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Medicinal important of *Pongamia pinnata* - A review

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Abstract
For thousands of years, nature has been a reliable supply of medicinal agents. Many contemporary medications have been derived from natural sources, many of which have been founded on their application in traditional medicine. *Pongamia pinnata*, also referred to as karanj, is used to cure a variety of human ailments and is acknowledged in several traditional medical systems. This plant's many parts have long been used to cure a variety of illnesses, such as leprosy, rheumatism, bronchitis, whooping cough, diarrhea, and gonorrhea. Therefore, the current study shows that *Pongamia pinnata* has a wide range of pharmacological properties that have been scientifically recorded, as well as traditional usage and its involvement in industry.

Keywords: *Pongamia pinnata*, fabaceae, inflammation, heat-induced protein denaturation technique

Introduction
One of India's wealthiest and most brilliant trees is the "*Pongam* Tree." The Tamil term "*Pinnata*," which means "Pinnate leaves," is the source of the name *Pongamia*. *Pongamia pinnata* is a member of the Pipilionaceae subfamily of the Leguminosae family.
The medium-sized glabraous tree *Pongamia pinnata* (Linn) Pierre is also referred to as Pongam in Tamil, Indian beech in English, and Karanja in Hindi (Krishanamurthi, 1969) [10]. *Pongamia pinnata* is used by the majority of Tamil Nadu doctors practicing Ayurvedic and Siddha, two forms of Indian traditional medicine, to cure a variety of illnesses, including diabetes mellitus (Punita and Manoharan, 2006) [19]. The "Pongam Tree" is one of the most beloved city trees in India, where it is grown in many gardens and along innumerable roadways (Duke, 1985) [6]. The tree is known for its multipurpose benefits and as a potential source of biodiesel (Naik *et al.* 2008) [16]. According to reports, the seeds typically contain between 28 - 34% oil, with a significant proportion of polyunsaturated fatty acids (Sarma *et al.* 2005) [20]. *Pongamia* has long been utilized as a folk remedy, especially in Indian medicine's Ayurvedic and Siddha systems (Meera *et al.* 2003) [12]. For the treatment of tumors, piles, skin conditions, itching, painful rheumatic joint wounds, ulcers, diarrhea, etc., all parts of the plant have been utilized as basic drugs (Shoba and Thomas, 2001) [23]. It is widely recognized for its use as fish poison, green manure, lumber, and animal feed. With its insecticidal and nematoidal properties, *P. pinnata* has been widely used in agricultural and environmental management. More recently, reports have indicated that it is also an effective source of biomedicine (Brijesh *et al.* 2006) [2] particularly as medicinal and antibacterial substances.

Taxonomy
Kingdom - Plantae
Subkingdam - *Tracheobionta*
Super division - *Spermatophyta*
Division - *Magnoliophyta*
Class - *Magnoliopsida*
Subclass - *Rosidae*
Order - *Fabales*
Family - *Fabaceae*
Genus - *Pongamia*
Species - *Pinnata*

Fig 1: Showing *Pongamia pinnata* twig.

Geographical distribution

It is extensively found in south-eastern Asia, Australia, India, tropical Asia, and the Seychelles Islands, as well as locally along riverbanks in the state of Maharashtra; Very prevalent in decan rivers and in Konkan beach forests and tidal areas close to the ocean (Prajapati *et al.* 2003) [18].

Medicinal importance

In traditional medicine, several plant parts have been utilized to treat rheumatic joints, bronchitis, whooping cough, and diabetic dipsia (Kirtikar and Basu, 1995) [9]. The leaves have laxative, anthelminitic, and hot digestive properties that help heal wounds, piles, and other inflammations. According to Satyavati *et al.* (1987) [21] and Chopra (1933) [5], a hot infusion of leaves is used as a medicinal bath to relieve rheumatic pain and to clean ulcers in cases of gonorrhea and scrofulous enlargement. Leucoderma, leprosy, lumbago, and muscular and articular rheumatism are among the infectious disorders that are treated using various extracts of leaves, roots, and seeds (Singh and Pandey, 1996) [26]. *P. pinnata* seed oil has therapeutic qualities and is used to treat skin conditions including itching (Wagh *et al.* 2007) [29].

Flowers are recommended as a treatment for diabetes and glycosuria (Carcache *et al.* 2003) [4]. The bark is used as an internal antibacterial (Akhtar *et al.* 1996) [1] and to treat diabetes, bleeding piles, and beriberi (Mumcuoglu *et al.* 1990) [13].

In India's Ayurvedic and Siddha medical systems, karanja seed is employed as a medicinal herb. The roots are used to clean gums, teeth, and ulcers; the leaves are active against micrococcus; their juice is used to treat colds, coughs, diarrhea, dyspepsia, gonorrhea, and leprosy; and the seed oil is used to treat scabies, leprosy, piles, ulcers, chronic fever, and lever pain. Powdered seeds are useful as a tonic, febrifuge, and treatment for whooping cough and bronchitis.

Pharmacological properties

Antimicrobial activity

According to reports, the oil extracted from *P. pinnata* exhibits antibacterial action against *Pseudomonas aeruginosa*, *Staphylococcus aureus* and *Aspergillus niger*. This was determined using the dry weight method and the Minimum Inhibitory Concentration (MIC) determination. It is possible to use this plant to find bioactive natural compounds that could be the starting point for the creation of novel medications that would meet unmet therapeutic requirements. It is hoped that the research will yield a molecule that can be used to create a new, stronger antibacterial medication or one that comes from a natural source.

Antiulcer activity

The aqueous extract of *P. pinnata* root induced a significant decrease in volume of gastric juice, acid output and peptic activity without any effect on mucin activity in acetyl salicylic acid (ASA) ulcerated rats. Moreover, it decreases ulcer index significant ulcer protective effect of methanolic extract of *P. pinnata* roots was attributed to the augmentation of mucosal defensive factors like mucin secretion, life span of mucosal cells, mucosal cell glycoprotein's, cell proliferation and prevention of lipid peroxidation rather than on the offensive acid pepsin secretion. A change in hexose and fructose content of carbohydrate was also found, however mucin activity remains unchanged (Prabhha *et al.*, 2003) [11].

Antidiarrhoeal activity

P. pinnata crude leaf extract's antibacterial activity assesses how it affects enterotoxin generation and activity. Its extraction lowers the generation of cholera toxin and bacterial penetration of epithelial cells, but it has no antibacterial, antigiardial, or anti-rotaviral properties. This suggests that *P. pinnata* extract has effective anti-cholera properties and specific anti-diarrheal action (Brijesh *et al.* 2006) [3].

Antiplasmodial activity

The antiplasmodial qualities of *Pongamia pinnata* ethanolic extract against Plasmodium falciparum were investigated *in vitro*. This *P. pinnata* ethanol extract exhibits strong anti-plasmodial properties (Simonsen *et al.* 2001) [25].

Antioxidant and Anti hyperammonemic activity

Leaf extract from *Pongamia pinnata* exhibits antioxidant action and vascular lipid peroxidation. It has been tested on hyperammonium rats generated by ammonium chloride. In rats given ammonium chlorides, this increases lipid peroxidation in the blood, leading to a marked drop in vitamin A, C, and E levels. This further lowers catalyze glutathione, glutathione peroxide, and superoxide dismutase levels (Essa and Subramanian, 2006) [8].

Antiviral activity

P. pinnata Linn, for treatment of clinical lesions of skin and genital was evaluated for antiviral properties against virus type-1 (HSV-1) and type-2 (HSV-2) by *in vitro* studies in vero cells. A crude aqueous seed extract of *P. pinnata* completely inhibited the growth of HSV-1 and HSV-2 at concentration of 1 and 20 mg/ ml (w/v) respectively, shows complete absence of cytopathic effect (Elanchezhiyan *et al.* 1993) [7].

Anti Lice activity

Research into new anti-lice agents (Mumcuoglu, 1999 and Yang *et al.* 2004) [14, 30] has become more popular due to the growing pattern of pediculocidal drug resistance to word head louses. According to Shirwaikar *et al.* (2003) [22], the study tested many extracts of *P. Pinnata* leaves against the head louse *Pediculus humanus* capitis. Chloroform, P. E., methanol, and water extracts of *P. pinnata* leaves were tested for possible pediculocidal and ovicidal action using a filter paper diffusion method. P. E. extract was found to

have anti-pediculocidal properties, while methanol extract demonstrated mild pediculocidal effects.

Anti-inflammatory activity

According to reports, a 70% ethanolic extract of *P. pinnata* leaves (Nadkarni, 1954 and Shrinivasan *et al.* 2001) [15, 24] has strong anti-inflammatory properties against the acute, subacute, and chronic stages of inflammation without having any negative effects on the stomach mucosa. Additionally, they noted that the extract had a strong antipyretic effect on pyrexia caused by Brewer's yeast (Singh and Panday, 1996) [27].

***Pongamia pinnata* as bio fuel**

The physical characteristics of pongamia seed oil as biofuel are very comparable to those of regular diesel. However, compared to traditional diesel, biofuel has cleaner emissions. It emits less harmful smoke and soot and contains no polyaromatic compounds. The petroleum diesel produced by Indian refineries will need to have a higher cetane number (>51) and a significant decrease in sulfur content (< 350 ppm). Nonetheless, biofuel satisfies two crucial requirements and would facilitate the importation of low-sulfur (0.13-0.16%) diesel lubricant. The current petroleum diesel flash point specification is 3500 c, which is lower than the global average. A safety necessity, the flash point will be raised with the use of biofuel.

According to the WHO, the oil is inedible due to the amount of erucic acid and the presence of poisonous flavonoids such karanjin, pongapin, and pongaglabrin. The possibility of using it as a biodiesel fuel is suggested by the low levels of saturated and polyunsaturated fatty acids, as well as the favorable cetane number and iodine value (Manju *et al.* 2010) [11].

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