



The Growing importance of Vijaysar in Agriculture, Industry and Medicine: A Review

¹Riddhi H. Shukla, ²Avani Y. Bhatt, ³Dr. Mihir K. Raval, ⁴Dr. Navin R. Sheth

I. INTRODUCTION

In the last few years there has been drastically growth in the field of herbal medicines, plants are playing a vital role in people's life. History of herbal medicine is ancient. Even in current scenario most of the people prefer herbal drugs. Traditional medicines are inexpensive, having less side effects and easily available, so 75-80% of the population relies on the medicinal plants for their primary health care¹. Natural Products have been prescribed since ages for the treatment of various ailments. There are number of traditional medicine have utilized the probability of medicinal plants. Number of plants, herbs, shrubs is used as medicines. Most of the medicinally active constituents are identified in the nineteenth and twentieth centuries and were employed in the shape of the crude extract. WHO states that the herbs are used two to three times more than the conventional drugs as remedies for various ailments². Pterocarpus marsupium (Fabaceae) is one of the best herbal drug which is involved in Ayurveda, Unani, and Homeopathic system of medicine. Pterocarpus marsupium, is a one of the most valuable multipurpose forest tree. That yield excellent timber for the international trade market³.

II. OCCURRENCE AND DISTRIBUTION

The plant species is native to India, Sri Lanka, and Nepal. It is notably found within the areas of Western Ghats in the Karnataka-Kerala region³(Gairola Seema et al, 2010). It's conjointly found in hilly region of Gujarat, Uttar Pradesh, Bihar and Orissa⁴. The herb is known as different name in the different regions. In Sanskrit it is referred as Bijaka, Pitasara, Asanaka, Bijasra, in English it is referred as Indian Kino Tree, in Gujarati it is referred as Biyo, in Hindi it is referred as Vijaysar, Bija.

III. BOTANICAL DESCRIPTION

Drug occurs as irregular pieces of variable size and thickness golden yellowish brown with darker streaks, on soaking in water gives yellow colour solution with blue fluorescence⁵. It is of moderate size to large tree. It is a medium to large sized tree reaching height up to 15-20 meter with dark brown to grey bark having swallow cracks⁶. Leaflets are alternate, oblong, and 2.5-7.5cm broad⁷. The flowers are very numerous, white, with a small tinge of yellow³. Vexillum is with a long, slender claw, very broad; sides reflexed, waved, curled and veined. Stamens are 10, Ovary is oblong, pedicelled, hairy, generally 2-celled; cells are transverse and 1 seeded. Seeds are single and Reni form⁸. The heartwood is golden yellowish-brown with darker streaks and produce as unequal pieces of irregular sizes and thickness. On submerge in water, it produces yellow

colour solution with blue florescence. Trees flower mature by august-September and fruits mature by February-March¹.

Scientific classification¹

Family: Fabaceae

Domain: Eukaryote

Kingdom: Plantae

Subkingdom: Viridiaeplantae

Phylum: Magnoliophyta

Subphylum: Euphyllophytina

Class: Magnoliopsida

Subclass: Rosidae

Order: Fabales

Genus: Pterocarpus

Species: Marsupium⁸

IV. VIJAYSAR AS AN AYURVEDA MEDICINE

The Drug Pterocarpus marsupium is widely distributed on the earth. Kino is used as powerful astringent odourless plant. Leaves are used for boils, sores, skin diseases and stomach pain¹. Leaves are also used for food and manure⁹. The flowers are used in the treatment of fever. The phloem of stem contains red astringent fluid present in secretory cell which exudes after given incision⁸. Due to strong astringent properties bark is used in the treatment of dysentery, passive haemorrhage, toothache¹⁰. Urethral discharged, chronic ulcer, abortifacient³. Leaf juice is given in purulent discharges from ear, p lant is useful in snakebite and scorpion sting⁶. The heartwood possesses astringent, anti-inflammatory, anti-diabetic and anodyne properties¹. The cups made of wood are available with Khandi and gramodyog commission for treatment of diabetes¹⁰. The gum is used as antipyretic, anthelmintic and tonic to liver, useful in all diseases of body and styptic vulnerant and good for griping and biliousness, ophthalmiya and urinary discharge¹¹.

बीजकः कुष्ठबीसर्पश्चित्रमेहगुद क्रिमीन।

हन्ति श्लेष्मास्तपित्तश्च त्वचयः केशयो रसायनः ॥

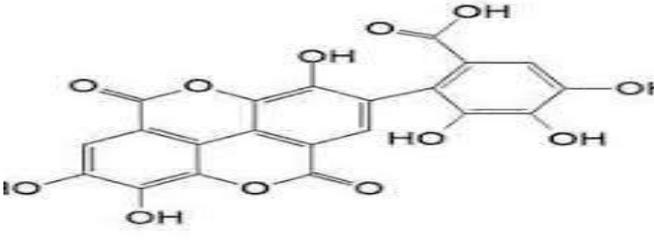
It means Bijaka cures skin diseases including leprosy, cellulitis, leucoderma, obstinate, urinary disorders including diabetes, disease of anorectum, and parasitic infestation. It destroys diseases of shleshma and haemorrhagic diseases. It is good for the skin, hair and is a rejuvenator¹².

V. PHYTOCONSTITUENTS

The major phytoconstituents of *Pterocarpus marsupium* are pterosupin, Pterostilbene, liquiritigenin, isoliquiritigenin, Epicatechin, kinoin, Kino tannic acid, Kino-red, beta-eudesmol, carsupin, marsupol, marsupinol etc¹. Wood contain a few novel flavonoid C-glycosides: 2,6-hydroxy-2(4-hydroxybenzyl)-benzofuran-7-C-b-dglucopyranoside(1),3-(a-methoxy-

4hydroxybenzylidene)-6-hydroxy benzo-2(3H)-furanone-7-C-b-d-glucopyranoside(2),2-hydroxy-2-p-hydroxybenzyl-3(2H)-6 hydroxybenzo furanone-7-C-b-d-glucopyranoside (4), 8-(C-b-dglucopyranosyl)-7,30,40 trihydroxyflavone (5) and 1,2-bis (2,4-dihydroxy,3-Cglucopyranosyl ethanedione (6) and two known compounds C-b-d-glucopyranosyl-2,6-dihydroxyl benzene (7) and sesquiterpene¹.

Sr.no	Name	Structure
1.	Marsupin	
2.	Pterosupin	
3.	Pterostilbene	
4.	Epicatechin	
5.	Propterol	

6.	Kino Tannic acid	
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VI. ANT DIABETIC/ANT HYPERGLYCAEMIC/HYPOGLYCAEMIC ACTIVITY

Pterocarpus marsupium is proven one of the promising plant for anti-diabetic activity. Alcoholic extract of the bark of *Pterocarpus marsupium* was extracted with toluene, chloroform, ethyl acetate and butanol. These fractions were having beneficial effects on blood glucose levels². Extract of the *Pterocarpus marsupium* with absolute ethanol and then took the ethyl acetate soluble fractions which when tested upon alloxan-diabetic rats which significantly lowered the blood sugar level with an increase in blood insulin level¹³. Flavonoid fraction from *Pterocarpus marsupium* has been shown to effect the pancreatic beta cell regranulation¹⁴. ICMR (Indian Council of Medical Research) study group has also evaluated the efficacy of *Pterocarpus marsupium* in non-insulin dependent diabetes mellitus. They reported that blood glucose level and mean HbA1c level decreased significantly from 151-216mg/dl to 32-45mg/dl in non-insulin dependent diabetes mellitus⁶. Another study of *Pterocarpus marsupium*, 100 and 200mg/kg aqueous extract showed a decrease in fasting and postprandial blood glucose level in type 2 diabetic rats. It also improved the body weight of diabetic animals³.

VII. CNS ACTIVITY

- (-) Epicatechin has been isolated from the bark of the *Pterocarpus marsupium*. This flavonoid compound activities on CNS was tested on experimental rats, mice or frog. - (-) Epicatechin did not have any effect on CNS of mice and Rats, - (-) but it has shown both positive chronotropic and inotropic effects on frogs hearts. The effect was blocked by propranolol³ (Gairola Seema et al, 2010). - (-) Epicatechin was neither stimulant nor depressant of the CNS¹⁵.

VIII. HEPATOPROTECTIVE ACTIVITY

Methanolic extract of stem bark of *Pterocarpus marsupium* possesses hepatoprotective activity⁸. An investigation was carried out to evaluate the hepatoprotective activity of *Pterocarpus marsupium* bark extracts against carbon tetrachloride (CCl₄)-induced hepatotoxicity. Various biochemical parameters were used to assess the liver functions like total bilirubin, serum protein, alanine amino transaminase, aspartate amino transaminase, and alkaline phosphatase activities. Histopathological results shows normal hepatic cords, absence of fatty infiltration and necrosis¹. The

administration of hepatoprotective drugs may induce the hepatocytes to resist the toxic effect of CCl₄. The results indicate that the Methanolic extract of *Pterocarpus marsupium* has significant hepatoprotective activity¹⁶.

IX. ANTI-FUNGAL ACTIVITY

Pterocarpus marsupium showed beneficial effects as a topical agent against *Tinia cruris* and *Tinia corporis*. Good response was obtained within 3days after first application¹⁷. The antimicrobial activity of *Pterocarpus marsupium* was evaluated against pathogenic bacteria *Staphylococcus aureus*, *Pseudomonas aeruginosa* and *Klebsiella pneumonia* in an in vitro condition. Aqueous extracts from barks of *Pterocarpus marsupium* were tested for antimicrobial activity using the zone of inhibition method. The aqueous extract of *Pterocarpus marsupium* inhibited growth of bacteria with the minimal inhibitory concentration ranging from 0.04 mg to 0.08 mg¹⁸.

X. ANTI-HYPERLIPIDAEMIC ACTIVITY

The aqueous extract of *Pterocarpus marsupium* bark prevents hypertriglyceridemia. The ethyl acetate extract of heartwood of *Pterocarpus marsupium* when given to rats, shows a significant reduction of serum triglyceride, total cholesterol, LDL- and VLDL- cholesterol without any affect to the HDL- cholesterol level³. Another investigation suggest that marsupin, pterosupin and liquiritigenin constituents of *Pterocarpus marsupium* were effective in lowering serum cholesterol, LDL-cholesterol, and atherogenic index and raising the level of HDL-cholesterol and total cholesterol ration¹⁹.

XI. ANALGESIC ACTIVITY

Three different solvent extracts like Methanol extracts, ethyl acetate and petroleum ether extracts from *Pterocarpus marsupium* leaf for their analgesic activity by acetic acid induced writhing assay in Swiss albino mice. Methanolic extract have most potent analgesic activity than, ethyl acetate and petroleum ether extracts²⁰. The central analgesic activity of *Pterocarpus marsupium* bark extract by using a hot place method, result shows that reduce the pain threshold and also increase the response latency periods to the thermal stimuli in mice, similar as reference drug pentazocin¹.

XII. ANTI-CATARACT ACTIVITY

Determination of the aqueous extract of *Pterocarpus marsupium* bark in reducing the opacity index in the



alloxan induced diabetic rats was carried out. This activity proved anti-cataract activity of *Pterocarpus marsupium*¹.

XIII. CARDIO TONIC ACTIVITY

High diluted aqueous extract of heartwood of *Pterocarpus marsupium* produced negative chronotropic and positive inotropic effects in frogs. This activity proved the cardio tonic effect⁸. In another study, (-)-epicatechin, has also showed cardiac stimulant activity in perfused frog hearts producing increase in force along with increase in rate¹.

XIV. ANTI-CANCER ACTIVITY

Pterostilbene and Stilbene²¹ having 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 that it inhibits two important metastasis inducers-Matrix Metalloproteinase 9 (MMP) and α -Methyl Acyl CoA racemase (AMACR). Thus, Pterostilbene are used for the treatment of breast and prostate cancer¹.

XV. ANTI-INFLAMMATORY ACTIVITY

Aqueous extract of *Pterocarpus marsupium* at doses of 100mg/kg and 200mg/kg was found to reduce the elevated inflammatory cytokine, tumour necrosis factor TNF- α level in type 2 diabetic rats²². Methanolic and aqueous extracts of *Pterocarpus marsupium* shows positive results for anti-inflammatory activity in carrageenan induced rat paw oedema model²³.

XVI. TOXIC EFFECT

As the herbal treatment for diabetes has been given for a longer duration, so the genotoxic assessment of *Pterocarpus marsupium* was done using both somatic and germ cells. The results showed that the extract was not genotoxic¹. *Pterocarpus marsupium* was not suggested during constipation due to its astringent properties⁵.

XVII. STANDARDIZATION OF PTEROCARPUS MARSUPIUM

Description of Drug:

Drug occurs as irregular pieces of variable size and thickness, golden yellowish brown with darker streaks are present on the surface²⁴; Monographs water it gives yellow coloured solution with blue fluorescence⁸. Powder of the *Pterocarpus marsupium* shows vessels with bordered pits, fibre tracheid, tracheid, fragments of xylem rays and few crystal fibres, starch absent.

XVIII. IDENTITY, PURITY, AND STRENGTH

Foreign matter	Not more than 2% ^{5,25}
Total ash	Not more than 2% ⁵ Not more than 18 % ^{5,25}
Acid insoluble	Not more than 0.5 % ⁵

ash	Not more than 1.5% ^{5,25}
Alcohol soluble extractive	Not less than 7% ⁵ Not less than 7.5% ^{5,25}
Water soluble Extractive	Not less than 5% ⁵ Not less than 11.5% ^{5,25}
Moisture content %w/w	0.0 + 0.17 ²⁶
Bitter value	7.08% ²⁶
Heavy metal analysis	Lead (Limit-10 ppm): 2.2238 Cadmium (Limit-0.3ppm): 0.0641 Arsenic (Limit-10ppm): 0.4243 ²⁶
Solvent system	Ethyl acetate: Glacial acetic acid: Formic acid: Water (10:1.1:1.1:2.6) ²⁶

TLC: -

TLC of alcoholic extract of silica gel G plate was done by using n butanol: acetic Acid: water (4:1:5) Then the system was exposed to Iodine vapour And then was sprayed with 5% methanolic phosphomolybdic acid reagent^{5,25}

DISCUSSION

Every culture and every medicinal system, from Ayurveda to Traditional Chinese Medicine, have used herbs for different therapeutic purposes. Thousands of herbs has been used in conventional medicines as well as for natural remedies. Nowadays, teas, vitamins and natural supplements have been widely using as herbs. Indian Kino, *Pterocarpus marsupium* belonging to the family fabaceae and widely distributed in central, western and southern regions of India. Plant has mainly potential in anti-diabetic action since ancient times. Wooden tumblers made from the bark of *Pterocarpus marsupium* tree are still used to control diabetes and referred to as “The miracle cure for diabetes”. The tumbler is filled with water and left overnight. This water when consumed daily twice for 30 days has shown beneficial effects in individuals suffering from diabetes⁸. Meanwhile this review is also focused on the various pharmacological properties like astringent, anti-inflammatory, haemostatic, anthelmintic, in chest pain, body pain and in indigestion, in diabetic anaemia, elephantiasis, erysipelas, urethrorrhea, anti-cataract, hyperglycaemic, antihyperlipidemic, cardio tonic activities, hepato-protective and ophthalmopathy. Several chemical constituents like Pterostilbene, (-)-Epicatechin, pterosupin, Mursupin, etc., have been identified. Several standardized data according to Ayurvedic pharmacopoeia can also include. This way *Pterocarpus marsupium* having best properties. Thus, the current review provides a background for the upcoming basic researches on *Pterocarpus marsupium* which will involve



pharmacological investigations to well establish its broad spectrum medicinal potential. so this review may be light on possible future research.

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