A REVIEW ON PAJANELIA LONGIFOLIA (WILLD.) K. SCHUM; AN IMPORTANT MEDICINAL PLANT

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ABSTRACT
Nature renders the primary necessities of individuals to be alive or self-care. With basic demands of particulars as food and shelter, nature also possess the therapeutic attributes which are due to the presence of various complex chemical substances as secondary plant metabolites in one or more parts of these plants. These natural substances reveal strong efficacy against several assorted diseases and promote health and alleviate illness. The present review emphasizes on traditional uses and clinical potentials of Pajanelia longifolia (Willd.) K. Schum, is a large evergreen tree found throughout the world as the wild plant. Previous pharmacological studies revealed that Pajanelia longifolia possessed anti-bacterial, hepatoprotective, anti-diabetic, anti-inflammatory, antioxidant and wound healing effects. The current review highlights the chemical constituents and pharmacological effects of Pajanelia longifolia.

KEYWORDS: Pajanelia longifolia, Phytochemistry, Pharmacological activities.

INTRODUCTION
Traditional system of medicine shows that plants have provided mankind large variety of patented drugs to cure various diseases. The drugs used in the traditional system of medicine are all crude drugs in their natural states or as their preparations. The crude drug thus, acts as a single chemical agent without any or much side effects unlike synthetic drugs. Bignoniaceous plants have significant medicinal value.2 Pajanelia longifolia (Willd.) K. Schum is a briefly deciduous or evergreen, small to medium sized tree belonging to the
family Bignoniaceae. Commonly distributed in the Western Ghats and Eastern Bengal in India and other tropical countries such as Bangladesh, Myanmar, and Burma.[1]

One of the earliest treatises on Indian medicine, the Charaka Samhita (1000 BC), records the use of this plant in the treatment of arthritis, stomach disorder, urinary disorders, etc. This plant also finds its importance in local folklore practitioners in Karnataka for obesity. Ethnobotanical investigation of tribal of Cachar district, Assam, India, revealed the use of bark decoction of this plant in liver ulcer and jaundice since for many years and their effectiveness is widely acclaimed among these tribal communities. Within the tribal communities of Southern Assam, the crude extract of leaves of *P. longifolia* is use to apply on skin to cure infection. The bark of the plant is conventionally claimed to have hepatoprotective property. Within the tribal communities of Southern Assam, the crude extract of leaves of *P. longifolia* is use to apply on skin to cure infection.[9,10,11]

The presence of secondary metabolites like phenol in the bark have been documented in the work of Zainab et al. 2013 where they established for the first time its levels of antioxidant and antimicrobial activity in its bark. Antibacterial activity was reported in its leaves where the leaf extracts containing polar components showed potential antibacterial activity. The preliminary hepatoprotective activity of the stem bark of this plant has been reported by Datta et al. 2012. Although many phytochemicals have been reported from other plants of this family, *P. longifolia* is little studied except for a potent bioactive compound, Pajaneelin discovered long back in 19th century.[12,13,14]

In India, *Pajanelia longifolia* have been distributed in Western Peninsular India, North East India and Nicobar Islands. Traditional healers in the tribal communities of Tripura have been using bark of Pajnelia longifolia for the treatment of Jaundice. Tribal communities of Assam have been using leaves of Pajnelia longifolia for the treating skin and nail infections. Ethnomedical practioners of Dakshina, Kannada district of Karnataka state uses Pajanelia leaves for treating eczema.[4] This paper focuses on taxonomy, distribution, chemical constituents, traditional uses and pharmacological effects of the plant, *Pajanelia longifolia*. 
Plant profile

Figure 1

Synonyms: Bignonia indica Lour, Bignonia longifolia Willd, Pajanelia rheedei Wt.

Vernacular names
Commonly known as: Pajanelia, tender wild jack.
English: Pajaneli
Kannada: Doundi, Mokkudu, Alangi
Malayalam: Palakapayyani, Pajneli, Payyani, Azhantha, Aralantha
Tamil: Aranthal

Taxonomic classification
• Kingdom: Plantae
• Division: Tracheophytes
• Class: Magnoliospida
• Order: Lamiales
• Family: Bignoniaceae
• Genus: Pajanelia
• Species: longifolia

Distribution
This species can be most commonly found within the deciduous and semi-evergreen mountainous rainforests of India, Sri Lanka, Myanmar, Thailand, Malaysia, Sumat...
and Borneo, and up to 1000m above sea level. It is often spotted alongside rivers or within forests adjacent to the coast, and is occasionally found lonesome in the plains.

**Description**

*Pajanelia* grows as a small to medium sized tree with an upright habit, with few sideways branches. It can grow up to 30 metres (98.4 feet) tall. The compound, ovate and chartaceous leaves of *Pajanelia* are imparipinnate and glabrous with 7-17 leaflets. They may be up to 120 cm (47 in) long, with the apex being acuminate. The rachis is triangular and glabrous. The petiolule is 0.6 cm (0.24 in) long and the midrib is flat or slightly canaliculate. The tertiary nerves are broadly reticulate. Between January & June inflorescent panicles of purple flowers with yellow interiors are produced. They are silken along their margins and smell of soap. The flowers bloom at night before fading at dawn. The brown, compressed and glabrous fruit is of capsule shape, 30–45 cm (12–18 in) long and 5–7.5 cm (2.0–3.0 in) wide. It is winged on both margins. The seeds are housed within two valves and are flat, chartaceous and winged on both sides. The trunk is occasionally buttressed and up to 115 cm (45 in) in diameter. The heartwood is white-brown coloured, and the pale grey outer bark is scaly and linearly lenticellate.¹⁵

**Traditional uses**

The hot decoction of the leaves is used externally against stomach disorder and also decoction of leaves is used in curing fever. In Southern Assam, the crude extract of leaves is used in treatment of bacterial and fungal infections. The bark is also used as a hepatoprotective agent. The bark of the plant is used for the treatment of Jaundice. Tribal communities of Assam have been using leaves of *Pajnelia longifolia* for the treating skin and nail infections. Ethnomedical practioners of Dakshina Kannada district of Karnataka state uses pajanelia leaves for treating eczema.⁴

**Chemical constituents**

Medicinal plants have curative properties due to the presence of various complex chemical substances of different composition, which are found as secondary metabolites in one or more parts of these plants. The secondary products of metabolism are formed from primary products and the plant is not able to reutilise them, and they are deposited in the cells as secondary metabolites.⁷
The preliminary phytochemical analysis revealed the presence of tannins, phenols, saponins, flavonoids, triterpenoids, steroids and sugars in ethyl acetate and ethanol extracts of the plant. Also identified the presence of flavanoids, in the ethyl acetate fractions of *P. longifolia* leaf.\(^4\)

**Pharmacological activities**

**Hepatoprotective activity**

The hepatoprotective effect of hexane and methanolic bark extract of *Pajanelia longifolia* was studied in carbon tetra chloride induced hepatotoxicity in mice. In accordance with the acute toxicity studies, the dose concentration of 200 mg/kg body weight per orally of hexane bark extract and methanol bark extract was selected. The treatment protocol followed for six days. Silymarin is used as the standard drug for comparison. The biochemical effects were further confirmed by histological results.\(^1^6\)

Mice treated with a single dose of CCl4 developed significant hepatic damage as observed from elevated serum levels of different liver function parameters. Level of SGOT, SGPT, alkaline phosphatase and bilirubin level in serum were increased in CCl4 intoxicated animals. Treatment with methanol bark extract (200mg/kg body weight p.o.) of *Pajanelia longifolia* afforded a significant protection against CCl4 induced increase in the serum enzyme levels and also in bilirubin level in comparison to bark extract with hexane. The liver histopathology of the control group showed normal hepatocytes whereas the CCl4 intoxicated treatment exhibited localized areas of necrosis and the pre-treatment with (50mg/kg body weight) of Silymarin showing normalization of liver architecture and 200mg/kg body weight of hexane extract and methanolic extract of *Pajanelia longifolia* exhibited healing of necrotic lesions.\(^1\)

**Anti-bacterial activity**

The crude acetone extract of leaves was tested against pathogenic bacteria and found to confer significant antibacterial activity. The antimicrobial activity was determined as per the modified Filter Paper Disc method as suggested by Vincent and Vincent (1944). The antibacterial activity of crude acetone extract of leaves was studied using four different test organisms, viz., Staphylococcus sp., Streptococcus sp., Klebsella sp. and E. coli. The crude extract was further taken up for phytochemical analysis for isolation and characterization of bioactive compound.
The crude extract showed significant antibacterial activity as compared to standard antibiotics. The acetone extract of the leaves showed significant activity against Staphylococcus sp. followed by Streptococcus sp., Klebsiella sp. and E. coli. As compared to the standard antibiotics like gentamycin, penicillin and amikacin, the activity of acetone extracts was significant against the microbes. The antimicrobial analysis of the acetone extracts of leaves against pathogenic microorganisms showed that the leaves of *P. longifolia* possess immense antimicrobial activity.[2]

**Antioxidant activity**

The antioxidant potentiality of the bark extracts of *Pajanelia longifolia* was evaluated using different solvents like hexane, ethyl acetate, acetone and methanol. Total phenol, flavonoid, total alkaloid were analyzed using Folin–Ciocalteu assay, aluminium chloride calorimetric assay. Antioxidant capacity and free radical scavenging potentialities were done by various in vitro methods, viz.; 1,1-diphenyl-2-picrylhydrazyl (DPPH), hydrogen peroxide scavenging activity, reducing antioxidant power (FRAP) assay, and thiobarbituric acid (TBA) method.

Maximum radical scavenging activity was exhibited by the acetone extract of *P. longifolia* implying that phenol and flavonoid content is positively correlated to the antioxidant activity of a plant. The study suggests that acetone extract from *P. longifolia* bark are a rich source of antioxidants that may be developed as a safer, non-toxic and functional ingredient.[3]

**Anti-inflammatory activity**

The anti-inflammatory activity of *Pajanelia longifolia* was studied using acute (Carrageenan induced paw edema) model of inflammation. This model is based on the principle of release of various inflammatory mediators by carrageenan. Edema is due to carrageenan in the rat paw as biphasic event. The initial phase is attributed to the release of histamine and serotonin. The second phase of edema is due to the release of prostaglandins, protease and lysosome. Subcutaneous injection of carrageenan into the rat paw produces inflammation resulting from plasma extravasations, increased tissue water and plasma protein exudation along with neutrophil extravasations, these results due to the reaction of arachidonic acid. The first phase begins immediately after injection of carrageenan and diminishes in two hours. The development of edema induced by carrageenan corresponds to the events in the acute phase of inflammation, mediated by histamine, bradykinin and prostaglandinds produced under an effect of cyclooxygenase. Stem bark extracts of *Pajanelia longifolia* showed significant anti-
inflammatory activity. This significant anti-inflammatory effect may be due to the inhibition of any inflammatory mediators by the glycosides or steroids present in the extract.\([17]\)

It has been concluded that the Pet-ether, chloroform and methanol extracts showed significant reduction of inflammation as compared to Indomethacin. The efficacy of bark part of *Pajanelia longifolia* as an effective therapeutic agent in the treatment of acute inflammations.\([6]\)

**Anti-diabetic activity**

The anti-diabetic activity of plant bark extract was studied using different solvents of pet-ether, chloroform and methanol in alloxan-induced diabetic rats. There were observable changes in the body weight of treated and untreated diabetic rats. Treated group of diabetic rats with the bark extracts of *Pajanelia longifolia* or glibenclamide improved the weight gain as compared to untreated diabetic rats.

A dose-dependent reduction in blood glucose level was observed in alloxan-induced diabetic rats treated with various extracts of Pajanelia longifolia. After a single dose of the extract given to the alloxan-induced diabetic rats, there was a significant reduction in blood glucose level of the diabetic rats within the period of acute study as compared to control. The maximum effect was observed at 7h with the various extracts exerting comparable effect. Among the extracts, pet-ether extract exhibited a potent antidiabetic activity. During prolonged study (7days), the various bark extracts produced a sustained significant reduction in blood glucose level of the diabetic rats as compared to control. The effect of pet-ether extract was more potent than that of the chloroform and methanol extracts when compared with standard drug glibenclamide.

Pet-ether extract cause a significant decrease in blood glucose level as compared to standard drug Glibenclamide. The study indicated the efficacy of bark part of *Pajanelia longifolia* as an effective therapeutic agent in the treatment of diabetes.\([6]\)

**CONCLUSION**

Medicinal plants are the local heritage with the global importance. World is endowed with a rich wealth of medicinal plants. Medicinal plants also play an important role in the lives of rural people, particularly in the remote parts of developing countries with few health facilities. *Pajanelia longifolia* is one of such ethnomedical plant commonly used by the
folklore practitioners since long period. The present review reveals that *P. longifolia* contains several phytoconstituents such as flavonoids, tannins, saponins, triterpenoids, phenols and steroids which responsible for the curative property of the plant. The plant has been studied for the various pharmacological activities like antibacterial, antioxidant, hepatoprotective, anti-inflammatory and anti-diabetic.

There is an increasing interest worldwide in herbal medicines accompanied by increased laboratory investigations into the pharmacological properties of the bioactive ingredients and their ability to treat various diseases. With the availability of primary information, further studies can be carried out like phytopharmacology of different extracts, standardisation of the extracts, identification and isolation of active principles and pharmacological studies of isolated compounds. These may be followed by development of lead molecules as well as it may serve for the purpose of use of specific extract in specific herbal formulation.

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**REFERENCES**


4. Katherin Steffy et al., Chemical Composition and Antibacterial Activity of *Pajanelia longifolia* (Willd.)K.Schum Against Multi Drug Resistant Clinical Isolates from Diabetic Foot Ulcer.