



**A REVIEW OF *CHUNIODENDRON SPICATUM* (ROOT): AN OVERVIEW OF ITS
BIOLOGY, TRADITIONAL USES, AND PHARMACOLOGICAL ACTIVITIES**

Ms. Sweety Vishwakarma*¹, Dr. Dhyanendra Singh Baghel²

¹Research Scholar, Mansarovar Global University, Sehore (M.P.).

²Professor, Faculty of Pharmacy, Mansarovar Global University, Sehore (M.P.).



***Corresponding Author: Ms. Sweety Vishwakarma**

Research Scholar, Mansarovar Global University, Sehore (M.P.).

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ABSTRACT

Chuniodendron spicatum, commonly known as Rohituka or Amoora, is an important medicinal tree belonging to the family Meliaceae. The plant has been widely used in traditional systems of medicine for the treatment of tumors, liver disorders, inflammation, rheumatism, diabetes, skin diseases, and intestinal infections. Different parts of the plant, particularly the root, possess diverse phytoconstituents including alkaloids, limonoids, triterpenoids, flavonoids, glycosides, and sterols. Recent pharmacological investigations have demonstrated significant anticancer, antioxidant, antimicrobial, anti-inflammatory, hepatoprotective, antidiabetic, and cytotoxic activities associated with the root extract. The present review summarizes the botanical profile, phytochemistry, traditional medicinal applications, and pharmacological activities of *Chuniodendron spicatum* root. The review also highlights the therapeutic potential of the plant and future perspectives for drug discovery and development.

KEYWORDS: Different parts of the plant, particularly the root, possess diverse phytoconstituents including alkaloids

INTRODUCTION

Medicinal plants have played a central role in traditional healthcare systems for centuries. Natural products continue to provide lead molecules for the development of modern therapeutic agents.^[1] Among medicinal plants, *Chuniodendron spicatum* has gained considerable scientific attention because of its broad spectrum of biological activities and rich phytochemical composition. The plant belongs to the family Meliaceae and is distributed mainly in India, Bangladesh, Sri Lanka, China, Myanmar, and Southeast Asian countries.^[2]

Traditionally, the root of *C. spicatum* has been used in Ayurveda and folk medicine for treating cancer, liver disorders, spleen enlargement, diabetes, rheumatism, and inflammatory conditions.^[3] Modern pharmacological studies have validated several of these traditional claims and identified multiple bioactive compounds responsible for its therapeutic properties.^[4]

Botanical Description and Biology

Chuniodendron spicatum is a large evergreen tree that grows up to 20–30 meters in height. The plant is characterized by a straight cylindrical trunk, pinnate leaves, fragrant flowers, and reddish fruits containing seeds with bright arils. It is commonly found in tropical and subtropical forests. The tree thrives in humid climates and is widely distributed across the sub-Himalayan regions and Western Ghats of India.^[5]

The roots contain several medicinally active phytochemicals and have been extensively investigated for their biological activities. Various plant parts including bark, roots, leaves, and seeds possess therapeutic properties; however, the root remains one of the most pharmacologically important components.^[6]

Traditional and Ethnomedicinal Uses

The root of *Chuniodendron spicatum* has been extensively used in traditional medicine systems. Ethnobotanical reports indicate that the root is employed

as an astringent, anthelmintic, anti-inflammatory, and hepatoprotective remedy. In Ayurvedic medicine, it is used for the treatment of tumors, spleen disorders, ulcers, jaundice, diabetes, skin diseases, and rheumatism.^[7]

In Bangladesh and India, traditional healers use root preparations to manage cancer-related symptoms and inflammatory disorders.^[8] Decoctions prepared from the root are also used for liver protection and digestive disorders.^[9] Powdered root preparations are sometimes applied externally for skin diseases and rheumatic pain.^[10]

Phytochemical Constituents

Phytochemical investigations of the root have revealed the presence of numerous bioactive compounds such as alkaloids, flavonoids, limonoids, triterpenoids, glycosides, tannins, and sterols.^[11] Major compounds isolated from the plant include rohitukine, aphananin, amooranin, aphanamixin, limonoids, and various flavonoid glycosides.^[12]

Rohitukine is considered one of the most important alkaloids isolated from *C. spicatum*.^[13] It has attracted attention because of its anticancer potential and its role as a precursor for synthetic cyclin-dependent kinase inhibitors.^[14] Limonoids and tetranortriterpenes isolated from the roots also exhibit anti-inflammatory and cytotoxic properties.^[15]

Pharmacological Activities

Anticancer Activity

Several studies have demonstrated significant cytotoxic and anticancer activities of *C. spicatum* extracts against different cancer cell lines.^[16] Root extracts have shown growth inhibitory effects against breast cancer, cervical cancer, pancreatic cancer, and leukemia cell lines.^[17] The anticancer effect is believed to involve apoptosis induction, cell cycle arrest, and inhibition of tumor cell proliferation.^[18]

Bioactive compounds such as rohitukine and limonoids contribute significantly to the anticancer activity.^[19] Research indicates that these compounds can interfere with signaling pathways involved in cancer progression and induce programmed cell death in malignant cells.^[20]

Anti-inflammatory Activity

The root possesses notable anti-inflammatory properties due to the presence of limonoids and terpenoids.^[21] Experimental studies have shown inhibition of nitric oxide production and inflammatory mediators in activated macrophage cells.^[22] Traditional use of the root in rheumatism and inflammatory diseases is supported by modern pharmacological evidence.^[23]

Antioxidant Activity

Methanolic and ethanolic extracts of the root exhibit strong antioxidant activity by scavenging free radicals such as DPPH and nitric oxide radicals. The antioxidant

effect is mainly attributed to flavonoids and phenolic compounds present in the root. Antioxidant activity may contribute to its protective role against oxidative stress-related diseases including cancer and liver damage.^[23]

Antimicrobial Activity

Root extracts have demonstrated antibacterial and antifungal activities against several pathogenic microorganisms. Studies reported inhibitory activity against *Escherichia coli*, *Staphylococcus aureus*, *Pseudomonas aeruginosa*, and fungal strains. These findings support the traditional use of the root in infectious diseases and wound healing.^[24]

Hepatoprotective Activity

Traditional use of the root in liver disorders has been validated experimentally. Extracts of *C. spicatum* have shown hepatoprotective effects against chemically induced liver damage in animal models. The protective effect may result from antioxidant and anti-inflammatory mechanisms.^[25]

Antidiabetic Activity

Recent investigations suggest that *C. spicatum* possesses antidiabetic potential. Experimental studies demonstrated reduction in blood glucose levels, improvement in lipid profiles, and enhancement of antioxidant defenses in diabetic animal models. Polyphenolic compounds present in the plant may contribute to these effects.^[26]

Future Perspectives

Although several pharmacological activities of *Chuniiodendron spicatum* have been scientifically validated, further studies are necessary to establish its safety, efficacy, and clinical applications. Future research should focus on.

- Isolation and characterization of novel bioactive compounds
- Molecular mechanisms underlying pharmacological effects
- Standardization of herbal formulations
- Toxicological evaluation and pharmacokinetic studies
- Clinical trials to validate therapeutic efficacy in humans

Advances in nanotechnology and phytopharmaceutical research may further enhance the medicinal value of this plant in the future.

CONCLUSION

Chuniiodendron spicatum is an important medicinal plant with significant ethnopharmacological and therapeutic relevance. The root contains diverse phytoconstituents responsible for a wide range of pharmacological activities including anticancer, antioxidant, anti-inflammatory, antimicrobial, hepatoprotective, and antidiabetic effects. Scientific evidence strongly supports many of its traditional medicinal uses. Continued phytochemical and pharmacological investigations may

lead to the development of novel plant-based therapeutic agents from this valuable medicinal species.

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