation methods, dosages, and regional practices have further complicated the documentation of its efficacy. This review aims to provide a detailed analysis of the pharmacological and therapeutic properties of *P. reticulatus*, serving as a foundation for future investigations.

Aim of the Study

The primary objective of this review is to collect, analyse and summarize the existing scientific evidence on the pharmacological activities of *P. reticulatus*. By consolidating traditional knowledge with contemporary research findings, this work seeks to promote the development of standardized herbal formulations and encourage further pharmacological research. Furthermore, this review highlights the need for systematic studies to validate the safety, efficacy and mechanism of action of *P. reticulatus*.

Scope of Pharmacognostical Studies

This review also explores the pharmacognostical profile of *P. reticulatus*, encompassing its morphological, anatomical, and chemical characteristics. Such an approach not only aids in the identification and authentication of the plant but also ensures quality control in the development of herbal products. Moreover, the review underscores the plant potential for drug development, particularly in the fields of hepatoprotection, anti-inflammatory therapy, and diabetes management.



A. Leaf and flower of plant



B. Fruits of the plant

Plant taxonomy

Domain : Eukaryota
 Kingdom : Plantae
 Claudus : Angiosperm
 Order : Malpighi ales
 Genus : Phyllanthus
 Species : Phyllanthus reticulatus
 Family : Phyllanthaceae

Description: ^[2,3,6]

Plant habit: It is a large, straggling or climbing shrub growing from 8 to 10 ft in height.

Origin: The plant is widely distributed in tropical Africa, tropical America, Sri Lanka, Southeast Asia, China, Malaysia and throughout India, mostly in hedges or waste places.

Stem: The stem is pubescent, cylindrical and the matured stem is blackish-brown and it is green in young.

Leaves: Leaves have an alternate arrangement, ovate-elliptic. The margins of the leaves are entire margins. The apex of the leaves is acute; the ventral side is dark green in colour while dorsal side is light green in colour. The size of the lamina is 2-2.5 x 1-1.5 cm, abaxially glaucous, with 5-7 pairs of lateral veins, and the petiole is 0.2-0.4 cm long. The leaves are acute at both ends.

Flowers: The flowers are unisexual, axillary cyme on slender branches. The male flowers are clustered and the female flowers are solitary, sometimes both mixed. A female flower is grouped with a number of male blooms from September to October, flowers are in bloom.

Calyx: Calyx is glabrous and reaches 1 - 2 mm long; the Segment is oblong and very obtuse, alternating the glands of the disk.

Stamens: They have 5 stamens; the 3 inners connate into a column, the 2 outers free, shorter.

Ovary: Ovaries are globose, which consist of 5-10 celled; ovules 2 in each cell, superposed; style 3, which are minute and 2-lobed.

Fruit: The roundish, fleshy berry fruits of *P. reticulatus* are globose, smooth and shining have a strong odour with a 4-6 mm diameter. They start out green and soon become purple-black. They consist of 8-16 seeds. Seeds are irregularly trigonous and finely granulate.

Common names: ^[4,6,7]

Tamil : Karunelli, Kattukilanelli, Nirppul, Abaranji
 Sanskrit : Pulika, Krishna-kamboji
 Bengali : Panjulil
 Gujarati : Datwan
 Hindi : Panjuli, Makhi, Buinowla
 Kannada : Pulaveri, Anamsule, Huli balli, Karisuli
 Malayalam : Niruri, Nireli
 Marathi : Pavana
 Oriya : Jandaki
 Telugu : Nallapuli, Nallapurugudu, Pulaguwa, Phulsar
 Punjab : Panjuli
 Delhi : Neelbari
 Rajasthan : Kabonan
 Assam : Amluki

Traditional Use of *Phyllanthus reticulatus* in Various Countries

Phyllanthus reticulatus has been valued for its therapeutic properties across diverse cultures and regions. Its application ranges from treating minor ailments to addressing more complex health issues, underscoring its adaptability and medicinal significance.

India

In India, *Phyllanthus reticulatus* is prominently used in Ayurvedic medicine. The dried bark and leaves are prepared as a decoction to serve as a diuretic, coolant, and remedy for smallpox. This preparation is also employed for treating liver disorders such as jaundice and hepatitis. The dried bark is particularly effective in treating bleeding gums, often used in conjunction with other herbal remedies. Additionally, the root of the plant is traditionally applied to treat "Madras eye", a localized form of conjunctivitis, emphasizing its role in ocular health. These uses demonstrate the plant's multifunctional nature and its integration into traditional healthcare practices [13,14,15].

Africa

African traditional medicine relies on the powdered leaves of *P. reticulatus* for external application to heal sores, burns, and chafed skin. This reflects its strong antimicrobial and soothing properties. Furthermore, the roots and bark are processed to create dyes that range from red to black, highlighting its utility beyond medicine. The decoction of the root and bark is also used as a potent purgative, addressing digestive issues such as constipation and intestinal blockages [16].

Sri Lanka

In Sri Lanka, the bark decoction is widely used for its astringent and diuretic properties, often incorporated into remedies for managing fluid retention and edema. The fruits are particularly known for their ability to alleviate bowel inflammation, showcasing their utility in addressing gastrointestinal disorders. This highlights the plant's role in promoting digestive health and managing inflammatory conditions [17].

Indo-China

In Indo-China, *P. reticulatus* is employed as a remedy for severe ailments such as smallpox and syphilis, reflecting its historical importance in combating infectious diseases. The fruits, known for their astringent properties, are used to manage inflammation and conditions related to blood disorders. These practices underscore the plant's versatility and its potential in treating systemic diseases [18].

Philippines

The Philippines has found unique uses for *P. reticulatus*. The ripe fruits are processed to produce ink, but they are also utilized medicinally as an astringent for bowel disorders and inflammation. The leaves and bark are prepared as diuretics, often included in traditional therapies to manage urinary and kidney-related conditions. These applications demonstrate the plant's dual-purpose use in both utility and medicine [19].

Japan

In Japan, the dried leaves and bark of *P. reticulatus* are commonly used to treat digestive issues, including constipation. Moreover, the entire plant is utilized for its hepatoprotective effects, addressing liver disorders such as hepatitis and cirrhosis. This emphasizes its importance in managing chronic diseases and promoting overall digestive and hepatic health [20].

Bangladesh

In Bangladesh, the aerial parts of *P. reticulatus* are widely used for respiratory problems such as coughs, colds, and asthma. Decoctions prepared from the plant are prescribed for diarrhea, dysentery, and digestive issues, reflecting its broad-spectrum use in traditional medicine. These practices highlight its role in managing both respiratory and gastrointestinal ailments [21].

Biological activity of *phyllanthus reticulatus*

Antidiabetic Activity

The methanolic and petroleum ether extracts of *P. reticulatus* leaves have been extensively studied for their antidiabetic potential. In experimental models involving alloxan-induced diabetic mice, the plant extracts demonstrated significant hypoglycemic and antihyperglycemic effects. At doses of 500–1000 mg/kg, the extracts improved glucose metabolism, with the higher doses showing superior efficacy. These findings suggest that *P. reticulatus* could be developed into a complementary therapy for diabetes management [22,23].

Antimicrobial Activity

Methanolic extracts of the stem bark have shown strong antibacterial properties. Studies using the disc diffusion method revealed that extracts prepared with ethyl acetate, petroleum ether, and chloroform were effective against bacterial strains such as *E. coli*, *K. pneumoniae*, *S. aureus*, and *Vibrio cholera*. Among the solvents, ethyl acetate extracts exhibited the highest antibacterial activity, evidenced by larger inhibition zones. These findings underscore the plant's potential in developing antimicrobial agents [24,25].

Hypocholesterolemic Activity

Aqueous extracts of *P. reticulatus* (250–500 mg/kg) demonstrated significant reductions in triglycerides, LDL cholesterol, and oxidative stress in hypercholesterolemic rats. Simultaneously, the extracts increased HDL cholesterol levels, highlighting their effectiveness in improving lipid profiles. These properties suggest potential applications in cardiovascular health and cholesterol management [26].

Cytotoxic Effect

Methanolic extracts of *P. reticulatus* exhibited cytotoxic activity against colon cancer cell line HT-29, with an IC₅₀ value of 69.65 µg/ml. Further, chloroform-soluble fractions displayed significant cytotoxicity in brine shrimp lethality assays. This suggests that the plant contains bioactive compounds with anticancer potential, making it a candidate for further cancer research [27].

Hepatoprotective Effect

Methanolic extracts of the plant's aerial parts have been shown to protect the liver in CCL4-induced liver damage models. The treatment reduced serum levels of liver enzymes (SGPT, SGOT, ALP) and bilirubin, indicating its hepatoprotective effects. These findings support its traditional use in liver disease management and warrant further investigation into its mechanisms [28,29].

Analgesic and Anti-inflammatory Effects

In animal studies, methanolic extracts reduced acetic acid-induced writhing in mice, demonstrating dose-dependent analgesic effects. At doses of 100 and 200 mg/kg, inhibition rates of 40.19% and 51.95% were observed, respectively. These findings suggest the plant's potential as a natural alternative for pain and inflammation management [30].

Antiplasmodial Effect

The leaves of *P. reticulatus* demonstrated in vitro antiplasmodial activity against chloroquine-sensitive and chloroquine-resistant strains of *Plasmodium falciparum*. IC₅₀ values were ≤10 µg/ml, showcasing its potential as a novel antimalarial agent [31].

Antiviral Activity

The plant's ethanolic extracts exhibited antiviral activity against the hepatitis B virus (HBV). Two semi-purified fractions (PR1 and PR2) effectively reduced HBsAg levels in serum samples from infected patients. This highlights its potential in antiviral drug development, particularly for HBV [32].

Antioxidant Activity

Methanolic and ethanolic extracts of *P. reticulatus* exhibited strong antioxidant properties. Assays such as DPPH radical scavenging, β-carotene bleaching, and lipid peroxidation confirmed its ability to mitigate oxidative stress. The methanolic extract showed superior activity, with low IC₅₀ values across various in vitro models [33].

CONCLUSION

Phyllanthus reticulatus, is popularly known as black-honey shrub having many branches, reddish brown or greyish brown bark and small, roundish berries. This study explained the morphological, anatomical, and chemical characteristics of the plant thereby leads to the identification, authentication including quality control of the plant derived herbal products. This plant was used traditionally for its antidiabetic, antimicrobial, hypoglycemic, cytotoxic, hepatoprotective, analgesic, anti-inflammatory, antispasmodic, antiviral and antioxidant activities in many countries such as India, Africa, Srilanka, Indo-china, Philippines, Japan, Bangladesh etc.

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