# Unveiling the Medicinal Secrets of *Millingtonia hortensis* - A Review.

Hadiya Pathan[1], Kshitija Ahire[2], Harshavardhan Mishal[3], Rashmi Mishal[4]*

[1,2,3] MET's Institute of D Pharmacy. Bhujbal Knowledge City, Nashik 422003.

[4] GES's Sir Dr. M. S. Gosavi College of Pharmaceutical Education and Research, Nashik.

**Abstract:** The Indian cork tree, or *Millingtonia hortensis* L. f. is a multipurpose plant with important therapeutic and aesthetic benefits. The plant is well-known for its wide range of medicinal uses, which include the treatment of infections, inflammation, and respiratory conditions. The purpose of this paper is to examine the pharmacological activities and many applications of *Millingtonia hortensis* in both conventional and alternative medicine. The study highlights the antioxidant, antibacterial, and anti-inflammatory qualities of the plant while investigating the bioactive substances that cause these effects. The report also addresses *Millingtonia hortensis's* possible future uses in pharmaceutical development as well as its traditional uses in a variety of cultural behaviour. The results highlight the value of this plant as a natural resource for creating novel therapeutic agents and the necessity of more study to completely comprehend its mechanisms of action and maximize its therapeutic applications.

**Keywords:** *Millingtonia hortensis,* Indian cork tree, Medicinal plant, Bignoniaceae

**Introduction[(1) (2)]:** A genus represents a group of its closely related species. Some experts believe that the purpose of a genus is to group various species together, based on how closely related they are and in a way that reflects their evolutionary connections. To classify a species within a genus, the key question is whether it is related to the confirmed species in that genus. According to other experts, a genus is a taxonomic category set apart from other genera by a clear gap, and it consists of either one species or a group of species with a common ancestor (monophyletic).

Traditionally, a genus should be easily recognized based on a few distinct features.

(i) **Several Characteristics:** Rather than relying on a single characteristic, a genus should be identified by the combination of its traits. These traits often arise as adaptations to different ecological conditions, which makes it easy to distinguish genera in some cases. For instance, aquatic species of the genus Ranunculus have been classified in a separate genus called Batrachium.

(ii) **No Size Requirement:** There is no specific size requirement for a genus. It could include just one species, such as Leitneria, Ginkgo, or Milula, or it could consist of many species, like Euphorbia (with 2100 species), Astragalus (2000 species), Carex (1800 species), Senecio (1500 species), or Acacia (1300 species). Senecio used to contain over 2500 species but has since

been split into different genera. The most important factor is that there should be a clear difference between species of two genera. If they can't be easily distinguished, they may be combined into one genus and divided into subgenera or sections.

(iii) **Sections and Subgenera:** When considering the divisions within a genus, it's important to think about the size of the genus and whether it's practical to have sections and subgenera in larger genera. Customary usage should also be considered when determining how to classify these groups.

(iv) **Geographic Distribution:** Since certain traits that remain stable in one region may not hold in another, it's important to study a group of species across its entire range when setting the boundaries of a genus. Bignonia is one such genus, named after Abbé Bignon, a librarian of King Louis XIV, gives its name to the Bignoniaceae family. Species of Bignonia are famous for their beautiful flowers, which is why many, such plants as *Bignonia capreolata*, are grown as ornamental climbing plants. *Bignonia capreolata*, one of the most striking species, is native to North America but also grows well in warm climates. Most other Bignonia species are native to the warmer regions of the western hemisphere. Botanically, the genus is identified by its bell-shaped calyx with a slightly wavy edge and its irregularly shaped corolla. The plant has five stamens—two longer fertile ones, one sterile—and a stigma that is split into two flat parts. Its fruit is shaped like a pod, with seeds arranged in two rows, each surrounded by a thin, papery wing. In some species, the wood forms a cross when cut. Bignonia has pinnate leaves, and its vibrant flowers usually grow in clusters, though the fruit of many species remains largely unknown. Many Bignonia species are climbing vines that use tendrils to reach the tops of tall trees. In Brazil's dense forests, they grow in such abundance that they often form almost impenetrable barriers. A notable species is *B. alliacea*, also known as the Garlic shrub, which grows in Guiana and the West Indies. When its leaves are crushed, they give off a strong garlic odor. Another species, *B. Kerere,* native to French Guiana, is a climber with smooth, angular stems and hairy, elliptical leaves. The local people use its flexible stems to make ropes, as well as to weave baskets and hats for protection from the sun and rain. Perhaps the most important species is *B. chica*, which grows in Venezuela, New Grenada, and Guiana. It uses its tendrils to climb trees, and its leaves have pairs of oval-shaped leaflets. The violet, funnel-shaped flowers grow in drooping clusters and produce pod-like fruit with winged seeds. *B. chica* is famous for making a red dye called Carajuru by soaking its leaves in water. Indigenous people along the Rio Negro often use this dye for body painting. *Millingtonia hortensis* L.f. is the only species in its genus within the Bignoniaceae family. This tree is known for its tree-like growth and distinctive fruit, which is divided into two sections by a partition that runs parallel to the

fruit's valves. It is a medium-sized tree with pinnate leaves and smooth-edged leaflets. The tree produces large clusters of fragrant white flowers, making it a popular ornamental plant in many parts of India and the Indian Archipelago. The calyx is bell-shaped with five short, equal lobes, while the corolla has a long tube with five lobes, with the top two partially fused. It has four stamens with parallel anthers, and both the stamens and style extend beyond the corolla. The fruit is a smooth, flat capsule containing broadly winged seeds. Some species that were once included in Millingtonia have now been moved to other genera within the Bignoniaceae family.

**Taxonomy and distribution:** [3]

Kingdom: Plantae

Division: Magnoliophyta

Class: Magnoliopsida

Order: Lamiales

Family: Bignoniaceae

Genus: Millingtonia

Species: *Millingtonia hortensis*

Scientific Name: *Millingtonia hortensis L.f.*

Though a native to the Malay Archipelago and Burma, it grows naturally over most of the India and is also extensively farmed. Throughout Southern Asia, including South China, Thailand, Burma, and India & Sindh, Punjab regions of Pakistan. One can find this significant medicinal plant. It may thrive in a variety of soil types.[4]

This tree is tall and deciduous, growing metre by metre. There are several pinnate layers in the leaves. The dried flowers are used as a lung tonic that helps heal cough-related ailments, while the bark is used to make yellow dye. The trees usually reach a height of 8 to 25 meters, and it grows well in the tropical woods of central India. The plant has elliptic, ovate, or oblong leaflets that are 1.5 to 4 cm long. The plant can grow to be 40 to 100 cm long. The leaflets are smooth, with whole margins, an acuminate apex, and a rounded or oblique base. The midrib's sides are lined with four or five lateral veins.

With a tiny, cup-shaped calyx that is 2-4 mm long and has lobes that are somewhat reflexed, the inflorescence is paniculate and cymose. The white corolla has a diameter of 2-3 mm and a length of 3-7 cm in a tube. There are many ovules in the glabrous ovary, which are organised into four rows. This tall deciduous tree is primarily found in tropical woods on low-elevation slopes between 500 and 1200 meters. It can tolerate a variety of soil types and wet climates, and it usually grows at elevations between 0 and 922 meters. [5] **(Figure 1)**

**Traditional Uses:** Flower buds are used to treat asthma, sinusitis, and as a cholagogue and tonic. They are also used in rituals and added to tobacco for smoking as a remedy for throat ailments. Stem holds the significant medicinal value, functioning as a lung tonic and treating cough-related diseases while its bark is utilized to produce a yellow dye. Leaves, along with the roots, are known for their anti-asthmatic and antimicrobial properties. The entire plant exhibits antipyretic, antitubercular, antimicrobial, larvicidal, antimutagenic, anticancer, and antifungal activities. [6]

**Chemistry:** Lapachol, β-sitosterol, and paulownin have been isolated from the roots of *Millingtonia hortensis.* [7] β-Sitosterol has been extracted from the heartwood and bark, along with the identification of bitter substances and tannins.[8] Hispidulin and rutinoside have been identified from the leaves of *Millingtonia hortensis*, as well as the flavonoid dinatin and beta-carotene. [9] Fresh flowers of *Millingtonia hortensis* yielded a new glycoside (scutellarein-5-galactoside) and scutellarein. Additionally, flavonoids such as scutellarein, hispidulin, and scutellarein-5-glucuronide were isolated from the flowers. Furthermore, various compounds have been extracted from the dried flowers of *Millingtonia hortensis.* [8] **(Table 1)**

**Pharmacological Activities:**

**Larvicidal Activity:** *Millingtonia hortensis* has been screened against three species of mosquito vectors with some success though some medicinal properties of this plant are known but so far there is no report of its biological activity against insects.[9]

**Antifungal Activity**: A number of fungal infections were used to assess the antifungal qualities of many M. hortensis extracts. With a minimal inhibitory concentration (MIC) of 4 µg/ml against Candida krusei and a MIC of 2 µg/ml against Saccharomyces cerevisiae, the methanol extract outperformed fluconazole in terms of activity. However, it exhibited fluconazole-like activity against Candida glabrata. Additionally, the aqueous extract showed four times greater activity against Saccharomyces cerevisiae (MIC of 2 µg/ml) and Candida krusei (MIC of 4 µg/ml). Comparing the extracts to the standard, the chloroform and ethyl acetate showed lesser efficacy against all fungal infections, with the exception of Candida krusei. All extracts showed less effectiveness than the standard against the filamentous fungus Trichosporon cutaneum. antimicrobial effectiveness That reported it. Leaf extracts of *Millingtonia hortensis* derived from Polar extracts exhibited significant antibacterial properties. Twenty different bacterial strains and two yeast cultures were used. The aqueous alcohol extract exhibited good activity against all tested pathogens, particularly Salmonella typhimurium and Escherichia coli, both Gramnegative bacteria, with MIC values of 6.25 µg/ml. The action is compared to well-known antibiotics as gentamycin and nystatin.[10]

**Antiproliferation Activity**:

*Millingtonia hortensis* was characterised as a medicinal plant that is widely utilised in numerous Asian nations by Siwapong Tansuwanwong *et al.* (2008). Although the precise process is yet unknown, it has been demonstrated that an aqueous crude extract from this plant can cause RKO colon cancer cells to undergo apoptosis. Three aqueous fractions were obtained from the crude extract after it was partially processed using Sephadex LH-20 in order to do additional research on the plant extract. Using an MTT experiment, the cytotoxicity of each fraction was examined.[11]

**Conclusion:** The extensive ethnobotanical and literature survey has revealed that Millingtonia hortensis is an important plant with variety of active medicinal constituents. It is used in the form of crude dosage forms in folk medicine by tribals of various states of India since ancient times. The main pharmacological properties indicated its larvicidal, anti-proliferation and anti-fungal activity. Some phytochemical work has already been already been done by the research workers all over the country. Still the research is insufficient and many aspects are unexplored such as different chemical constituents of seeds and bark of the plant and their isolation with reference to its different pharmacological activities. This needs due separate attention. Further studies should be carried out to explore the hidden areas and their practical clinical application which can be utilized for the human welfare.

**Figure 1:** ***Millingtonia hortensis***

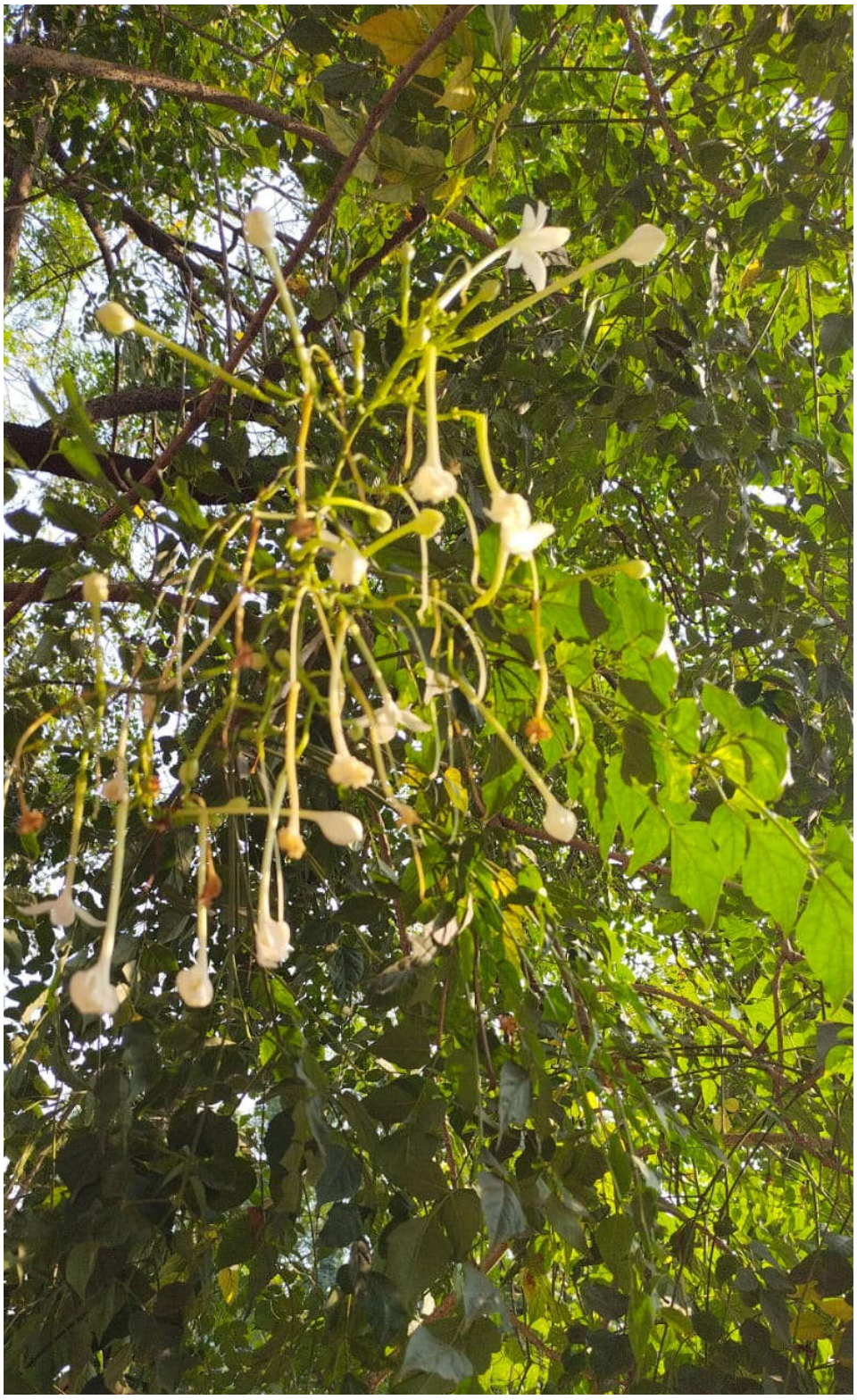
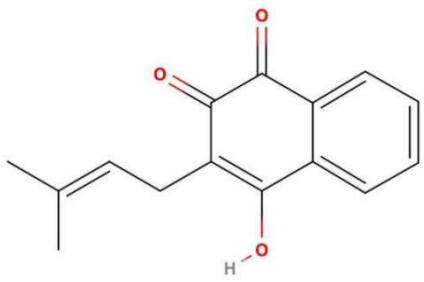
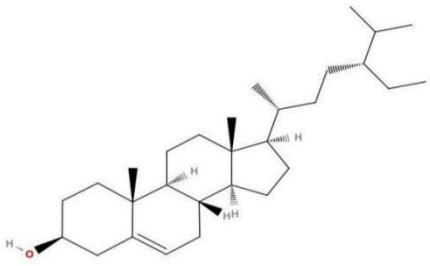
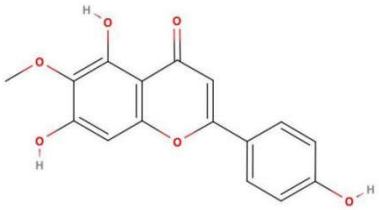
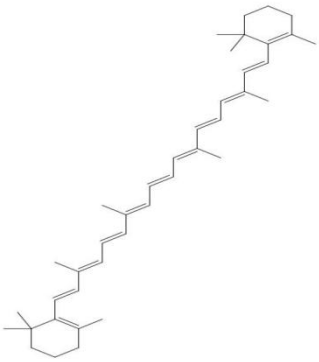


**Table 1: Chemical Compounds Isolated From *Millingtonia hortensis***

| | |
|---|---|
|  **Lapacol** |  **β - sitosterol** |
|  **Hispidulin** |  **β - carotene** |

**References:**

1. Singh, Gurcharan; *Plant Systematics: An Integrated Approach*. CRC Press; **(2019);** IIIrd Ed; pp 53-54.

2. Moore, Thomas; *The Treasury of Botany: A Popular Dictionary of the Vegetable Kingdom;* Vol. 1; Longmans, Green, and Company; (**1889)** pp 741.

3. Ramasubramaniaraja, R; *Millingtonia hortensis* Linn.: An Overview; *Int J Pharm Sci Rev Res* **(2010)**; 04 (2); pp 123-5.

4. Khan, D; Surface Micromorphology of *Millingtonia hortensis* Linn. F. Cultivated in Dubai, UAE." *Int J Biol Biotechnol*; **(2020);** 17 (2); pp 411-32.

5. Manubolu, Krishnaveni, *et al*; Evaluation of Anti-inflammatory Activity of *Millingtonia hortensis* Leaf Extract; *IJCBS*; **(2023)**; 24(6); pp 380-385.

6. Chulasiri, Malyn, *et al*; Mutagenicity and Antimutagenicity of Hispidulin and Hortensin, the Flavonoids from *Millingtonia hortensis* L." Environ Mol Mutagen; **(1992)**; 20 (4); pp 307-312.

7. R. Kaushik & P. Saini; Screening of Some Semi-arid Region Plants for Larvicidal Activity Against *Aedes aegypti* Mosquitoes; *J Vector Borne Dis*; **(2009)**; 46; pp 244 - 246.

8. Dr. Alekhya Ketha, A.Sai Charan *et al*; A Review on *Millingtonia hortensis* Linn.; *IJCRT*; **(2023)**; 11 (2); pp 165 - 170.

9. Kaushik, R., and P. Saini; Larvicidal Activity of Leaf Extract of *Millingtonia hortensis* (Family: Bignoniaceae) Against *Anopheles stephensi*, *Culex quinquefasciatus* and *Aedes aegypti*; *Journal of vector borne diseases*; (2008); 45 (1); pp 66.

10. Sasidharan, B. R., P. Balaji, *et al*; A Study on Biochemical Constituents and Anti-bacterial Activity in the Bark Extract of *Millingtonia hortensis*." *Int J Curr Microbiol Appl Sci*; **(2020)**; 9 (5); pp 2436-2434.

11. Siwapong Tansuwanwong *et al*; Antiproliferation and Apoptosis on RKO Colon Cancer by *Millingtonia hortensis; Plant Foods for Human Nutrition*; **(2008)**; 64 (1); pp 11-17.