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Review Article on Pharmaceutical, Pharmacological Activities and Therapeutic Potential of "Pterocarpus Marsupium"

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ABSTRACT:-

Pterocarpus marsupium has been regarded as one of the most adaptable medicinal plants with a wide range of biological activit y in India and its neighboring nations for over 2000 years. Natural-source medicines are expected to play a significant role in healthcare, particularly in India's rural areas. Pterocarpus marsupium is a significant herbal medication with a variety of pharmacological qualities that needs to be explored further

Keywords:- Photochemical Screening, Antibacterial Activity, Antifungal Activity.

Introduction:-

Pterocarpus marsupium has been regarded as one of the most adaptable medicinal plants with a wide range of biological activit y in India and its neighboring nations for over 2000 years. P. marsupium has been a homoeopathic medication and has become a cynosure of contemporary medicine since every part of the tree has been employed as a traditional medicine for household remedies against numerous human aliments since antiquity. The Indian kino tree is Pterocarpus marsupium Roxb. (Fabaceae). Kino tree from Malabar. Kino, also known as "Bija" in India, Nepal, and Sri Lanka, is a native of these three countries. It can be found in some regions of the Western Ghats [1, 2].

There are 35 species of Pterocarpus in the genus Pterocarpus.
P. acapulcensis, P. alboputescens, P. Mildred, P. Amazonum, P. Claessensii, P. Dalbegicides, P. Erinaceous, P. Echinatus, P. Gillet, P. Hock ill, P. Homble, P. Indicus, P. Lucens, P. Marcrocarpus, P. Marsupium, P. Mutondo, P. Officinalis,
P. Orbiculatus, P. Onus, P. Rohril, P. Rotundifolius, P. Santalinoides, P. Santolius, P. Soyauxil, P. Ternatus, P. Tessmannil, P. Tinctorius, P. Velutinus, P. Villosus, P. Violaceus, P. Zehntneri, P. Zenkeri [3].

Scientific Classification:-

Family – Fabaceae Domain – Eukaryote

Kingdom – Plantae

Subkingdom – Viridaeplantae Phylum – Magnoliophyta

Subphylum – Euphyllophytina Class – Magnoliopsida

Subclass – Rosidae

Super order – Fabanae Order – Fabales

Genus – Pterocarpus Species – Marsupium [4, 5]

Vernacular Name:-

English – Indian Malabar kino, Indian kino, Gummy kino.

Hindi – Bija, Bijasal.

Sanskrit – Pitasala, Asana, Sarfaka.

Telugu – Paiddagi, Chekka.

Marathi – Bibala.

Tamil – Vegaimaram, chakkal.

Assam – Aajar.

Bengali – Piyasala, Pitasala.

Kashmiri – Lal chamber.

Malayalam – Venga.
Orissi – Piashala.
Punjabi – chandan lal.
Tamil – Vengai.
Urdu – Bijasar [6].

Figure 1 – Pterocarpus marsupium

Distribution and Habitat:-

Pterocarpus marsupium grows in defoliate and evergreen jungles in India's southern, western, and central regions. It's true.
Gujrat, Bihar, West Bengal, and Orissa, utter Pradesh, Western Ghats, Kerala, Karnataka, and Madhya Pradesh of major India, Sri Lanka, and Nepal are all places where this species can be found. It grows up to a height of 150 to 1100 meters on hills, undulating fields, or rocky terrain. The average rainfall in its habitat ranges from 750 to 2000 mm, with maximum temperatures ranging from 35 to 48 degrees Celsius and minimum temperatures ranging from 0 to 18 degrees Celsius. It may grow in a wide range of soils and environments, including quartzite, shale, and conglomerates. It prefers sandy and sedimentary soils that drain well over loamy soil. The plant requires sufficient light and the early seedlings are frost-sensitive [7, 8, 9]. [As depicted in Figure [1]

Traditional uses:-

The bark and resin decoction is used as an astringent for severe diarrhoea, dysentery, urethral discharge, ringworm of the scalp, and chronic ulcers, and as an abortifacient [10]. Astringent, bitter acrid, anti-inflammatory, anthelmintic, and anodyne [11], the hearing wood is astringent, bitter acrid, anti-inflammatory, anthelmintic, and anodyne. It helps with rectalgia, leucoderma, diarrhoea, rectalgia, coughing, and hair greying [12]. It works well for wounds, fevers, stomachaches, diabetes, jaundice, and antiulcer [13].

Phytochemistry:-

The existence of active chemical ingredients such as alkaloids was tested in a preliminary phytochemical screening of P. marsupium extract. Flavonoids, tannins, phenolic oils, and lipids are all examples of flavonoids [14]. A number of flavonoids and derivatives have also been extracted from different areas of the plant. It has a lot of polyphenolic chemicals [15]. Epicatechin is a flavonoid extracted from bark (molecular formula: $C_{15}H_{14}O_6$) [16]. Is thought to be the primary component involved in the anti-diabetic effect [17]. However, three key phenolic compounds from the heartwood of Pterosupium, pterosupin and pterostilbene, have recently been discovered. Pterostilbene and marsupium have a considerable effect. Hyperglycemic rats' blood glucose levels were reduced [18]. [As seen in Figure 2]

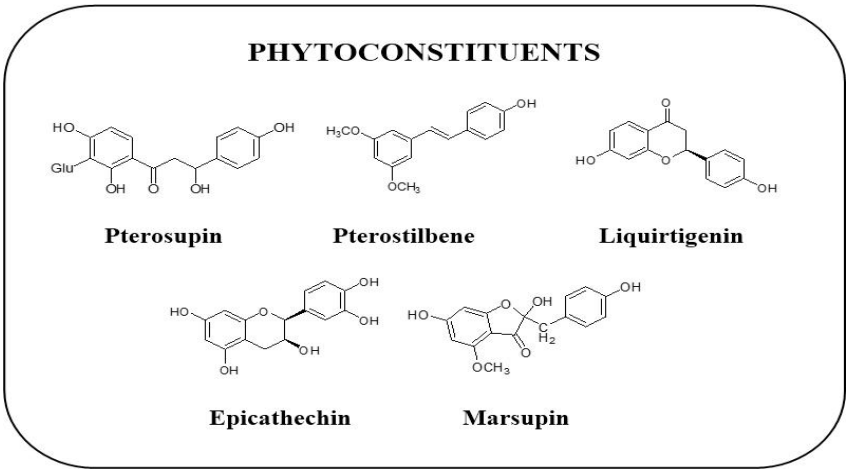

Figure 2 - Phytoconstituents of Pterocarpus marsupium

Pharmacological activities:-

Anti-diabetic and antioxidant activity:-

P. marsupium has pharmacological capabilities that are unique, including beta cell protection and regeneration, as well as blood glucose reducing activities. P. marsupium has been shown to repair beta cell damage and even repopulate islets, resulting in virtually complete restoration of normal insulin secretion [19-24].

Several processes contribute to the formation of free radicals or the impairment of antioxidant defenses in diabetic patients with persistent hyperglycemia [25]. There's a lot of evidence that diabetes causes alterations in antioxidant enzyme activity in different ti ssues [26]. Many studies have found that antioxidants that can neutralize free radicals are useful in preventing diabetes in animal models [27, 28]. As well as lowering the severity of diabetes complications,[29] complications Antioxidant supplementation showed higher protection against free radical-induced damage in diabetes individuals [30].

Antihyperglycemic activity:-

Glucose levels in rats with streptozotocin-induced hyperglycemia were measured following i.p. administration of marsupsin (1), pterosupin (2), and pterostilbene (3), three significant phenolic constituents of Pterocarpus marsupium heartwood. Marsupsin and pterostilbene considerably reduced hyperglycaemic rat blood glucose levels [31, 32].

Antidiarrhoeal activity:-

In castor oil and charcoal induced gastrointestinal motility tests in rats, an ethanolic extract of P. marsupium showed anti-diarrhoeal action. P. marsupium heartwood ethanolic extract (250 and 500 mg/kg b.wt.) significantly reduced the intensity and frequency of charcoal and castor oil-induced gastrointestinal motility or diarrhoea, validating the traditional use of this plant as a diarrhoea treatment [33].

Anti-fungal activity:-

A ten-day trial indicated that after seven and ten days of therapy, the alcoholic extract had 78 percent and 93 percent excellent to good responses, respectively, compared to 73 percent for the aqueous extract. P. marsupium was found to have a positive impact as a topical treatment against T. cruris and T. corporis, with a good reaction occurring only 3 days after the first application [34]..

Anti-cataract activity:-

An aqueous extract of Pterocarpus marsupium bark was shown to have anti-cataract activity. Pterocarpus marsupium aqueous extract possesses anti-cataract action. Aqueous extract index in diabetic rats induced by alloxan [35].

Anti-inflammatory activity:-

Methanolic and aqueous extracts were tested for anti-inflammatory efficacy in an acute inflammation paradigm utilizing carrageenan-induced rat paw edema. Methanol extract (50 mg/kg b.wt.) and aqueous extract (100 mg/kg b.wt.) both showed a significant reduction in paw edema. Pterostilbene, which is found in P. marsupium, has been proven to have anti-inflammatory properties [36, 37].

Toxic effects:-

Because of its astringent properties, P. marsupium is not recommended for constipation [38]. The geotaxis assessment of P. marsupium was done using both somatic and germ cells because the herbal treatment for diabetes is administered for a longer period of time. According to the findings, the extract was not geotaxis [39]. P. marsupium's anti-diabetic action was tested by an ICMR study group at a multicenter level, and blood glucose levels were shown to be considerably lower without any negative effects [40].

Antimicrobial activity:-

The disc diffusion method was used to assess the antimicrobial activity of aqueous and methanolic bark extracts of P. marsupium. The zone of inhibition for several extracts ranged from 11 to 22mm. Bacillus subtilis, Staphylococcus aureus, Escherichia coli, Pseudomonas aeruginosa, Klebsiella pneumoneae, Salmonella typhi, Proteus mirabilis, and Micrococcus sp. bactericidal potential of methanolic extract of stem bark (apical bark, middle bark, and mature bark) of Pterocarpus marsupium was At various dosages, the results revealed a substantial antibacterial impact [41].

Anticancer activity:-

Anticancer properties: Gosetti et al. [42] used calcein acetoxymethyl ester (calcein-AM) assays to assess the cytotoxicity of P. marsupium aqueous extract. An experiment revealed that pterostilbene suppressed cell proliferation.

Akt, Bcl-2, and other variables produced mitochondrial apoptic signals such as Bax and a cascade of caspases. As a result, pterostilbene has multiple targets for inducing apoptosis and can be used to treat breast and prostate cancer [43].

Anti-bacterial activity:-

The antibacterial activity of P. marsupium stem methanolic extract was investigated using the paper disc diffusion method against gram positive bacteria (Bacillus coagulans) and gram negative bacteria (Escherichia coli). Both bacteria's growth was severely suppressed by a concentration of 100 mg/ml [44].

Hepatoprotective activity:-

P. marsupium methanolic extract has been demonstrated to have hepatoprotective properties. Its methanolic extract was given at doses of 100 and 300 mg per kg-b.wt per day for 21 days at doses that were dose-dependently reduced serum glucose levels. Total ilirubin, serum protein, alanine aminotransaminase, aspartate aminotransaminase, and alkaline phosphate activity were observed to be controlled in extract treated groups. Normal hepatic cords, no fatty infiltration, and no necrosis were found histopathologically [45].

Conclusion:-

Herbal medicine has a long history dating back to the dawn of civilization. India's richness is hidden in the vast natural fl ora that has been bestowed upon her. India is basically all of the planet, with a vast variety of agro-climatic conditions. From time to time, the relevance of medicinal and aromatic herbs has been underlined. Natural-source medicines are expected to play a significant role in healthcare, particularly in India's rural areas. Pterocarpus marsupium is a significant herbal medication with a variety of pharmacological qualities that needs to be explored further.

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