

Premna tomentosa: a Review on its Current Therapeutic and Phytochemical Potential

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Abstract

Nature had been the best source of medicines to treat dreadful diseases in human beings and animals. There had been a huge supply of chemicals that serve as leads to produce synthetic and semi synthetic derivatives. There was a lot of research that was focussed on probing and proving the medicinal plants as potential sources of drugs to treat various diseases. Various reviews are published to bring forth the scientific literature concerning the Phytochemistry, pharmacological activities of plants. *Premna tomentosa* Willd is one of such widely used plants as per ethnopharmacological sources. Thus this review showcases the investigations as evident from the scientific data and literary works that are available of the plant. The plant is rich in flavonoids, tannins, alkaloids and terpenoids with which it exhibits various activities like anti-hyperlipidemic, hepatoprotective, anticancer, anti-oxidant, antibacterial etc. The information given in this work will surely help the researchers to select the area of research according to the available literature.

Keywords: *Premna tomentosa*, medicinal plants, phytochemical review, pharmacological activity

Introduction

Medicinal Herbs are those that have parts that possess medicinal properties and can be employed to treat human diseases or for veterinary purposes (Sofowara, 1993). They contain therapeutically significant bioactive molecules like the alkaloids, glycosides, tannins, flavonoids, terpenes etc and so in most cases they are used as precursors for the various synthetic drugs. There had been a continuous effort in this arena to isolate and synthesize newer molecules that can be used as cure for various disorders and pathogens. Approximately about 25% of the herbs around the world have been subjected to extensive medical and scientific process to establish their biological and therapeutic uses and also substantial amount of literary works had been published towards investigating them for their newer activities. Various species of plants classified under nutraceuticals, cosmetics also have found to be a great source of drugs of choice of many diseases currently (Monthana, 2005).

Until recently 25% of the total drugs that were prescribed in the US market were plant derived and are gaining importance day by day. Even with the advent of modern medicine and synthetic drugs, many drugs like Digoxin, Silymarin etc have been used as drugs of choice for CHF and Jaundice in view of their safety and efficacy. Most complex molecules often used to treat dreadful diseases like cancer were derived from plant sources. Moreover often times the herbal molecules holds their advantage of being active and potent against multiple disorders. Most natural drugs have been yet ignored to prove their pharmacological efficacy and proper review of those plants will possibly bring out the available scientific literature available so far. Often such literature reviews help out to facilitate the upcoming researchers to investigate for the yet to be discovered activities and to probe deeper into utilizing advanced methods to prove the activities of plants (Anandarajagopal et al., 2011). One of such useful plants is the current plant of review *Premna tomentosa* Willd. In this

review the information about the phytochemistry, pharmacological activities and ethnobotanical claims will be discussed in detail.

Taxonomy

Botanical name: *Premna tomentosa* Willd.

Kingdom: Plantae

Division: Magnoliophyta

Class: Magnoliopsida

Order: Lamiales

Family: Verbenaceae

Genus: *Premna*

Species: *Premna tomentosa*

The plant is commonly called as Woolly Leaved Fire- Brand Teak, Bastard Teak where its synonym being *Premna flavescens* Juss.

Distribution

The plant is widely distributed in India, Bangladesh, Bhutan, China, Myanmar, Thailand, Cambodia, Vietnam, Malay Peninsula, Sumatra, Java, Philippines and East-Timor. The plant grows best in shady, disturbed, cleared and degraded areas in secondary to evergreen, dry evergreen and mixed deciduous forests; sometime on the edge of plantations, roadsides, limestone bedrocks and streamsides; 0-1,500 m; flowering: March to July; fruiting: May to October (Jemel et al., 2015).

Plant description (Hymavathi et al., 2009)

Tree is about 25 to 20 feet tall. Bark is greyish brown, the branches and branchlets are obtusely quadrangular, the young parts are densely stellate-wooly with brownish hairs, and the older parts are a little glabrous. The nodes are flat and the internodes are 1-2 cm long. The leaves are simple, decussate-opposite, lanceolate-elliptic, ovate-cordate, and 5-22-14cm. The base is truncate to oblong, the margin is entire, and the apex is acute to acuminate, chartaceous, membranous, and densely pubescent above and below. The lateral veins are 5-7 on each side of the midrib, and the reticulate veinlets are on both sides. The petiole

is slender, pubescent, canaliculated, and about 5-12cm long. The peduncle is long, slender, obtusely quadrangular, densely hairy, about 2-4 cm long, the bracts are leaflike or foliaceous, lanceolate, with a caudate apex, about 4 mm long, and the bractlets are linear. A flower is a male or female, and there are a lot of them. The pedicels are about 2-4mm long, and the calyx is campanulate, with two lobes that are about 3mm across. The corolla is infundibular, 4 lobed, and two-lipped. The upper lip is 1 lobed, the lower lip is 3 lobed, the lobes are obovate, and the apex is acute. The corolla tube is narrow, about 3x1mm across, densely pubescent at the throat, and pubescent outside. Stamens are 4, didynamous, exerted, filaments are about 2-3 mm long, and anthers are globose, 2-celled, and slightly exerted. In this case, the egg is oblong, and the apex is truncated. It is about 1mm long, and it is covered in hair. The style is 3-4mm long, and the stigma is very faint. The fruit is drupaceous, oblong, glabrous, and about 2 to 3 mm across. It is green when it is young, but turns dark purple and black when it is ripe.

Ethnomedical claims

Premna tomentosa is a well-known plant that is used a lot to treat a lot of different illnesses. A lot of people in traditional medicine use preparations made from *Premna tomentosa* leaves, bark and roots to treat things like diarrhoea, hepatic disorders and stomach problems. They also use them to treat things like dog bites and anaemia. In traditional Indian medicine, all parts of this plant have been used to treat a wide range of different illnesses. Locally, the roots are used to make aromatic oil that is used to treat stomach problems. Its bark extract is said to be a long-term cure for hepatic problems and root barks are used for rheumatic pains (Srinivasa Rao et al., 2015).

Human paralysis is treated with water heated with its leaves. It's also an effective anti-rheumatic. Dropsy and stomach ailments are treated with a decoction of leaves, while diarrhoea is treated with an extract of inner bark. Tribal tribes in Andhra Pradesh, India, eat the young leaves of this plant. The thick, heavy wood of this shrub is utilised for combs, house construction, furniture, turnery, weaving shuttles, carving, and beautiful crafts (Bharath et al., 2012).

Phytochemistry

The plant was studied extensively for its phytochemistry and various phytochemicals like flavonoids, alkaloids, tannins, polyphenols, steroids etc (Suriyavathana et al., 2010) however another research on the phytochemistry revealed the presence of various kinds of chemical constituents like limonene, caryophyllene-17%, myricetin, and vicenin. More than 50% of the limonene is isolated from the leaves of the plant compared to any other part that is consumed as a major ingredient in food in traditional culture. There were other studies that report the percentages of the chemical constituents that are isolated from the plant (Jyotsna et al., 1984; Balakrishna et al., 2003; Etti et al., 2005). Cadalen-type sesquiterpene-7.5%, sesquiterpene tertiary alcohol 6%, aditerpene 6%, 5,3-dihydroxy-3,7,4',5'-tetramethoxy flavone, myricetin-7,3',4'-trimethyl ether, di-C-glycosyl flavone, 3 clerodane diterpenoids, premnones A–C, coniferaldehyde, syringaldehyde, lupeol, betulin, and 2-(4-methoxyphenyl)-2-butanone (Devi et al., 2013; Chin et al., 2006). In one study which included the bioassay based isolation of chemical constituents from the stem bark of the plant that resulted in the separation of 4 diterpenes of icetexane, betulin, lupeol, syringaldehyde and coniferaldehyde (Hymavathi et al., 2009). 3 lupane-type diterpenes have also been isolated from the plant (Ayinampudi et al., 2012).

Pharmacological activities

Antidiabetic activity

Studies demonstrated the invitro and invivo anti-diabetic potential of the ethanol extract of roots of *Premna tomentosa* in streptozotocin induced DM in albino wistar rats (Bharath et al., 2012). The investigations were done in two doses 250 and 500mg/kg which showed significant activity by reducing serum glucose, cholesterol, creatinine, TG and TC. This also supports the antihypercholesterolemic activity of the extract.

Anticancer Property

Studies reported that the n-hexane extracts of stem bark of the plant exhibited cytotoxicity activity against various cell lines like MCF-7, Hep-G2, A-431 and Colo-205 (Hymavathi et

al., 2009). In the same work the antioxidant and anti-mutagenic activities were also investigated (Naidu et al. 2014).

Anti-inflammatory Property

The anti-inflammatory activity of the ethanol extract of leaves of the plant was investigated invivo in albino wistar rats against cotton pellet granuloma. The extract showed a significant activity at 100mg/kg dose by reducing the weight of spleen, thymus gland and also SGOT, SGPT levels in rats serum (Alam et al., 1993).

Antimicrobial Activity

The antibacterial activity of various extracts of leaves of the plant was investigated against bacillus, E.coli and alkaligenes bacteria in agar well diffusion method. The ethanol and water extracts of the plant showed a dose dependant activity (Matritin et al., 2006; Anbazhakan and balu, 2009). The antibacterial activity of petroleum ether (40-60 °C), benzene, chloroform, methanol, and water extracts of *Premna tomentosa* Willd. (Verbenaceae) aerial parts was tested against six pathogenic gram-positive (*Staphylococcus aureus* and *Streptococcus pneumoniae*) strains (Rathi and Gopalakrishnan, 2005).

Anti-nociceptive property

Investigations on the methanol extract of the leaves of the plant in the acetic acid induced tail flick and tail clip showed anti-nociceptive activity at different doses like 500, 400, 200 mg/kg. Various doses of the plant also showed hypnotic activity of the plant (Devi et al., 2003).

Antioxidant Activity

The antioxidant activity of ethanolic extracts of *Premna tomentosa* willd leaves was tested in vitro for enzymatic and non-enzymatic antioxidant activity and found to be outstanding. The presence of flavanoids and phenolics in the plant extract may be responsible for the antioxidant action (Suriyavathana et al., 2010).

Limonene, a monocyclic terpene with antioxidant properties, is the most abundant component in the leaves (58%). Authors investigated the entire plant of *P. tomentosa* and discovered that a number of essential phytochemicals had strong antioxidant and free

radical scavenging activities (Sridhar et al., 2013). They carried out bioassay-guided fractionation and chemical analysis of the whole plant of *P. tomentosa*, which resulted in the isolation and characterization of compounds such as premnalinal and acetoxysyringaldehyde, which had potent α -glucosidase inhibition and free radical scavenging activities and could help to reduce oxidative stress.

Immunomodulatory Activities

The immunomodulatory activity of the plant was investigated against chromium induced immunosuppression in the lymphocytes in the spleen. The extracts showed better activity at 5 μ g by increasing the cytotoxicity, apoptosis and by combatting the oxygen free radicals. It also lowered lymphocyte proliferation and also boosting the cell mediated and humoral immunity (Roza Dianita & Ibrahim Jantan, 2017).

Hepatoprotective Activity

The plant is well used to treat jaundice and other hepatic related problems in traditional systems of medicine. The leaf extract of the plant showed activity against the acetaminophen induced mitochondrial damage in the liver cells. There was significant lowering of the lipid peroxidation, GSH and dehydrogenase (Devi et al., 2005; Naidu et al., 2014). *P. tomentosa* may also protect against dimethylnitrosamine (DMN)-induced hepatic fibrosis by reducing the activation of liver stellate cells and the buildup of collagen and other connective tissue proteins, according to Hari Prasad et al. (2006).

Neuropharmacological activity

Devi et al. (2003) used potentiation of phenobarbitone-induced hypnotic and locomotor activities in rats to test the effects of a methanol extract of *P. tomentosa* leaves as a central nervous system (CNS) depressant. The extract reduced locomotor activity and somewhat increased sleeping duration at dosages of 400 and 500 mg/kg orally, which were equivalent to CNS depressive chlorpromazine (10 mg/kg, i.p) but significantly different from CNS stimulant ephedrine hydrochloride (10 mg/kg, i.p).

Conclusion:

From the above review this is a basic understanding that *P. tomentosa* is extensively used in traditional medicine from ancient times and is widely available in tropical countries like India and Africa. Most parts of the plant were used for treating various kinds of disorders ranging from jaundice, skin problems etc. The phytochemical review of the plant reveals the presence of flavonoids, tannins, alkaloids, glycosides etc which are responsible for various proven activities like hepatoprotection, antimicrobial, antihyperlipidemic, antioxidant and anti-cancer activities.

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