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# PHARMACOLOGICAL PROPERTIES AND THERAPEUTIC POTENTIAL OF PTEROCARPUS MARSUPIUM(VIJAYASAR): A REVIEW

**Balraj Singh[1*], Chandan Singh[2], Laxminarayan Sharma[3], Rajendra Purvia[4], Suman Shekhawat[5] and Mayukh Sharma[6]**

[1]M.D. Scholar PG Deptt. of Dravyaguna University College of Ayurveda Dr. S R Rajasthan Ayurveda University Jodhpur, Rajasthan, India.

[2]M.D. (Ayu.), Asso. Prof. & HOD, PG Deptt. of dravyaguna University College of Ayurveda, Dr. S R Rajasthan Ayurveda University Jodhpur, Rajasthan, India.

[3]M.D. (Ayu.), Asso. Prof., PG Deptt. of Dravyaguna University College of Ayurveda, Dr. S R Rajasthan Ayurveda University Jodhpur, Rajasthan, India.

[4]M.D. (Ayu.), Assistant Prof., PG Deptt. of Dravyaguna University College of Ayurveda, Dr. S R Rajasthan Ayurveda University Jodhpur, Rajasthan, India.

[5]M.D. Scholar PG Deptt. of Kayachikitsa University college of ayurveda Dr.S R Rajasthan Ayurveda University Jodhpur, Rajasthan, India.

[6]M.D. Scholar PG Deptt.of dravyaguna University college of ayurveda Dr.S R Rajasthan ayurveda university jodhpur, Rajasthan, India.

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***Corresponding Author**
**Dr. Balraj Singh**
M.D. Scholar PG Deptt. of Dravyaguna University College of Ayurveda Dr. S R Rajasthan Ayurveda University Jodhpur, Rajasthan, India.

## ABSTRACT

*Pterocarpus marsupium* commonly known as Indian Kino tree or Asana or Vijayasar. It is highly enriched with an array of phytoconstituents including pterosupin, pterostilbene, liquirtigenin, isoliquiritigenin, epicatechin, kinoin, kinotannic acid, carsupin, marsupol, and so on. Many of these constituents have been explored for numerous biological actions like anti-cancer, anti-cataract, anti-diabetic, anti-hyperlipidemic, anti-inflammatory, anti-oxidant, cardiotonic, hepatoprotective etc. Thus, the current review`s aims to provide the complete pharamacognocy, phytochemistry and pharmacological profile of *Pterocarpus marsupium*.

**KEYWORDS:** *Pterocarpus marsupium.*

## INTRODUCTION

Pterocarpus marsupium Roxb., a medicinal plant, known for its anti-oxidant and anti-diabetic activity is a rich source of phytochemicals with antihyperglycemic and antihyperlipidemic activities. One of the such plant Pterocarpus marsupium Roxb., from the family Leguminosae also known as "vijaysar" or "Bijasar" is a large tree that commonly grows in the central, western, and southern parts of India and in Sri Lanka. Various parts of the P. Marsupium tree (heartwood, leaves and flowers) have long been used for their medicinal properties in Ayurveda.1The heartwood is used in the treatment of inflammation and reported to have medicinal importance in the management of diabetes since long.2 The flavonoids and phenolic contents present in the tree viz., marsupiun, pterosupin, and liquiritegenin are reported to posses antihyperglycemic and antihyperlipidemic activities.[1,2,3] So many compounds isolated from the different parts of the P. Marsupium extracts may serve as a potential source of natural antioxidant as well as for the treatment of diabetes.[4,5,6,7,8,9]

### Description

**Botanical Name: *Pterocarpus Marsupium* Roxb.**

**Family: leguminosae** (fabaceaea)

*Sanskrit: bijaka, pitasara, asanaka, bijasra*

*assamese: aajar*

*bengali: piyasala, pitasala*

*english: indian kino tree*

*gujrati: biyo*

*hindi: vijyasara, bija*

*kannada: bijasara, asana*

*kashmiri: lal chandeur*

*malayalam: venga*

*marathi: bibala*

*orissi: piashala*

*punjabi: chandan lal, channanlal*

*tamil: vengai*

*telugu: yegi, vegisa*

*urdu: bijasar.*[10]

**Scientific classification**[11,12,13,14]

Family: Fabaceae

Domain: Eukaryota

Kingdom: Plantae

Subkingdom: Viridaeplantae

Phylum: Magnoliophyta

Subphylum: Euphyllophytina

Class: Magnoliopsida

Subclass: Rosidae

Super order: Fabanae

Order: Fabales

Genus: Pterocarpus

Species: Marsupium

**Ayurvedic Profile**[15]

**Medicinal Properties**

Guna (Qualities) - Laghu (light to digest), Ruksha (dry)

Rasa (Taste) - Kashaya (astringent), Tikta (bitter)

Vipaka (post-digestive taste) - pungent

Veerya (Sheeta) - Coolant

Effect on tridosha – balances kapha and pitta dosha

Dosage – Decoction 50-100 ml; powder 3-6 gm[38]

**Classical Categorization**

Susruta – Salaasaradi gna

Vabhata – Asanadi Gana

Kaideva Nighantu – Oshadhi Varga

Dhanvantari Nighantu – Amradi Varga

Bhavaprakasha – Vatadi Varga

Rajanighantu – Prabhadradi Varga

**MORFOLOGICAL DESCRIPTION**

**Habit:** Tree

**Leaf:** Leaves are compound with 5 to 7 leaflets. Leaflets are oblong or elliptical with rounded or obtuse or retuse ends, glaucous beneath, secondary nerves close and paral-lel, over 12 cm each side.

**Flower:** Flower yellow, up to 1.2 cm long, corolla papil-ionaceous, exserted beyond calyx, Stamen 10, split in 2 bundles.

**Fruit**: - Legume indehiscent, orbicular, compressed, broadly hardened winged around smargin, usually ingle seeded, seeds subreniform, hilum small.

**Uses**- *Pterocarpus marsupium* is one of the valuable multipurpose forest tree that yield excellent timber for the national & inter-national trade market. Wood is used for building furniture, agricultural and railway purpose.

**Wood:** The heartwood is used as an ointment to astringent, bitter, acrid, cooling, anti-inflammatory, union promoter, depurative, urinary astringent, haemostatic, asthelmintic, constipating, anodyne alterant and rejuvenation. It is also useful in elephantiasis, inflammations, fractures bruises, lep-rosy, skin disease, leucoderma, erysipelas urethrorrhoea, dia-betes, rectalgia, rectitis, opthalmopathy, diarrhea, dysentery, cough, asthma, bronchitis and greyness of hair.

**Leaves:** The leaf paste is used as an ointment to treat skin diseases, sores and boils.

**Flower:** The flower is used as appetizing and febrifuge and also taken to treat anorexia and fever.

**Gum-resin:** The gum is taken to treat bitter, styptic, vulner-ary, antipyretic, anthelmintic and liver tonic. It is useful in spasmodic gastralgia, boils, gleet, urethrorrhoea, odontalgia, diarrhea, psoriasis, wound and ulcers, helminthasis, fevers, hepatopathy and ophthalmia.[33,34,35,36,37]

**Parts are used -**Heartwood, Leaves, Flowers, Gum resin.

**Doses of various preparations:** Bark powder-3-6 grams;decoction-50-100 ml;extracted juice 125 mg.

**Phytochemistry**

The ethyl acetate extract of powdered dried heartwood of *Pterocaipus marsupium* revealed the presence of following constituents: pterostilbene, (2S)-7-hydroxyflavanone, isoliquiritigenin, liquiritigenin, 7,4'-dihydroxyflavone, marsupsin, pterosupin, p-hydroxybenzaldehyde, (2R)-3-(phydroxyphenyl)-lactic acid and pm-33.[16] Tripathi and Joshi isolated three compounds from the ethyl acetate fraction of *Pterocarpus marsupium*, retusin-8-O-α-L-arabinopyranoside, naringenin, lupeol.[17] The resolution of ethyl acetate extract of the aqueous decoction of dried heartwood of *Pterocaipus marsupium* yielded pterocarpol among other compounds.[18] Handa *et* al. Isolated and identified an isoaurone C- glucoside named as pterocarposide.[19] Suri *et* al. Isolated a novel cglucoside, 1-(2', 6'-dihydroxyphenyl)-β-D-glucopyranoside from the aqueous decoction of powdered dried heartwood of *Pterocarpus marsupium.*[19] Maurya *et al.* Prepared the aqueous extract of heartwood of *Pterocarpus marsupium* and isolated five new flavanoid C-glucosides: pteroside, pteroisoauroside, marsuposide, flavon C-glucoside, vijayosin and two known compounds, C-β-D-glucopyranosyl-2,6-dihydroxyl benzene and sesquiterpene.[20] In another study, the bark of *Pterocarpus marsupium* was extracted with ethanol in a percolator and the phenolic constituent was identified as (-)-epicatechin. Two sterols, sitosterol and stigmasterol were also isolated.[21] Tripathi and Joshi isolated two new flavonoid glycosides from the roots of *Pterocarpus marsupium*, 7-Hydroxy-6, 8-dimethyl flavanone-7-O-alpha-L-arabinopyranoside and 7, 8, 4'trihydroxy-3', 5'-dimethoxy flavanone-4'-O-beta-d-glucopyranoside.[22]

**Therapeutic use of pterocarpus marsupiumm**

**Hepatoprotective Activity** Administration of methanol extract and aqueous extract of *P. Marsupium* stem bark showed significant hepatoprotective activity, which was comparable with the standard drug silymarin. The effect was more pronounced with methanol extract. Many phytochemical reports revealed that the methanolic extract of the plant was found to contain higher concentrations of flavonoids and glycosides.[23] The qualitative phytochemical investigations on the methanolic extracts of *P. Marsupium* also showed positive for flavonoids by ferric chloride, alkaline reagent and Shinoda tests. Further, it has been reported that the flavonoid constituents of the plant possess antioxidant properties[24] and was found to be useful in the treatment of liver damage.[25]

***Antidiabetic/Antihyperglycaemic/Hypoglycaemic activity***

Grover *et al.* Reviewed the medicinal plants having anti diabetic potential and found *Pterocaipus marsupium* to be one of the promising plants.[23] Dhanabal *et al.* Prepared the alcoholic extract of the bark of *Pterocaipus marsupium* and successively extracted with toluene, chloroform, ethyl acetate and butanol. These fractions were found to have beneficial effects on blood glucose levels.[24] A flexible dose double blind multicenter randomized controlled trial undertaken from October 1995 till January 1998 concluded that vijayasar is an effective blood glucose lowering agent, its glycaemic effect being comparable to that of tolbutamide in treatment of naive patients with Type 2 diabetes.[25] The beakers made from heartwood are filled with water and are allowed to stand overnight to give "Beeja Wood Water". This water when consumed daily twice for 30 days has shown beneficial effects in individuals suffering from diabetes.

***Anti-hyper triglyceridaemic activity***

Jahromi and Ray administered the ethyl acetate extract of heartwood of *Pterocarpus marsupium* in rats for 14 consecutive days. The results proved that there is a significant reduction of serum triglyceride, total cholesterol, LDL- and VLDL cholesterol without any significant effect on the level of HDL- cholesterol.[26]

***Cardiotonic activity***

In one study, it was observed that at a very high dilution the aqueous extract of heartwood of *Pterocarpus marsupium* produced negative chronotropic and positive inotropic effects in frogs. The results showed that the aqueous extract of *Pterocaipus marsupium* possesses an excellent cardiotonic activity.[27] In another study, (-)- epicatechin extracted from the bark of *Pterocarpus marsupium* was studied and it showed cardiac stimulant activity in perfused frog hearts producing increase in force along with increase in rate. Thus (-)-epicatechin showed a cardiac stimulant property.[28]

**Anti-cancer Activity**

Pterostilbene[29] and Stilebene[30] have been found to exhibit the anti-cancer potential. An investigation showed that Pterostilbene inhibited the cell proliferating factors like Akt, Bcl-2 and induced the mitochondrial apoptic signals like Bax, and the series of caspases. It was also found to inhibit two important metastasis inducers-Matrix Metalloproteinase 9 (MMP) and α-Methyl Acyl coa racemose (AMACR). Thus, Pterostilbene has manifold target sites to induce

apoptosis and it can be used for the treatment of breast and prostate cancer.[31] Resveratrol has also been reported to possess anticancer potential.[32]

## CONCLUSION

*Pterocarpus marsupium* has been used since ages for the management as anti-diabetic *Pterocaipus marsupium* is being used commercially in pharmaceutical preparations. In the *Pterocarpus marsupium* extract many chemical constituents like pterostilbene, marsupsin, pterosupin, (-)-epicatechin etc. have been identified and isolated. The current review has focused on the numerous pharmacological activities of PM lik, anti-cancer, anti-hyperlipidemic, anti-oxidant, cardiotonic, hepatoprotective.

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