



International Journal of Pharmacy and Natural Medicines

CODEN (USA): IJPNRC | ISSN: 2321-6743
Journal Home Page: www.pharmaresearchlibrary.com/ijpnm



Plant Profile on *Tectona grandis* – A Review

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ABSTRACT

Tectona grandis has been widely used as medicine in Ayurveda. The use of herbal as well as ayurvedic medicines is wide spread among the patients in treating various of diseases. The chemical constituents of *Tectona grandis* plant belongs to different classes such as tannins, proteins, fatty acids, steroidal compounds, resins, Anthraquinone-naphthquinone pigments. Teak has number of medicinal uses and also shows Pharmacological activities. This review article summarizes phytopharmacological and therapeutic potential of *Tectona grandis*.

Keywords: *Tectona grandis*, anthraquinone - naphthquinone, pharmacological activities.

ARTICLE INFO

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ARTICLE HISTORY: Received 05 March 2021, Accepted 21 May 2021, Available Online 29 Dec 2021

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Citation: G. Sindhu, et al. Plant Profile on *Tectona grandis* – A Review. *Int. J. Pharm. Natural Med.*, 2021, 9(1): 26-29.

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1. Introduction

Tectona grandis is tropical hardwood tree species in the family Lamiaceae[1]. It is mostly known Sagwan in Hindi, Saka in Sanskrit and Teak in English, Peddateku in telugu [2]. Teak is a hard woods pecies of worldwide reputation [3]. T.grandis is native to south and southeast Asia. Mainly it is available in Bangladesh, India, Indonesia, Malaysia, Myanmar, Thialand and Srilanka, but is cultivated inmany countries of Africa and Caribbean[4]. Teak leaves are elongated or egg shaped. Upper surface of leaf is rough.T.grandis fruits are 1-3 cm diameter in size.Root contains lapachol, tectol, tectoquinone, b-sitosterol and aditerpene, Tectograndinol [5]. The various

pharmacological investigations have stated that the *Tectona grandis* has several bioactivities such as anti-fungal activity[6], anti-ulcer activity[7], anti-anaemic activity[8], wound healing activity[9], anti-oxidant activity[10]. The present review of T.grandisdescribes the different phyto pharmacological activities and the complete profile of the plant [11].

2. Plant profile

Synonyms: The synonyms of *Tectona grandis* are:

- *Tectona grandis* f.abludens Koord & Valetton[12].
- *Tectona grandis* f. canescens Moldenke,

- *Tectona theca* Lour. *Theka grandis* (L.f.) Lam [13].

Scientific classification:

Kingdom: Plantae

Clade : Tracheophytes

Clade : Angiosperms

Clade : Eudicots

Clade : Asterids

Order : Lamiales

Family : Lamiaceae

Genus : *Tectona*

Species : *T. grandis*



Figure1: Teak plant

Plant Description:

Teak is a large momentary tree up to 40 m (131 ft) tall with grey to greyish-brown branches, known for its high quality wood^[14]. *T. grandis* leaves are elliptic or egg shaped. The Leaf margins are entire, the branchlets are 4-angled^[15]. Leaves are usually wedge-shaped at the base, and the upper surface is rough, but without hairs, and the lower is densely covered with grey or yellowish hairs^[16]. The calyx is small, board, bell-shaped, and covered with stellate hairs, with subequal and spreading lobes. The corolla is white, and smooth, and less than 1 cm across, with subequal and spreading lobes^[17]. *T. grandis* fruit is rounded, about 1.3 cm in diameter, and the soft pericarp densely clothed with felted, stellate hairs^[18].

Chemical Constituents:

Chemical constituents of *T. grandis* plant is belongs to the different categories. Some of those are tannins, proteins, fatty acids, steroidal compounds, resins, anthraquinone-naphthquinone pigments^[19], diterpens and dye. Compounds such as Lapachol and its derivatives^[20], methyl quinizarin and squalene isolated from the heart wood were found to have cytotoxic^[21], antiulcer, wound healing, and anaemia activities in experimental animals^[22].

Uses:

The plant parts of *T. grandis* have many uses. Roots are used in the treatment of anuria (absence or suppression of urine) and urine retention [24]. The flowers are acrid; bitter and useful in the treatment of bad digestion, stomach pain, constipation and urinary discharges[25]. Bark is astringent, acrid, sweet and useful in the treatment of bronchitis[26]. The wood is acrid, sedative, antihelmintic,

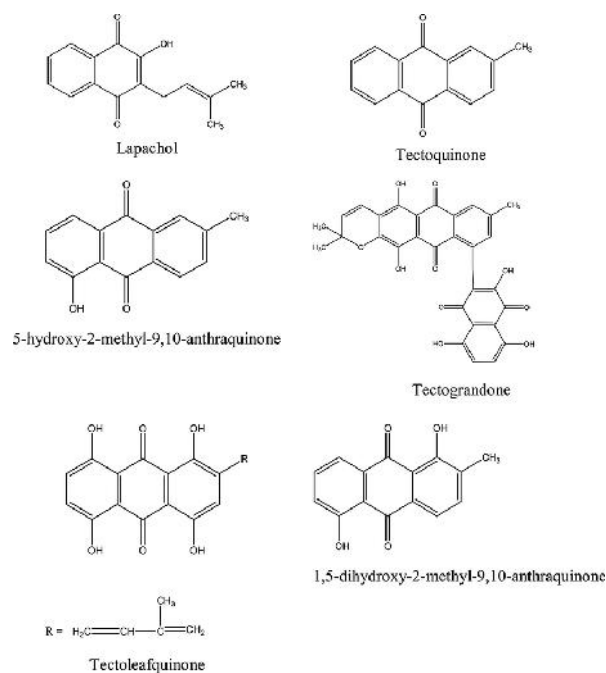
expectorant and useful in the treatment of gravid uterus, piles, leucoderma, dysentery, headache and burning pain in liver region[27]. The ashes of wood applied to swollen eyelids and to strengthen the eyesight[28]. The oil of nuts promotes the growth of hair and removes the itchiness of skin. The flowers and the seeds are promotes diuretics [29].

3. Pharmacological actions

Antifungal activity:

The antifungal activity of methanolic crude extract of *Tectona grandis* was studied at different concentrations are (1000, 2000, 3000, 4000 and 5000 ug/ml). The extract of *Tectona grandis* showed 90.00% and 86.84% inhibition growth against *Alternaria cajani* and *Helminthosporium*. The higher Concentration of methanolic extract impart maximal antifungal activity^[30].

Structure of some important chemical constituents of *Tectona grandis* Linn.



Antiulcer activity:

Lapachol (a naphthoquinone) isolated from the roots of *T. grandis* given at a dose of 5 mg kg⁻¹ p.o. (by mouth) twice daily for 3 days was found to have an anti-ulcer effect on subsequently induced experimental gastric and duodenal ulcers in rats and guinea-pigs[31]. Its action appears to be associated with an effect and also shows positive results in experimental animals[32].

Antianaemic activity:

The extract of *T. grandis* leaves are evaluated on anaemic model of rat induced by intraperitoneal route of injection of phenylhydrazine at 40mg/kg for 2 days. Oral administration of *T. grandis* extract at 1 g/kg/day, to the rats are previously treated with phenylhydrazine, increased the concentration of haemoglobin, red blood cells number, haematocrit and reticulocytes rate^[33]. Moreover, the extract of *T. grandis*

enhanced the osmotic resistance of the red blood cells that confirm the important presence of young red blood cells^[34].

Wound healing activity:

To evaluate the effect of hydrochloric extract of *T. grandis* on experimentally induced wounds in rats. It is well known wound healing agent, and compared the effect observed along with aloe vera^[35]. *T. grandis* leaf extract treatment orally produced a significant increase in the breaking strength, dry weight and hydroxyproline content of the granulation tissue in dead space wound. It was concluded that *T. grandis* leaf extract applied topically (5% and 10% gel formulation) or administered orally (250 and 500 mg/kg body weight) possesses wound healing activity^[36].

Antioxidant activity:

The present study deals with in-vitro antioxidant activity of ethanolic extract of *Tectonagrandis* Linn. (TG) by using DPPH (1,1-Diphenyl-2-picryl-hydrazyl) assay, Ferric Reducing Antioxidant Power (FRAP) scavenging assay and H₂O₂ radical scavenging assay^[37]. The IC₅₀ value observed in DPPH and H₂O₂ radical scavenging assay were 37.5 Fg/ml, 32.0 Fg/ml respectively, and 50 % reduction in ferricyanide complex at 190 Fg/ml concentration. The results were compared with ascorbic acid as a standard^[38]. Hence antioxidant property of *T. grandis* may be due to presence of tannins and saponins. These results clearly indicate that the *T. grandis* is effective against free radical mediated diseases^[39].

Antibacterial activity:

The methanol extracts of teak bark were inhibitory to *Listeria monocytogenes* and MRSA (Methicillin Resistant *Staphylococcus aureus*) by means of disc diffusion. GCMS analyses revealed that the inhibitory compound having MW-174 and a structure of 5-hydroxy-1,4-naphthalenedione (juglone)^[40]. *T. grandis* sawdust extract exhibited the growth of *Aspergillus niger*. Endophytic isolated from *T. grandis* could produce inhibitory substance effective against *Bacillus Subtilis*, *S. aureus*, *Escherichia Coli* and *Candida albicans* in vitro.

Nitric oxide scavenging activity:

The hexane extract of *T. grandis* was examined for their possible regulatory effect on Nitric oxide (NO) levels using sodium nitroprusside as a Nitric oxide donor in vitro. The plant extract tested demonstrated direct scavenging of Nitric oxide and exhibited significant activity^[41].

Anti fertility agent:

T. grandis plant along with *Lawsonia intermis*, *Butea monosperma* and *Carica papaya* shows antifertility action for birth control^[42]. The antibacterial and cytotoxic potential of the chloroform extract and the antioxidant potential of the ethyl acetate extract from the plant have also been reported. The alcoholic and aqueous extracts of the stem-barks showed significant and dose dependent analgesic and anti-inflammatory effects^[43].

4. Conclusion

The use of herbal medicines is wide spread among the patients in treating varieties of diseases and the importance of the ayurvedic medicines. This review highlights the

importance of different pharmacological activities of *T. grandis* Linn. Modern pharmacological investigations have communicated that *T. grandis* possess, several activities such as antifungal activity, anti-bacterial activity, anti-anaemic activity, wound healing activity, anti-oxidant activity. Other than that *T. grandis* shows cytotoxic activity, anti-inflammatory activity, Nitric oxide scavenging activity, antifertility activity, antiviral activity.

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