



# A critical review on Karanja (*Pongamia pinnata*) & its medicinal properties

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## ABSTRACT:

*Pongamia pinnata* is one of the remarkable herbal plants with various medicinal properties. *P. pinnata* is a possible medium-sized pod tree also known as Karanja. It is widely distributed in the Western Ghats of India. This plant is mostly grown in coastal areas, river banks and tidal areas forests and roadsides. It is popularly known as the “Indian Beech tree” and has been identified in the Ayurvedic and Siddha systems. Medicines with a healing effect on humans. Different parts of the whole plant are used to treat various diseases, incl rheumatism, diarrhoea, gonorrhoea, whooping cough, leprosy and bronchitis. Extracts of the whole plant have significant anti-inflammatory, anti-ulcer, anti-diarrheal, anti-inflammatory, antifungal and analgesic effects. The present review paper was aimed to update the Information of *Pongamia pinnata* with reference to its Pharmacological properties, chemical constituents and its use as anti-urolithiatic agent for the treatment of Urolithiasis.

**KEYWORDS:** *Pongamia pinnata*, pharmacological properties, Indian beach tree, Phytochemistry, medicinal uses.

## INTRODUCTION:

A rich supply of phytochemicals found in plants can have a maximal therapeutic impact with little to no negative side effects. Plants have been used in many traditional medicinal uses to treat a wide range of illnesses. Prior to the discovery of the precise bioactive component causing the curative action, plants were employed as extracts or plant mixes for medical purposes. However, recently, several of The Identification of the plant source’s active principle has been the main emphasis. However, the identification of the active component from the plant source has received a lot of attention lately. In order to increase their Application in drug discovery as biomedicine. It’s been Extensively publicized for a number of purposes, including secondary Metabolites have been identified and documented for a number of Actions. This analysis aims to provide an updated Thorough explanation of the isolated phytochemicals From the known pharmacological and botanical actions Thus far.

*Pinnata pongamia* (L.) In Tamil, Hindi, Bengali, Marathi, Sanskrit, Honge, Hulugala, or Maktabala, Pierre is often known as Pongam Tree. Oil from the Indian Beech Nut Tree (Kannada: Kanigemara) and Pongam Tree/ Hongay oil tree/ malva nut (English), Ki pahang laut (Malay) and Kacang kayu laut (Indonesian) <sup>1</sup> It is a member of the Pipilionaceae subfamily and the Fabaceae (Leguminosae) family. Another common name for this plant is *Millettia Pinnata* (L)<sup>2 3</sup>

## Botanical Description

*Pongamia pinnata* is a naked, medium-sized evergreen tree with five to seven leaves alternate, odd, opposite and oval; there are flowers pink white, in armpits. The calyx is cup-shaped 4-5-toothed with papilionate corolla. Stamens are Monadelphous, number 9-10. Ovary is subsessile, two ovules, curved, glabrous ending in a stigmatizing the resident. The seed pod is woody, compressed, glabrous and yellowish gray as it matures, changes size and shape, 4.2-7.7 cm long and 1.8-3.4 cm wide, with a short curved beak. It usually contains two elliptical shapes or uniform seeds, 1.7-2.0 cm long and 1.3-1.9 cm wide, which has a red-brown leathery Testa<sup>4</sup>

## Geographical Distribution (Species Distribution)

*Pongamia pinnata* is native to India and divided in the east, which includes the south East Asia. It is typical of distant countries like Australia, China, Egypt, Fiji, Indonesia, Japan, Malaysia, Mauritius, New Zealand, Pakistan, Philippines, Seychelles, Solomon Islands, Sri Lanka, Sudan and the United States America (Florida, Hawaii). In India it is found in tropical dry region to subtropical dry forest areas and western countries Tidal wooded ravines on the river banks and near the sea coastal<sup>4</sup>

## Ethnobotanical Uses

In Ayurveda and Siddha system of Indian medicine in the early days *Pongamia pinnata* was used for the treatment of various diseases. For treatment wounds, ulcers, painful rheumatic joints, tumors, masses, skin diseases, itching, diarrhea and other diseases. The the leaves of the plant are used to heal and soothe wounds rheumatic pains, anthelmintic, cleansing wounds, gonorrhea, gastrointestinal, laxative, genital, cold, cough, gonorrhea, diarrhea, dyspepsia and leprosy. Flowers used in the treatment of diabetes. It was a choir part used as an antimicrobial agent to treat bleeding, Beriberi, diabetes. Febrifuge was treated with seeds powder, tonic for whooping cough and bronchitis, scabies use of seed oil, ulcers, leprosy, piles and chronic fever. The root is used to clean gums, teeth and ulcers. The extracts of leaves, seeds and roots are used for treatment infections in diseases such as leukoderma, leprosy, lumbago, muscular and joint rheumatism<sup>5</sup>

Other applications of *Pongamia pinnata* include its use e.g animal feed, wood and fish poison. It was also used in many other applications such as green in agriculture fertilizer, such as insecticide and nematicide and indoors environmental management<sup>6</sup>. Karanji and furanoflavonol presence is used in agricultural activities as its insecticide, insecticidal and acaricidal effect. It is commercially available as a biopesticide<sup>7</sup>. Pongam If infected with *Bradyrhizobium liaoningense* PZHK1 has been shown to be effective phytoremediation process and biofuel production raw materials on the periphery<sup>8</sup>.



Figure 1 *Pongamia Pinnata*

**Phytochemistry:****Whole Plant:**

*Pongamia pinnata* contains many secondary substances metabolites/phytochemicals. Phytochemical studies different parts of the plant showed that the plant is abundant flavonoids, isoflavonoids, chalcones, flavanones, triterpenes and alkaloids<sup>9-10</sup>. There are several proofs of this flavonoids and their derivatives such as furanodiketones, furanoflavones, coumarins, terpenes and modified Dipeptides of phenylalanine have been isolated from it plant<sup>11</sup>. The presence of other compounds such as protocatechuin, ellagic, ferula, gallus, gentisic acid, 4-hydroxybenzoic acid and 4-hydroxycinnamic acids in the bark; sorbic, ferulic, bile, salicylic and p-coumaric acid in leaves; vanillin, Gallia and tannic acids in seeds, as well as major phenolic acids I noticed<sup>12</sup>.

**Seeds:**

The seeds of *Pongamia pinnata* are rich in oil and have been described contains 28-34% oil and with a high percentage polyunsaturated fatty acid. The seed oil is rich in sterols, fatty acids and their derivatives<sup>13</sup>. A total of six sterols, their derivatives and eight fatty acids (three saturated and five unsaturated fatty acids) are separated a seed. Two fatty acids have been reported from the plant monoenoic acids, i.e. oleic acid (44.24%) and stearic acid (29.64%), one dienoic acid i.e. Palmitic acids (18.58%) and two trienoic acids containing a small amount of octadecatrienoic acids amounts (0.88%). Also, compounds such as carangin, pongamol, pongagalabrone, pongapin, pinnatin, canyon, glabrin (complex amino acid) furanoflavone and pyranoflavonoid (karanjachromenel) was isolated and it is characterized by the seeds of the plant [9]. Another metabolite such as beta-sitosterol acetate and its Galactoside, stigmasterol and sucrose have also been reported of this plant. Flavonoids such as glabrachalcone isopongachromine and pongoli flavone derivatives were also reported for the seeds of this plant<sup>13-14</sup>.

**Roots:**

A total of 52 flavonoids have been reported. The surface roots of *Pongamia* play an important role phytoalexins. Almost 11 pterocarpanoids have been identified. For phytochemical analysis of *Pongamia pinnata* roots including four new undeclared flavones and four new Kalton derivatives were reported by Wen et al., (2018a). As a result, identify different compounds including flavones, chalcones, isoflavones, flavanones and pterocarpanoids<sup>15-16</sup>.

Wen et al. (2018c) isolated 29 flavanones and flavanols, including 7 previously undescribed compounds *Pongamia* surfaceless from the roots. They are as follows (2S)-7-hydroxy-6,8-di-(3-methylbut-2-enyl)-3',4'-dimethoxy flavanone; (2S)-7-(2-methylbut-3-enyloxy)-8-(3-methylbut-2-enyl)-3',4'-dimethoxyflavanone; ponganone III; isoglabracromene; pongachino; 6-Methoxy-6",6"-dimethyl chromene-[2,3":7,8]-flavanone; isocarpine; max flavanone A; 6-( $\gamma,\gamma$ -dimethylallyl)-3',4'-dimethoxy-6",6"-dimethylpyran [2",3":7,8] flavanone; pongamo C; 3',4',7-trimethoxyflavanone; pinostrobin; liquiritigenin; griffin C; griffinone A and pongaflavanol<sup>17</sup>. Ghosh et al., (2009) Pterocarpanoids form another the largest group of natural isoflavonoids from root extracts. Other compounds reported from plant roots contains flavanols such as methyl ether-tetra-O-methyl fisetin, kanugin, desmethoxykanugin, karanjap (turkey) and two flavonoids namely pyranoflavonoids (karanjacromin) and furanoflavonoid (karanjin)<sup>18</sup>. Tanaka et al. (1992) reported the occurrence of nine new flavonoid compounds called pongamones III-XI, already with 18 flavanoids from the root bark announced on the<sup>19</sup>.

**Leaves and Stem:**

Pinnate leaves and stems of *Pongamia* are also abundant several flavones and chalcone derivatives such as pongono, galbone, pongaboli, pongagallone A and B. Li et al., (2006) reported the isolation and characterization of five flavonoids called pongamones A-E and 16 known metabolites of flavonoids<sup>20</sup>. Yin et al., (2004) and Yin et al., (2006) reported seven flavonoids viz pongaflavone, karanjin, pongapin, pongachrome, 3,7-dimethoxy-3',4,7-tetramethoxyflavone, two prenylated flavonoid derivatives (pongaflavanol and tunicata chalcone) from bark<sup>21-22</sup>. In addition, two hydroxy chalcones (onganones I and

II), cycloart-23-ene-3 $\beta$ , 25- diol and phenylpropanoids (pongapinon A and B). isolated and characterized by bark<sup>23 25</sup>

He et al. (2015) isolated chlorinated flavonoids: 2',6'- dichloro-3',5'-dimethoxy-[2'',300:7,8]furanoflavone, and 29 known compounds from stem extracts. The isolated compounds are pongaglabolic methyl ether; pongapin; lanceolatin B; karanji pongaglabro; 3'- methoxy-[2,3'':7,8]furanoflavone; 3',5'-dimethoxy-[2,3'':7,8]-furanoflavone; millet calyxins; pongal surface A; surface coating; gammatin; to sing desmethoxycanugin; 3,7,3',4'-tetramethoxyflavone; apigenin-6-C-galactosyl-8- C-arabinoside; pongacromen; maximum isoflavone J; formononetin; pseudobaptigenin; 3',7,8-trihydroxy-4'- methoxyisoflavone; 8-O-methylretusine; 8-hydroxy-7,4'- dimethoxyisoflavone; loncocarpine; glabrachromene II; isocarpine; oval chromene B; betulonic acid; macroseric acid; (2S,4R) ovalin<sup>10</sup>

The leaves contain canugin, desmethoxycanugin and pinnatin triterpenoids, glabrachromenes I and II, 3'-methoxypongapine and 4'-methoxyfuran[2''3'':7,8]- flavone 4 . Marzouk et al (2008) isolated two isoflavonoids diglycosides (4 and #039;-O-methylgenistein 7-O-beta-D-rutinoside and 2 and # 039;, 5 and # 039; -dimethoxygenistein 7-O-beta-D-apiofuranosyl- (1 and #039;-andgt;6 and #039;-andgt;) -O-beta-D-glucopyranoid) and rotenoid (12a- hydroxy-alpha-toxicarol) along with nine known metabolites vekinin-2, kaempferol 3-O-beta-D-rutinoside, rutin, vitexin, isoquercitrin, kaempferol 3-O-beta-D- glucopyranoside, 11,12a-dihydroxymunduserone, kaempferol and quercetin <sup>24</sup>

### Flowers:

Flowers of *Pongamia pinnata* have been reported to contain phytochemicals such as flavones, hydroxyfuranoflavones (Pongaglabol), furanoflavones (karanjin, lanceolatin B, canyon and pinnatin), chromenoflavone, triterpenes, beta-sitosterol glycosides, phenylalanine dipeptide and aurantiamide diacetate <sup>11</sup>

### Fruits:

Furanoflavonoid glycosides (pongamosides A-C), flavanol glycoside pongamoside D and furanoflavonoid aglycones have been reported from *Pongamia* fruits surface<sup>25</sup>. Recently, Saraphon et al (2017) reported The presence of a (4'-) furanoflavonoid derivative (hydroxypinnatin) and compounds derived from fruits *Pongamia pinnata* extracts. The isolated compounds are 4'-Hydroxypinnatine; surface coating; pongaglabola methyl ether; canyon; 3,7,3',4'-tetramethoxyflavone and 5,7- dimethoxy-8-(2'-hydroxy-3'-methyl-3'-butenyl) flavanone<sup>26</sup>

## TRADITIONAL AND MODERN VIEW

### Folk view:

Karanja plant has been a medicinal plant since ancient times. Beside Hartwell (1967-1971), *Uses of Germs and Fruits in India* in folk remedies for stomach tumors, seeds for keloid tumors in Sri Lanka and the plant powder is used for tumors in Vietnam <sup>27</sup>. Each part of the plant has ethnobotanical properties. Seed oil *P. pinnata* is used for itching, abscesses and other skin diseases <sup>31</sup>. The flowers are used to treat diabetic problems <sup>28</sup>. Shell the plant is used for internally bleeding piles, beriberi and diabetes and hepatoprotective effect <sup>29</sup>. The leaves were used as medicine bath to relieve rheumatic pains and to clean ulcers in gonorrhoea and an increase in scrofula <sup>32</sup>. The roots are used to clean the gums, teeth and ulcers and other dental problems <sup>30</sup>

### Ayurvedic view:

Pongam tree is known as one of the richest and brightest trees in the region India. The word "pongamia" is derived from the Tamil word "pinnata". Which refers to the "leguminozae" family. It is known as Hindi and Bengali such as Karanj or Paper or Kanji <sup>33</sup>. It is classically classified as Charaka Samhita "Kandughna" which means a group of herbs that provide relief itching, Katuka Skandha is a group of herbs with a pungent taste. Charaka mentioned it as an important oil source <sup>34 35</sup>

**Ayurvedic Uses of Karanj (P. pinnata)**<sup>36 37 38</sup>

Yonidoshahrut (योनिदोहरहृत)– Detoxifies vaginal diseases, use in Uterine disorders

Kushtaghna (कुष्ठघ्न)– Useful in skin diseases

Udavartahara (उदावर्तार) – relieves bloating

Gulmahara (गुलमोहर)– relieves abdominal tumor, bloating

Arshahara (अर्शाहार)– useful in piles/hemorrhoids

Krumihara (कृमिहार)– relieves worm infestation

**Table .Rasa panchak (properties and action) of Karanj (P. pinnata)**

Sanskrit/English	Sanskrit/English
Rasa/Tast	Katu,tikta,kasaya/ Punjent,Astringent, Bitter
Guna/Physical properties	Tiksna/ piercing
Virya/Potency	Usna/Hot
Vipaka/Metabolic properties	Katu/Punjent

### **P. pinnata leaves**

Kaphavatahara (कफवताहार)– balances kapha and vata

Arshahara (अर्शाहार)– Useful in piles/hemorrhoids

Krumihara (कृमिहार) – relieves worm infestation

Shothahara (शोथाहार) – relieves inflammation

Bhedena (भेडेना) – induces diarrhea, relieves constipation

Pittala (पिटला) – increases Pitta

### **P. pinnata Fruits are**

Kaphavataghna (कफवत्घ्ना) – balances Kapha and Vata

Mehahaha (मेहाहा) – Useful in urinary tract disorders and diabetes

Arshahara (अर्शाहार) – Useful in piles/hemorrhoids

Krumihara (कृमिहार) – relieves worm infestation

Pongam oil is an important source of biodiesel and is used in Ayurveda for external use to contract piles, heal wounds and abscesses quick It is useful in acne vulgaris, pimples and exudates<sup>39</sup>

**MODERN VIEW:**

The consumption of herbal medicines has increased in the world today widely Reported studies have shown increased growth sales of herbal products in 2000-2008 varies from 3 percent to 12 percent per year <sup>40</sup>. Due to the increase in demand for herbal products The risk of herbal medicines also increases. Quality of the final product compromises because the raw material is contaminated with toxic substances metals, microbes, other scraps and fakes (added fakes or inferior plant material, orthodox medicines, foreign material) which leads to poor quality of medicines <sup>41</sup>. Internal problems, e.g unevenness (increase due to environmental factors and geographical reasons distribution, use of pesticides, fertilizers) and complexity of herbal medicinal ingredients affecting quality. For herbal medicines <sup>42</sup>. Lack of standardization technology for herbs products are also responsible for the poor quality of medicines failure to discover an original drug that exploits its use system of traditional medicine <sup>43</sup>. Developing a new dosage forms without affecting the main component the need of the day. Many formulations such as oil, creams and seeds are produced by *P. pinnata* plant. The seed oil has its medicinal value, That is why it is used to treat rheumatism in humans. Modern science has used this effect to improve pigmentation on the skin in people with leukoderma or pruritus There is also oil used as a lubricant, water-based paint binder, insecticide and in soap making and tan industry <sup>44</sup>

**PHARMACOLOGICAL PROFILE**

*Pongamia pinnata* have been investigated for its biological Activity based on the traditional therapeutic knowledge

**Anti-diabetic activity**

*Pongamia pinnata* extracts have shown potential e.g diabetes phytomedicine due to its antihyperglycemic activity potential against several animal models of diabetes. Oral administration of ethanol extract of *Pongamia pinnata* flower showed significant anti-hyperglycemic activity effect of oral administration on alloxan-induced diabetics rats <sup>45</sup>. Sikarwar et al (2010) suggested the potential hypoglycemic and hypolipidemic effect of aqueous extract from articles <sup>46</sup>. Sweetey et al. (2011) also came to this conclusion Ethanol extract of *Pongamia pinnata* showed potential hypoglycemic activity in OGTT and normoglycemic rats and the antidiabetic effect in alloxanized rats is comparable reference drug glibenclamide<sup>47</sup>

**Anti-cancer activity**

Pongapin and Karanjin, two furanoflavanoid derivatives showed different antitumor effects demonstrate their potential as natural anticancer agents. Pongapin inhibited the growth of cervical cancer cells (HeLa), significantly increasing intracellular reactivity oxygen species (ROS) and stabilize its expression I- $\kappa$ B (nuclear factor kappa-light polypeptide gene enhancer in B-cell inhibitor) and down-regulator of expression NF- $\kappa$ B (enhancer of nuclear factor kappa light chain activated B cells). It also greatly increased DNA injury-induced expression of p53 and p21. On the contrary, Karanjin reduced ROS levels by inhibiting I- $\kappa$ B NF- $\kappa$ B degradation limits nuclear translocation. In addition, it caused low DNA damage with increased p53 expression, induced G2/M arrest and increased SubG1 of the population showing induction of apoptosis. *Pongamia* induces caspase-dependent apoptosis by induction Bax/Bcl-2 ratio due to increased Bax expression while Karanjin induced caspase-dependent apoptosis through low expression of Bcl-2 <sup>48</sup>

**Anti-lipidemic activity**

*Pongamia pinnata* pods and flower extracts were seen possible hypolipidemic activity when induced by streptozotocin diabetic rats <sup>46</sup>. *Pongamia pinnata* leaf extract in possession which has a significant anti-hyperlipidemic effect decreased serum lipid parameters such as total cholesterol, triglycerides, low density lipoprotein (LDL), very low high-density lipoproteins (VLDL) and an increase in high-density lipoproteins lipoprotein (HDL) in an atherogenic diet hyperlipidemic rats<sup>49</sup>

**Anti-urolithiatic activity**

Traditionally, seed powder was prescribed as a treatment kidney disease Ahmed et al (2016) reported Urolithic effect Seeds of *Pongamia pinnata*<sup>50</sup>

### Antioxidant activity

The methanol extract of the seeds has an antioxidant effect improves the reducing/antioxidant effect of ferrous metal (FRAP activity) and  $\beta$ -carotene degradation, DPPH (2,2- diphenyl-1-picrylhydrazyl) radical scavenger activity and superoxide levels. The result may be an antioxidant effect the presence of total free phenol content. In addition, the number of germinated seeds and oil-fried seeds increased phenol content, enhanced antioxidant and free radicals rush action This confirmed the antioxidant potential participation of phenolic compounds<sup>51</sup>

Karanjapin (turkey) and karanjachromin (pyranoflavonoid) increases full antioxidant status through radical inhibition cation ABTS+50 . Cycloart-23-ene-3 $\beta$ ,25-diol was isolated Pongamia pinnata stem bark. Dependent on the dose antioxidant activity showed increased potential removal of various free radicals including DPPH, superoxide, hydroxyl, hydrogen peroxide, nitrous oxide radicals and metal chelates<sup>53</sup> . Karanjin and Pongapin, two An important property of Pongamia pinnata is furanoflavon ability to remove nitrogen oxide approximately 95.60% 68.05% As reported by Ghosh et al., (2018).<sup>52</sup>

### Antimicrobial activity

Extracts and compounds of Pongamia pinnata leaves, bark, seeds and seed oil have been extensively described antibacterial, antifungal and antiviral effect. The alcoholic extracts of the seeds have been reported to contain antibacterial property against several gram-positive, gram negative bacteria and antifungal property<sup>54</sup>. Wagh et al., (2007) reported that Pongamia fatty oil pinnata can be used to develop antimicrobial drugs, it is possible against antifungal and antibacterial effects *Aspergillus niger*, *A. fumigatus*, *Staphylococcus aureus* and *Pseudomonas aeruginosa*<sup>55</sup>

Bajpai et al (2009) reported the use of leaf extract in the food industry and the pharmaceutical industry antimicrobial activity against several strains of *Bacillus subtilis*, *Staphylococcus aureus*, *Listeria monocytogenes*, *Listeria monocytogenes*, *Pseudomonas aeruginosa* and *Salmonella typhoid fever*<sup>31</sup> . Antifungals were reported by Dahikar et al (2017). Effect against several bacterial and fungal strains<sup>12 56</sup>

### Antiviral activity

Pongamia pinnata has been widely used in Ayurveda and Siddha systems of traditional medicine for treatment clinical lesions of the skin and genitals<sup>5</sup> . Elanchezhiyan et al al., (1993) reported antiviral properties of water-based agents Pongamia pinnata seed extract for herpes simple virus type 1 and type 2 (HSV-1 and 2) using Vero cells as an in vitro model<sup>57</sup> . Rameshthangam and Ramasamy (2007) reported the antiviral effect of ethanol extract from the leaves and the isolated compound bis (2- methylheptyl) phthalate against white spot syndrome Virus (WSSV) belonging to *Penaeus monodon* Fabricius, which causes white spot syndrome in shrimp<sup>58</sup>

### Anti-inflammatory activity

There were extracts of Pongam pinnata leaves and seeds has been reported to have strong anti-inflammatory effects rat induced by acute, subacute and chronic inflammation models<sup>59</sup>. Extracts of seeds (ethanol) were also exposed. Anti-inflammatory effect on chemically induced foot inflammation in rats. At the same time, anti-inflammatory the effect was best observed against bradykinin and PGE1 induced inflammation and minimal histamine and 5-HT- caused by inflammation. Antipyretic effect is also important has been seen against pyrexia caused by beer fest extract<sup>60</sup> Seeds and seed oil were used in the processing various inflammatory conditions such as leukoderma, lumbago and rheumatism. Pongami seeds and root extracts pinnata has been reported to be ulcer protective and healing effect in rats<sup>61 62</sup>

**Other pharmacological activities**

- A) Skin protection :** *Pongamia pinnata* leaf extracts have showed very good light absorption through the UV range. That is why it is proposed used in sunscreen products because it has UV protection ability and it also has the advantage of avoiding harmful ones and the unwanted effects of synthetic sunscreens compounds<sup>63</sup>. *Pongamia pinnata* extract seeds they were found to be very good UV absorbers in the UVA and B ranges because they contain photon absorbent compounds and therefore have been proposed used with herbal preparations such as creams, ointments or creams as they claim to appear protective effect in a wide range of all ultraviolet radiation under <sup>64</sup>
- B) Anti- plasmodial activity:** Methanolic extract *Pongamia pinnata* bark has been shown to be effective in vitro antimalarial activity (IC<sub>50</sub> value 11.67 µg/ml) against *Plasmodium falciparum* (3D7 strain) susceptible to chloroquine and showed significant activity against *Plasmodium berghei* malaria parasite in vivo<sup>65</sup>
- C) Neuroprotective activity:** Neurodegenerative diseases associated with emerging neuroinflammation overproduction of nitric oxide (NO) in microglial cells. Three compositions of *Pongamia pinnata* viz Pongaglabolic methyl ether (flavonoid) and loncocarpine (heel) and glabracromen II (heel). Be potential therapeutic agents in neurodegenerative diseases because they significantly inhibit LPS. Induces nitric oxide production in microglial BV-2 cells<sup>10</sup>
- D) Anti-mutagenic activity :** Significant antimutagenicity *Pongamia* single flower honey was exposed ski Monofloral honey with solid phase extraction followed by HPLC-guided mutagenicity testing identified the biggest anti-section of the section mutagenicity and characterized it as containing abscisic acid (ABA). In addition, the male also isolated ABA showed strong mutagenicity<sup>65</sup>. Significant anti-The ethanol extract of the leaves had anticonvulsant activity *Pongamia pinnata* with maximum electric shock seizure (MES) model of wistar albino mice and Pentylene-tetrazole-induced convulsions (PTZ) in rats models <sup>66,67</sup>.

**PHARMACOLOGICAL AND THERAPEUTIC USES**

Several scientific studies/research have shown that this plant consists of various pharmacological effects such as antioxidant, antimicrobial, anti-parasitic, anti-inflammatory, anti-seizure, anti-diabetic, anti-hyperammonemic, cytotoxic, anthelmintic and many others. They mentioned below:

- 1. Antioxidant properties:** Mainly ethanol extract of leaves it has antioxidant properties. The experiment was done on NH<sub>4</sub> Cl-induced hyperammonemia rats and the results showed that oral administration (300 mg/kg body weight) significantly decreased TBARS, HP and CD levels and increased superoxide levels dismutase, catalase, glutathione (GSH) peroxidase and GSH liver and kidney <sup>68</sup> It contains flavonoids and polyphenols the extract has antioxidant properties. Another study confirms this the methanol extract of the seed increases the level of iron(III) reduction/ antioxidant power <sup>69</sup>
- 2. Antimicrobial:** consists of various plant extracts antibacterial activity against various Gram negatives and Gram-positive bacteria such as *Proteus vulgaris*, *Staphylococcus epidermidis*, *Staphylococcus aureus*, *Enterobacter aerogenes*, *Bacillus subtilis*, *Salmonella typhimurium*, *Escherichia coli*, *Propionibacterium acne*, *Yersinia enterocolitica*, *Listeria monocytogenes*, *Shigella flexneri*, and *Vibrio cholerae* <sup>71</sup>. Chalcone, triterpene and aromatic carboxylic acid are the main compounds with antimicrobial activity action <sup>70</sup>. The experiment was conducted to evaluate the antifungal property and it was observed that the seed oil showed maximum activity Against *Aspergillus niger*, followed by *Aspergillus terreus* and *Candida albicans* <sup>72</sup>. Cycloart-23-ene-3β,25-diol is a triterpene compound the antifungal activity of this plant has been tested. The result showed strong activity against *C. albicans* and no activity against *Penicillium notatum* <sup>73</sup>. The crude aqueous extract of the seed inhibited growth of herpes simplex virus type 1 (HSV-1) and HSV-2 <sup>74</sup> and showed no activity against rotavirus <sup>75</sup> The experiment is done showed that oral administration of an ethanolic extract of the leaves inhibited increased growth and survival of white spot syndrome virus the share of shrimp is up to 40-80% <sup>76-80</sup>. ( 76 to 80 )

3. **Anti-Protozoal:** The reported studies showed that the bark and leaf extract with low IC50 values, the dry extract showed antimalarial activity, antiplasmodial activity against *Plasmodium falciparum*<sup>81</sup>. On a magnifying glass is the main ingredient that prevented the invasion of *P. falciparum* merozoites<sup>82</sup> and also inhibited trypanosome growth *cruzi* and *Leishmania*
4. **Anti-inflammatory:** The test was done on rats to evaluate the anti-inflammatory effect of the methanolic extract seeds orally at a dose of 12-50 mg/kg for 5 days. The results showed a protective effect against the stomach ulcer in rats<sup>83</sup>
5. Another study was conducted to evaluate the anti-inflammatory agent activity against complete Freund's adjuvant-induced arthritis in rats. The model was found to have been injected with this herbal formulation includes *Cissampelos pareira* City. Roots, *M. pinnata* (L.) leaves. *Pierre* and *Vitex negundo* leave castle. It has an anti-inflammatory effect properties<sup>84</sup> This composition reduces the swelling of the rear foot body weight along with other model improvements

## CONCLUSION :

*Pongamia pinnata* is a plant native to India the peninsula was widely used in traditional folklore as a cure for many diseases caused by them non-toxic nature with no side effects/minimal side effects. This review provides extensive information on this topic Phytochemicals isolated from different parts of *Pongamia* reported surface and biological functions plant extracts and their compounds. Based on traditional information available to the institution, research contribution determine the components responsible for the healing effect was started, leading to the extraction, isolation and characterization of plants. Top with pongam screening of biological activity in vitro and in vitro in vivo models of various diseases have shown significant properties that include antimicrobial, antidiabetic, antimicrobial anti-inflammatory, anti-cancer etc. Phytochemicals has also been identified as responsible for these effects, characterized and described by many authors. With this Basic and advanced study of *Pongamia pinnata*, next the focus is on the mechanism of action bioactive compounds or extracts must be understood describe complex pharmacological effects. In addition, clinical trials ensure safety therapeutic treatments using *Pongamia pinnata* in modern medicines

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