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Pramila Ghumare, D B Jirekar

Anandrao Dhonde Alias Babaji
Mahavidyalaya Kada. Dist.
Beed., India

Mazahar Farooqui

Dr. Rafiq Zakeria College for women,
Aurangabad, India

S D Naikwade

K. S. K. College, Beed, India

A Review of *Pongamia pinnata* – An Important Medicinal Plant

Pramila Ghumare, D B Jirekar, Mazahar Farooqui and S D Naikwade

ABSTRACT

Nature has been a good source of medicinal agent for thousands of years and an impressive number of modern drugs have been isolated from natural sources, many based on their use in traditional medicine. *Pongamia pinnata* commonly known as karanj and has been recognized in different traditional system of medicine for the treatment various diseases of human beings. Different parts of this plant are traditionally used for treatment of various ailment including bronchitis, whooping cough, rheumatism, diarrhoea, gonorrhoea and leprosy. Therefore present study reveals that comprehensive information of *Pongamia pinnata* with various scientifically documented pharmacologically activities, traditional uses along with its role in industry.

1. INTRODUCTION

The '*Pongam Tree*' is known as one of the richest and brightest tree of India. The name Pongamia has derived from the Tamil name 'Pinnata' that refers to 'Pinnate leaves'. *Pongamia pinnata* belongs family *Leguminosae* and subfamily is *Pipilionaceae*.

Pongamia pinnata (Linn) Pierre is medium sized glabraous tree popularly known as Karanja in Hindi, Indian beech in English and Pongam in Tamil¹. Most of the Tamil Nadu physicians of Indian system of traditional medicine Ayurveda and siddha use *Pongamia pinnata* to treat various kinds of diseases including diabetes mellitus². The '*Pongam Tree*' is being cultivated in a large number of garden and along the countless roads in India and is becoming the one of the most admired city trees³. The tree is known for its multipurpose benefits and as a potential source of biodiesel⁴. The seeds are reported to contain on an average about 28-34% oil with high percentage of polyunsaturated fatty acids⁵. Historically *pongamia* has been used folk medicinal plant, particularly in Ayurveda and siddha system of Indian medicine⁶. All part of plant have been used as a crude drug for the treatment of tumours, piles, skin diseases, itches, painful rheumatic joints wounds, ulcers, diarrhoea etc⁷. It is well known for its application as animal fodder, green manure, timber and fish poison. It has been plenty of application in agriculture and environmental management, with insecticidal and nematicidal activity, more recently, the effectiveness of *P. pinnata* as a source of biomedicine has been reported⁸ specifically as antimicrobial and therapeutic agents⁹.

Correspondence

Mazahar Farooqui

Dr. Rafiq Zakeria College for women,
Aurangabad, India

Email: mazahar_64@rediffmail.com

2. TAXONOMY

Kingdom	-	Plantae
Subkingdom	-	Tracheobionta
Super division	-	Spermatophyta
Division	-	Magnoliophyta
Class	-	Magnoliopsida
Subclass	-	Rosidae
Order	-	Fabales
Family	-	Fabaceae
Genus	-	Pongamia
Species	-	pinnata

3. GEOGRAPHICAL DISTRIBUTION

It is widely distributed throughout tropical Asia and the Seychelles Islands, south eastern Asia, Australia, India and locally distributed throughout the state of Maharashtra along banks rivers; Very common near the sea coast in tidal and beach forest in konkan; along decan rivers¹⁰.

4. TRADITIONAL USES

Different parts of the plant have been used in traditional medicine for bronchitis, whooping cough rheumatic joints and to quench dipsia in diabetes¹¹. The leaves are hot digestive, laxative, anthelmintic and cure piles, wounds and other inflammations. A hot infusion of leaves is used as a medicated bath for relieving rheumatic pain and for cleaning ulcer in gonorrhoea and scrofulous enlargemen^{12,13}. Different extract of leaves, roots and seeds are used to treat infection diseases such as leucoderma, leprosy, lumbago, muscular and articular rheumatism¹⁴. The seed oil of *P. Pinnata* possesses medicinal properties and used in itches and other skin diseases¹⁵.

Flowers are prescribed for glycosuria and as remedy for diabetes¹⁶. The bark is used internally for bleeding piles, beriberi¹⁷ and diabetes and as an antimicrobial¹⁸. Karanja seed is used as a medicinal plant, particularly with the Ayurvedic and siddha medicine system of India. Leaves are active against micrococcus; their juice are use for cold, cough, diarrhoea, dyspepsia, gonorrhoea and leprosy and seed oil is used in scabies, leprosy, piles, ulcers, chronic fever, lever pain; Roots are used for cleaning gums, teeth and ulcers. Powdered seeds are valued as febrifuge, tonic and in bronchitis and whooping cough.

5. PHARMACOLOGICAL PROPERTIES

5.1 Antimicrobial activity

It is reported that the oil obtained *P. pinnata* shows antimicrobial activity against *Aspergillus niger*, *Staphylococcus aureus* and *Pseudomonas aeruginosa*, which was carried out by employing Minimum Inhibitory Concentration (MIC) determination and dry weight method. This plant can be used to discover bioactive natural products that may serve as leads form the development of new pharmaceuticals that address hither to unmet therapeutic needs. It is hoped that study would leads to the establishment of some compound that used to formulate new and more potent antimicrobial drug or natural origin.

5.2 Antiulcer activity

The aqueous extract of *P. pinnata* root induced a significant decrease in volume of gastric juice, acid out put and peptic activity without any effect on mucin activity in acetyl salicylic acid (ASA) ulcerated rats. Moreover, it decrease 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 unchanged¹⁹.

5.3 Antidiarrhoeal activity

The antimicrobial effect of crude leaf extract of *P. pinnata* evaluates its effect on production and action of enterotoxins. Its extraction has no antibacterial, anti-giardial, anti- rotaviral activities but reduce the production of cholera toxin and bacterial invasion to epithelial cells. This indicates that the extraction of *P. pinnata* has selective anti- diarrhoeal action with efficacy against cholera²⁰.

5.4 Antiplasmodial activity

The ethanolic extract of *Pongamia pinnata* was examined *in vitro* for antiplasmodial properties against *Plasmodium falciparum*. This ethanol extract of *P. pinnata* shows significant anti plasmodial activity²¹.

5.5 Antioxidant and Anti hyperammonemic activity

Pongamia pinnata leaf extract shows circulatory lipid per oxidation and antioxidant activity. It has been evaluated in ammonium chloride induced hyper ammonium rats. That enhances lipid per oxidation in the circulation of ammonium chlorides treated rats, resulting in a significant decrease in the level of vitamin A, C and E, which further reduces catalyse glutathione, glutathione peroxide and superoxide dismutase²².

5.6 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 effect²³.

5.7 Anti Lice activity

Growing pattern of pediculocidal drug resistance to words head louse laid the found attraction for research in exploring novel anti lice^{24,25} agent for medicinal plant. In the study, various extracts of *P. Pinnata* leaves tested against the head louse *pediculus humanus capitis*²⁶. A filter paper diffusion method was conducted for determining the potential pediculocidal and ovicidal activity of chloroform, P. E, methanol and water extracts of *P. Pinnata* leaves. The result revealed that P. E. Extract possess anti and methanol extract showed moderate pediculocidal effects.

5.8 Anti-inflammatory activity

Anti-inflammatory 70% ethanolic extract of *P. Pinnata*^{27,28} leaves has potent anti inflammatory activity against different phases (acute, sub acute and chronic) of inflammation without side effect on gastric mucosa has been reported. They also observed significant antipyretic action of the extract against Brewer's yeast induced pyrexia²⁹.

5.9 *Pongamia pinnata* as bio fuel

Pongamia seed oil as bio fuel has physical properties very similar to conventional diesel. Emission properties

however, are cleaner for Bio fuel than for conventional diesel. It has no polyaromatic compound and reduced toxic smoke and soot emission. A drastic reduction in sulphur content (< 350 ppm) and higher cetane number (>51) will be required in the petroleum diesel produced by Indian refineries. However bio fuel meets there two important specifications and would help in importing the lubricity of low sulphur (0.13-0.16%) diesel. The present specification of flash point for petroleum diesel is 350⁰c, which is lower than all countries in the world. Bio fuel will help in raising the flash point, a requirement of safety³⁰.

The level of erucic acid and present of toxic flavonoids, for example karanjin, pongapin and pongaglabrin, render the oil inedible according to WHO recommendation, However low level of saturated and polyunsaturated fatty acid with desirable cetane number and iodine value suggest potential for application as a bio diesel fuel³¹.

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