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**CHEMICAL CONSTITUENTS AND MEDICINAL USES OF *PTEROCARPUS MARSUPIUM ROXB.*****MANEESHA TIWARI, MANIK SHARMA AND H. N. KHARE**

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**Received** : 28.1.15; **Accepted** : 6.4.15**ABSTRACT**

Extracts of *Pterocarpus marsupium* were prepared using methods like infusion, maceration, decoction and percolation. Several chemical constituents like pterostilbene, (-) epicatechin, pterosupin, marsupin, tannins, pentosan, propterol, isoflavonoid glycol, liquiritigenin etc. were identified and isolated. The present review aimed to describe the chemical constituents mainly and commercial importance.

Figures : 02

References : 07

Table : 00

KEY WORDS : Chemical constituents, Medicinal plants.

**Introduction**

Plants are Inevitable to man for his life. Plants have always been common source of medicament either in the form of traditional preparations or pure active principles. All phyta of plants yield official and unofficial products of medicinal importance. The history of herbal medicine is as old as human civilization. India is virtually herbarium of the whole world. Even though the biological active compounds of some herbal drugs or their extracts are known, they are prescribed widely because of their effectiveness , minimum side effects in clinical experiences and relatively low costs.

*Pterocarpus marsupium Roxb.* is grown in deciduous and evergreen forests of central, western and southern regions of india. It is found mostly in the states of Gujrat , Madhya Pradesh, Bihar, Orissa . The heart wood, leaves, flowers and bark have useful medicinal properties. The heart wood of *Pterocarpus marsupium* is astringent, bitter, acrid, anti-inflammatory, anthelmintic and anodyne. It is used for the treatment of elephantiasis, leucoderma, diarrhoea, dysentery, rectalgia, cough and greyness of hair. It is also reported that an aqueous infusions of the wood is of use in diabetes and water stored in vessels

(glass) made of the wood, called tumbler, is reputed to have anti-diabetic qualities. The bark is used as an astringent and also for relieving toothache. The bruised leaves are considered useful as an external applications for boils, sores and skin diseases. *Pterocarpus marsupium* is widely used in "AYURVEDA" as "RASAYANA" for management of various metabolic disorders including hyperlipidemia. The bark of *Pterocarpus marsupium* may be considered as good source of natural anti-oxidants for free radical mediated ailments.

**MORPHOLOGY:**

It is a deciduous tree about 90 ft or more high.

**BARK** : stem bark is grey-brown to brown. Heart wood is golden yellow and bark yields a reddish gum.

**LEAVES** : 3-5 inches long, have 5-7 leaf lets long, margin wavy and obtuse. The petioles are round, smooth and waved from leaflet to leaflet, 5 or 6 inches long and no stipules.

**FLOWER** : 1.5 c.m. long, very numerous, white, with a small tinge of yellow, stamens are 10. United near the base but soon dividing into two parcels of 5 each; anthers are globose and 2 lobed.

It consists of irregular pieces of bark with

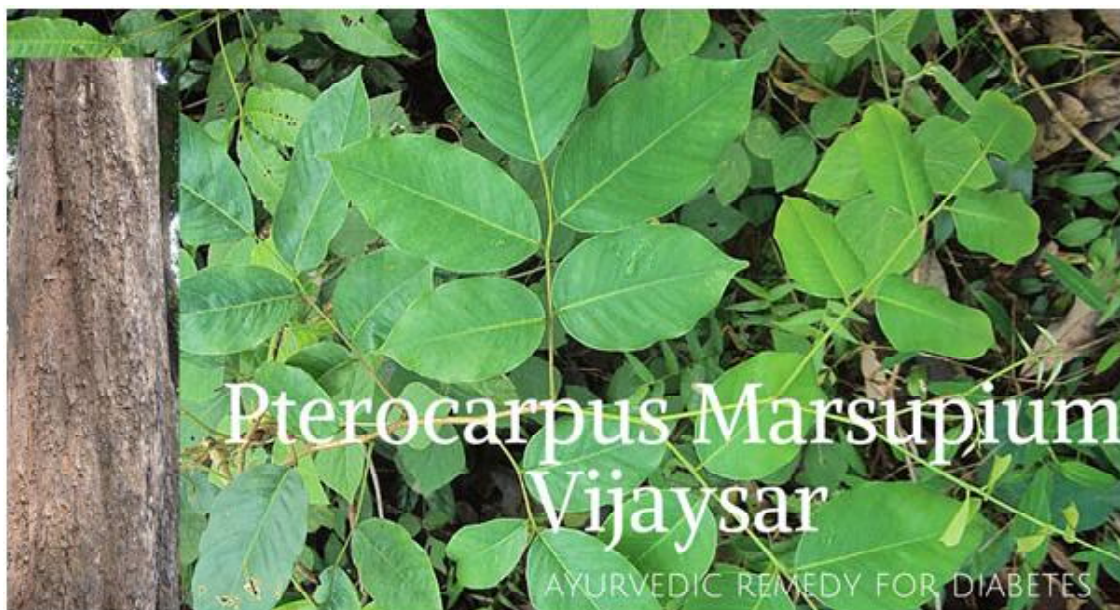


Fig. 1 : *Pterocarpus Marsupium* Vijaysar : ayurvedic remedy for diabetes

variable size and thickness. It is golden yellowish-brown in colour with darken streaks. It is very hard and brittle. In water it gives yellow coloured solution with blue fluorescence. Transverse section shows alternating bands of larger and smaller polygonal cells consisting of tracheids, fibre tracheids, xylem parenchyma and transversed by xylem rays. Xylem vessels are throughout distributed.

#### CHEMICAL CONSTITUENTS :

Researches in the past have established the genus *Pterocarpus* to be the rich sources of polyphenolic compounds. All active principles of *Pterocarpus marsupium* are thermostable. The plant contains pterostilbene 4-5%, alkaloids 0.4%, tannins 5%, protein, pentosan, pterosupin, pseudobaptigenin, liquiritigenin, isoliquiritigenin, garbanzol, 5-de-oxykaempferol, p-hydroxybenzaldehyde, beudesmol, erythrodiol-3-monoacetate, l-epicatechin, marsupol, carpusin, propterol, propterol B, marsupinol, irisolidone-7-O-A-L-rhamnopyranoside, have been obtained mainly from the heartwood and root.

The gum kino from the bark provides non-glucosidal tannins.

- ☐ Kinotannic acid
- ☐ Kinonin (C28H24O12)

- ☐ Kino-red (C28H22O11)
- ☐ Pyrocatechin
- ☐ Pyrocatechin acid & small quantities of resin, pectin and gallic acid.

Aqueous extract of the heartwood of *Pterocarpus marsupium* contains 5 new flavonoids C-glucosides namely 6-hydroxyl-2-(4-hydroxybenzyl)-benzo-furan-7-C- $\beta$ -D-glucopyranoside, 3-( $\alpha$ -methoxy-4-hydroxybenzylidene)-6-hydroxybenzo-2(3H)-furanone-7-C- $\beta$ -D-glucopyranoside, 2-glucopyranoside, 8-(C- $\beta$ -D-glucopyranosyl)-7,3,4-trihydroxyflavone and 1,2-bis (2,4-dihydroxy,3-C-glucopyranosyl) – ethanedione and two known compounds C- $\beta$ -D-glucopyranosyl-2,6-dihydroxyl benzene and sesquiterpene were isolated

Ether extract of the roots of *Pterocarpus marsupium* consists of a new flavonol glycoside 6-hydroxy-3,5,7,4-tetramethoxyflavone 6-O-rhamnopyranoside, 8-hydroxy-4'-methoxy isoflavone-7-O-glucopyranoside. A benzofuranone derivative 2,4,6-trihydroxy-4-methoxy benzofuran-3(2H) one designated carpusin, 1,3-bis(4-hydroxyphenyl) propan-2-ol designated propterol, 1-(2,4-dihydroxyphenyl)-3-(4-hydroxyphenyl) propan-2-ol designated propterol, 6-hydroxy-7-O-methyl-3-(3-hydroxy-4-O-methyl benzyl) chroman-4-one.

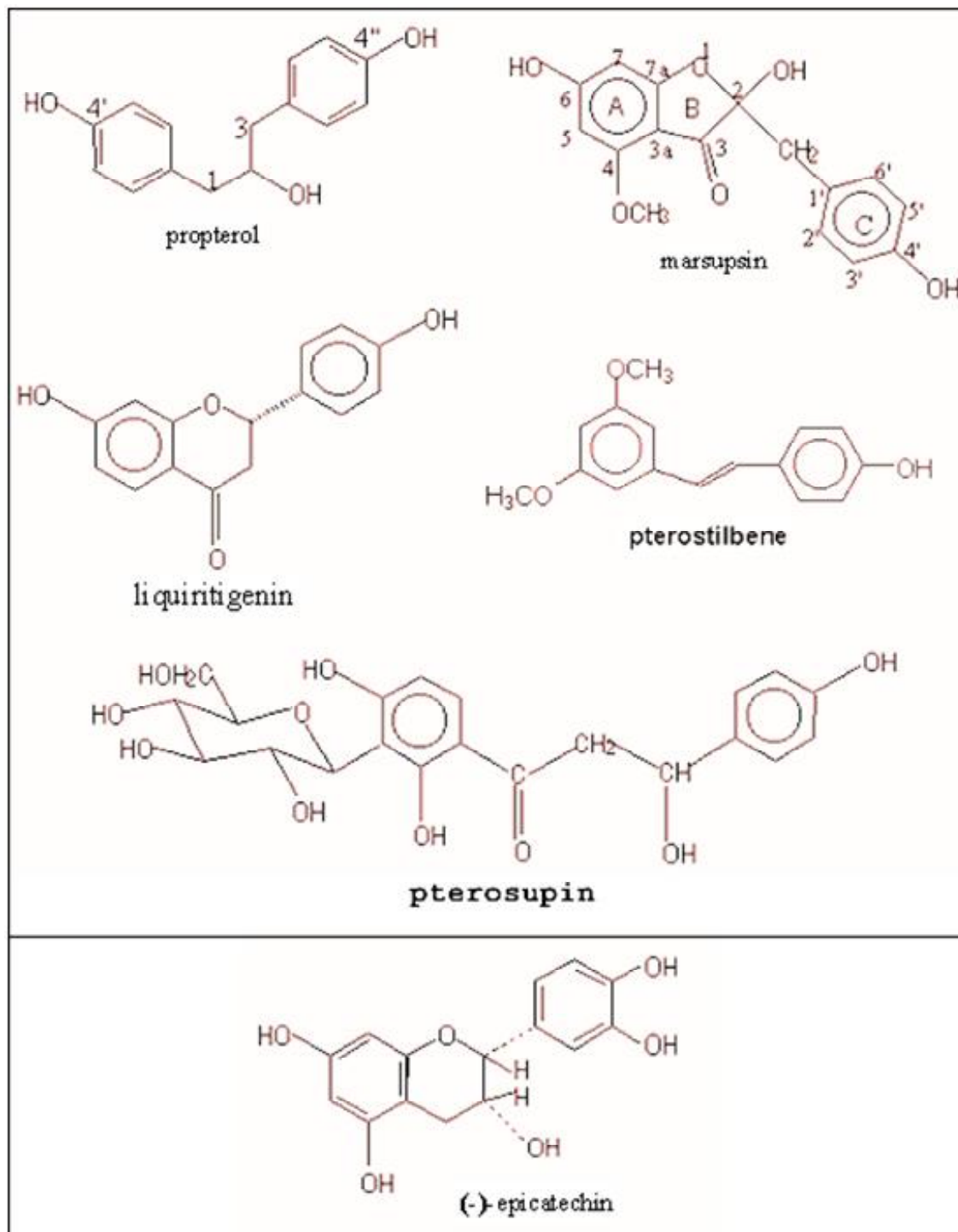


Fig. 2 : Chemical constituents of *Pterocarpus marsupium*

Ethyl acetate extract of root contains benzofuranone, marsupin, dihydro chalcone, pterosupin, stilbene, pterostilbene, a homoisoflavone-pteromarsupone, trans-stilbene, liquiritigenin, isoliquiritigenin. Methanolic extract of heart wood contains an isoflavone 7-O- $\beta$ -L-rhamnopyranosyloxy-4'-methoxy-5-hydroxy-isoflavone.

Three new isoflavone glycosides viz retusin 7-glucoside, irisolidone 7-rhamnoside and 5,7-dihydroxy-6-methoxyisoflavone 7-rhamnoside have been isolated from the heartwood of *Pterocarpus marsupium*. 2,6 dihydroxy-2-(P-hydroxybenzyl)-3(2H)-benzofuran-7-C- $\beta$ -D-glucopyranoside.

#### ETHNOMEDICINAL USES :

Useful parts of the herb are heartwood, leaves, flowers, gum.

The genus is widely distributed on the Earth and the astringent drug from this genus is known as "Kino". The phloem of stem contains red astringent fluid present in secretory cell, which exudes after given incision. Kino is odourless but has astringent taste and sticks in the teeth, colouring the saliva red in colour. As astringent it is used in diarrhoea, dysentery etc.

Bruised leaves are applied on fractures, leprosy, leucoderma, skin diseases, sores and boils, Constipation, depurative, rectalgia, ophthalmology, hemorrhages and Rheumatoid arthritis.

Marsupin and Pterostilbene significantly lower the blood glucose levels useful in NIDDM.

Bark is used as diuretic in Gabon and fresh leaves are used as food in Nizeria.

Leaves are used in GIT disorders.

Stem in the treatment of neurological problems.

The wooden glass made up of heartwood of *Pterocarpus marsupium* is being used for drinking water to control blood sugar and strong antidiabetic in Ayurvedic system of medicine.

Leaves, wood, stem bark, seed and flours are used in African traditional medicine, especially in the Cameroonian pharmacopoeia, for treating various diseases including hypertension, diabetes, intestinal parasitizes, renal and cutaneous

diseases.

#### Pterostilbene

Acts as hypolipidemic, hypoglycemic, significant reduction in glycosylated Hb and increase in total Hb level.

- It inhibits cell proliferation and induces apoptotic effect in tumour cell lines.
- Moderate inhibition of COX-I and weakly active against COX-II showing potent antioxidant activity.
- It inhibits electrolyte leakage caused by herbicide-induced oxidative damage.
- 10. Alkaloids.
- Hypoglycemic.
- It raises the B.P. and indirectly on sympathetic nerves.

#### Tannins :

- Scavenger against mitochondrial lipid peroxidation.
- Hypocholesteremic.
- Antimicrobial against bacteria and virus.
- The flavonoid, epicatechin, extracted from the bark of this tree has been shown to prevent pancreatic  $\beta$  cell damage in rats. No other herbal concoction has been shown to prevent  $\beta$  cell damage and even regenerate damaged  $\beta$  cells in diabetics. The heart wood is prepared as an astringent to treat diabetes.

#### Conclusion

In developing countries, providing modern healthcare facilities is still in infancy. The *Pterocarpus marsupium* carried out an importance from the ancient times to cure mankind against various disease conditions. These studies play the drug as a novel candidate for bioprospection and drug development for treatment of diseases such as cancer, diabetes, cataract, ulcer, dementia, diarrhea and various disorders. The medicinal applications of this plant are countless and investigations still remain and carry out in relatively new areas of its function. By the isolation of various phytochemicals it enables to exploit its therapeutic value and plays a major role in modern system of medicine and it requires further exploitation.

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