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A REVIEW ON BEEJAKA (PTEROCARPUS MARSUPIUM ROXB.) WITH SPECIAL REFERENCE TO NIGHANTUS

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ABSTRACT

Beejaka (*Pterocarpus marsupium* Roxb.) belongs to the family Fabaceae and is widely distributed throughout India. It is well known common medicinal plant of India. The heartwood extract of this plant is reported to have many pharmacological compounds which are useful in the treatment of various disorders. At present it is considered as one of the potent anti-diabetic drugs of herbal origin. Ancient Samhitas like Charaka Samhita, Sushurut Samhita, Nighantu Granthas viz. Dhanvantari Nighantu, Raj Nighantu, Madanpal Nighantu, Shaligram Nighantu, Kaiyadeva Nighantu, Bhavprakash Nighantu, had described *Pterocarpus marsupium* Roxb and its therapeutic uses in detail. *Pterocarpus marsupium* extract shows promising results in hyperglycaemia, this plant also finds its use as antidiarrheal agent, cardio tonic and hepatoprotective agent. This review also highlights various medicinal properties of Beejaka through different studies.

KEYWORDS: Nighantu, anti-diabetic, *Pterocarpus marsupium*.

INTRODUCTION

Medicinal plants play a pivotal role in the health care of ancient and modern cultures. Ayurveda, the Indian system of medicine mainly uses plant based drugs or formulations to treat various human ailments because they contain the components of therapeutic value. In

addition, plant based drugs remain an important source of therapeutic agents because of the availability, relatively cheaper cost and non-toxic nature when compared to modern medicine.[1]

Beejaka is commonly known as Indian Kino tree or Bijaisar. It is a moderate to large sized, deciduous tree, upto 30 m high. It is extensively use for the treatment vitiligo, herpetic skin lesion, diabetes, obesity, worm infestation etc in Ayurveda. It also acts as skin tonic, hair tonic and tissue vitalizer.

Botanical name- *Pterocarpus marsupium* Roxb**.**

Family- Fabaceae

Taxonomical classification[2]

Kingdom: Plantae – Plants

Subkingdom: Tracheobionta – Vascular plants

Superdivision: Spermatophyta – Seed plants

Division: Magnoliophyta – Flowering plants

Class: Magnoliopsida – Dicotyledons

Subclass: Rosidae

Order: Fabales

Family: Fabaceae – Pea family

Genus: *Pterocarpus* Jacq. – *pterocarpus* P

Species: *Pterocarpus marsupium* Roxb. – Malabar kino

Classical names- Asana, Beejaka, Peetashalaka, Pitasara, Bandhookapuspha, Priyaka, Sarjaka

Vernacular name[3]

Eng- Indian kino Tree, Malabar kino Tree

Hindi- Bijasal, Vijaysar, Bia

Beng.-Pitashal, Piyasal

Guj.- Biyo, Hirodakhan

Kan.-Hannemara, Hone, Bijasara, Asana

Mal.- Venna, Venga

Mar.- Dhorbenla, Asan, Bibla

Punj.- Chandanlal, Channanlal

Tam.- Vengai

Tel.- Pedda, Asana

Assam-Ajar

Oriya- Byasa, Piashal**.**

Namarupa Vijnana[4]

1. **असन: (भा०)-- अस्यति क्षिपति प्रमेहादिन् रोगान I**
2. **काशर्य: (कै०) – क्रिश्त्वजनक: I**
3. **तिष्य: (कै०)-- तिष्ये पौषमासे पुष्प्यति I**
4. **नीलनिर्यास:--(म ०नि०)-- नीलो निर्यासोअस्य I**
5. **पीतसार: (भा०)-- पीतवर्ण: सारोअस्य I**
6. **पीवर: (नि०)—स्थुलकाण्डत्वत् I**
7. **प्रियक: (भा०)—प्रियत्वमापादयति I**
8. **बन्दुकपुष्प : (भा०)— बन्दुकस्येव पुष्पाण्यस्य I**
9. **बीजक : (भा०)— फले बीजस्यैव प्रध्यान्यत I**
10. **महासर्ज: (ध०)-- महान् वृक्ष: सर्जकार: I**
11. **शौरि: (कै०) – शूरे शूरसेनप्रदेशो भव: I**
12. **सर्जक: (भा०)— विसृजति निर्यसम I**
13. **सुगन्धि: (कै०) – पुष्पाणां सुगन्धित्वात् I**

Beejaka (*Pterocarpus marsupium* Roxb**.)** is a big tree resembling shala and sarja (pitashala, mahasarja) with thick stem (pivara) found in western U.P. (shauri) etc. having yellowish heart-wood (pitasara). It exudes blue gum (nilaniryasa). The plant bears fragrant (sugandhi) flowers like those of bandhuka (bandhukapuspa) in late winter (tisya). It also removes obesity (karshaya) and makes the physique charming (priyaka).

Literature Review

There is mentioned in the context of dantadhavana in Visnudharasutra (V.D.S. 61/14)

A) Samhita Kala[5]

Classical categorization of Beejaka according to various texts

In Susruta Samhita, it is mentioned under Salsaradi gana

In Astanga Hridaya, it is mentioned under Asanadi gana

Table No. 1: Showing the indication of Beejaka according to various Ayurvedic texts.

Classical Text	Indication	References
Charak Samhita	Describe with the names Priyaka	**Ch. Sam. Su.- 25/40**
Susruta Samhita	Describe with the names Priyaka	**Su. U-47/61**

B) Nighantu Kala

Table No. 2. Showing the Classical categorization of Beejaka according to various Nighantus.

Drug	D.N[6] 10-13th AD	K.N[7] 15th AD	M.P.N[8] 14th AD	R.N[9] 15th AD	S.N.[10] 19th AD	B.P.N[11] 16th AD
Beejaka	Amradi Varga	Aoushadi varga	Vatadi varga	Prabhadi Varga	Vatadi varga	Vatadi varga

(D.N- Dhanvantari Nighantu, K.N- Kaiyadeva Nighantu, R.N- Raj Nighantu, M.N- Madanpal Nighantu, S.N- Shaligram Nighantu, B.P. N. – Bhavaprakasha)

Table No. 3. Showing synonyms of Beejaka according to various Nighantus.

Synonyms	D.N[6]	K.N[7]	M.P.N[8]	R.N[9]	S.N.[10]	B.P.N[11]
Asana	-	+	-	+	+	+
Ashanaka	-	-	+	-	-	-
Bandhukapuspa	+	+	-	+	+	+
Bijaka	+	-	-	-	+	+
Souri	+	+	+	+	-	-
Pitashara	-	-	-	-	+	+
Pitashalaka	+	-	-	+	+	+
Priya	-	+	+	-	+	-
Priyaka	+	-	-	+	-	+
Sarjaka	-	-	-	-	-	+
Kamya	-	+	+	-	-	-
Alaka-priya	-	+	+	-	-	-
Nilaka	-	-	-	+	-	-
Mahasarja	+	+	-	+	-	-
Bijavriksha	-	-	-	+	-	-
Shyama	+	-	-	-	-	-
Nila niryasa	-	+	-	-	-	-

“ + ” denotes same name was mentioned in various Nighantu .“ - ” denotes this name was not mentioned.

The synonym Nila niryasa given by Kaiyyadeva nighantu poses confusion, since; the name is presently used to refer Tailaparni (*Eucalyptus globulus*). During the Nighantu Period its utility has increased and at present it is considered as one of the potent anti-diabetic drugs of herbal origin. Asana, Souri, Bandhukapuspa are most used synonyms.

Table No. 4: Showing Rasapanchak, Main Action and Properties of Beejak according to various Nighantus.

Nighantus	D.N[6]	K.N[7]	M.P.N[8]	R.N[9]	S.N.[10]	B.P.N[11]
Rasa	Sakashaya	Katu Kashaya	-	Katu Tikta	Tikta	-
Guna	-	-	-	Saraka	-	-
Virya	-	Usma	-	Usma	-	-
Vipak	-	Puspa-Madhura vipaka	-	-	Madhura	-
Effect on Tridosa	Kapha-Pitta Asranasanam	Kaphahara	-	Vataarti dosha	Vatahara	Shlesma-Asranasanam Pitta
Main Action	-	Rasayana	Rasayana	-		Rasayana
Properties	-	Keshya Asrapittaghna Krimi Visarpa Kustha Khuda Shvitra Medoroga Meha	Kustha Visarpapra Svitra Prameha Jwara krimi Kaphahara Raktapitta Tavchya Kesya	Galadoshaghna Rakta-mandal nasanam	Pachaka	Kustha Visarpa Svitra Meha Gudaroga Krimi Tvachya Keshya

Botanical description[3]

It is a moderate sized to large deciduous tree, grows up to 30 m high.

Stem- it is erect, strong and crooked. Branches are widely spreading.

Bark-it is grey, rough, longitudinally fissured and scaly with whitish markings,

Leaves are abundant, alternate imparpinate; without stipules, unequally pinnate with round petioles, leaflets 5 to 7, oblong.

Flowers are yellowish, fragrant, in large panicles, bisexual, pentamerous, zygomorphic and regular, calyx-sepal5, and corolla-petals5, papilionaceous, yellow.

Pods are orbicular, flat, winged, upto 5 cm in diameter.

Seeds are 1to 2, convex, bony.

Fig.1. Showing trunk https://images.app.goo.gl/7R71xX1kBCYWAwAZ6

Fig.2. Showing flower https://images.app.goo.gl/VtS93ZAw27L6HQfu9

Fig.3. Showing fruits. https://images.app.goo.gl/Cp5AXQks8buBMQ1bA

Distribution[12]

Hilly regions, throughout Deccan Peninsula, and extending to Gujarat, Madhya Pradesh, Uttar Pradesh, Bihar and Orissa.

Part used[12]

Leaves, Heartwood, Flower, Gum.

Pharmagnosy[13]

a) Macroscopic

It occurs as irregular pieces in variable size and thickness, golden yellowish brown with darker streaks, on soaking in water it gives yellow colour solution with blue fluorescence strong, tough, very hard, moderately heavy, fracture, it is difficult to break but brittle, taste is astringent.

b) Microscopic

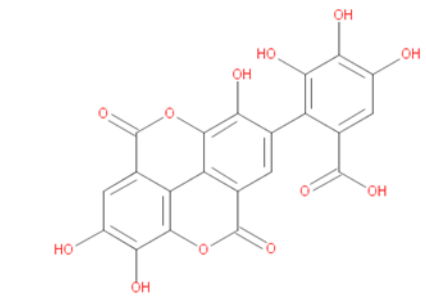
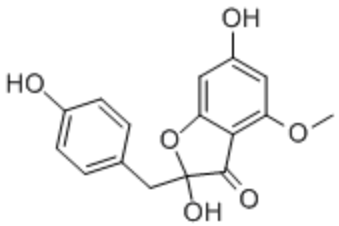
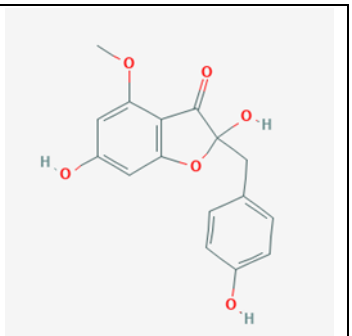
Its transverse section shows alternating bands of larger and smaller polygonal cells consisting of tracheids, fibre tracheids, xylem parenchyma and traversed by xylem rays, numerous xylem vessels distributed throughout, in singles or in groups of 2-3, showing tyloses filled with tannin; in isolated preparations, vessels, drum or barrel shaped with well-marked perforation rims and bordered pits; tracheids are numerous, long, thick-walled with tapering ends and simple pits; fibre tracheids elongated, thick-walled with narrow lumen and simple pits; xylem parenchyma rectangular with simple pits, paratracheal, surrounding vessels;

xylem rays are uni-to-biseriate, 3-5-7 cells high, prismatic crystals of calcium oxalate present in crystal fibres, starch is absent.

Powder: It is brown to chocolate in colour, under microscope shows vessels with bordered pits, fibre tracheids, tracheids, fragments of xylem rays and few crystal fibres, starch is absent.

Chemical constituents[3]

Plant yields gum kino which contains kinotannic acid, β-eudesmol, marsupol, carpusin, propterol, marsupinol, propterol- B, a flavone, new sesquiterpene alcohol-selin-4 (15)-en β, 11-diols, pterostilbene, a new compound marsupsin, a new chalcone derivative, pseudobaptigenin, liquiritigenin and its iso derivative and other related derivatives, a non-glucosidal tannin, kinoin and kino-red, protocatechuic acid.

		
Kinotannic acid	**Marsupsin**	**Carpusin**

Action and Uses[3]

The **heartwood** is astringent, bitter, acrid, cooling, anti-inflammatory, union promoter, depurative, urinary astringent, haemostatic, anthelmintic, constipating, anodyne, alterant and rejuvenating. It is useful in elephantiasis, inflammations, fractures, bruises, leprosy, skin diseases, leucoderma, erysipelas, urethrorrhoea, diabetes, rectalgia, rectitis, opthalmopathy, haemorrhages, verminosis, diarrhoea, dysentery, odontalgia, gout, rheumatoid arthritis, cough, asthma, bronchitis and greyness of hair. **Leaves** are useful in boils, sores and skin diseases. The **flowers** are bitter, sweet, cooling, appetising and febrifuge and are useful in anorexia and fever. The **gum** is bitter, styptic, vulnerary, antipyretic, anthelmintic and liver tonic. It is useful in spasmodic gastralgia, boils, gleet, urethrorrhea, odontalgia, diarrhoea, psoriasis, wounds and ulcers, helminthiasis, fevers, hepatopathy and ophthalmia.

Ayurvedic properties[12]

Rasa- Kashaya, Tikta

Guna- Laghu, Ruksha

Veerya- Ushna

Vipaka- Katu

Prabhava- Hridya

Doshaghnata- Kaphapittashamaka

Rogaghnata- Madhumeha, Prameha, Sthoulya, Kustha,Udarda, Visarpa, Shwitra, Shotha, Palitya, Abhighataja Vedana, Bhagna, Atisar, Pravahika, Krimi, Dantashoola, Raktapitta, Raktavikara.

Karma- Kusthaghna, Keshya, Shoothahara, Stambana, Krimighna, Raktashodhaka, Raktapittashamaka, Mootrasangrahaniya, Madhumehahara, Yonidoshahara, Sandhaniya, Rasayana.

Doses- Powder- 3-4gm; Decoction- 50-100ml; Gum-1-3gm

Formulation and Preparations

Nyadrodhadi churna, Ayaskriti, Asanabilvadi taila.

Substitute and Adulteration[3]

Terminalia tomentosa Bedd is used as substitute in certain pockets of the country. The dried juice of *Butea monosperma* (Lamk) Taub trunk is called Bengal Kino and is used as a substitute and adulterant to Indian Kino (*Pterocarpus marsupium* Roxb.).

Pharmacological activities

1. Anti-diabetic

Aqueous extract of *Pterocarpus marsupium* at doses of 100 & 200 mg/kg found to decrease the fasting and postprandial blood glucose in type 2 diabetic rats. The 200 mg/kg had more effect on postprandial hyperglycemia. This drug also improved the body weight of diabetic rats. Cytokine TNF-α was found to be elevated in untreated diabetic rats due to chronic systemic inflammation. This aqueous extract at both doses significantly ($P < 0.001$) decreased the elevated TNF-α level in type 2diabetic rats.[14, 15]

2. Cardiotonic activity

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 *Pterocarpus marsupium* possesses an excellent cardiotonic activity.[16] In one another study, it is seen that (-)- epicatechin extracted from the bark of *Pterocarpus marsupium* showed cardiac stimulant activity in perfused frog hearts producing increase in force along with increase in rate. Thus (-)-epicatechin showed a cardiac stimulant property.[17]

3. Anti-cataract activity

Aqueous extract of *Pterocarpus marsupium* bark showed anti-cataract activity. This was evident from the decreased opacity index in the alloxan induced diabetic rats.[18]

4. Hepatoprotective activity

The methanol extract of stem bark of *Pterocarpus marsupium* possesses hepatoprotective activity.[19]

5. Antidiarrheal activity

Ethanolic extract of *P. marsupium* heartwood (250 and 500 mg/kg b.wt.) significantly decreased the severity and frequency of charcoal and castor oil induced gastrointestinal motility or diarrhea confirming the strength of traditional use of this plant as the modality for diarrhea.[20]

CONCLUSION

The use of plants for medicinal purpose is as old as human civilization. India is gifted with enormous natural flora as it endowed with a wide diversity of agro-climatic conditions, India can be considered as herbarium of the world. The current review has focused on the numerous pharmacological activities like hyperglycaemia, as antidiarrheal agent, cardio tonic and hepatoprotective agent. Samhita and nighantus are the basic literature for understand and identification of different medicinal plants. On review of Beejaka in different samhita and nighantus we find the different synonyms and properties along with their medicinal uses.

Wooden tumblers or beaker made from the heartwood of tree are used since time immemorial to control diabetes and. The tumbler is filled with water and left overnight. This water when consumed twice daily for 30 days has shown beneficial effects in individuals suffering from

diabetes. *Pterocarpus marsupium* is very useful herbal drug which is used in many pharmacological disorders sine ages; however more research must be carried out to evaluate the mechanism of action of its active principles and their pharmacological properties, so that its potential can be fully utilized.

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