

An Overview of Medicinal Plant Guggul (*Commiphora wightii*)

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Introduction

Last few decades, rapid global population growth has been increased and led to challenges such as limited access to healthcare, high costs of treatment, and adverse effects of synthetic medications. As a result, there has been a growing focus on optimizing the use of natural resources, particularly in the fields of medicine and agriculture, to treat human ailments. In view of this, several medicinal plants had been identified for their medicinal properties, among them one of them, Guggul (*Commiphora wightii*) is an important plant due to its renowned medicinal properties (Fig. 1). It has been utilized in traditional medicine for centuries, primarily in Ayurveda, for its therapeutic properties. The plant's resin, known as gum guggul, is rich in bioactive compounds like guggulsterones, which are recognized for their anti-inflammatory, hypolipidemic, and antioxidant effects. It is predominantly found in areas such as Bangladesh, Pakistan, Rajasthan, Gujarat, Assam, Madhya Pradesh, and Karnataka (Kulloli and Kumar, 2013).

The guggul resin (gum guggul) extracted from the stem of the Mukul myrrh tree, has long been used in traditional medicine to treat various conditions such as arthritis, acne, hemorrhoids, and urinary tract infections. Additionally, guggul is well-known for its benefits in promoting weight loss. The resin is harvested from November to July, similar to the tapping process used for maple syrup. However, due to a lack of awareness about its conservation status, guggul is considered critically endangered in India and is listed as "Data Deficient" on the IUCN Red List (IUCN, 2015). Factors such as overexploitation from resin tapping, low natural germination rates, and slow plant growth have contributed to the decline of guggul populations. Despite continuous seed and flower production in areas like Rajasthan, poor germination hinders large-scale propagation. Therefore, *in vitro* methods are urgently needed to promote growth and enhance the production of the plant's active compounds.

Research has shown that guggul possesses cholesterol-reducing properties due to compounds like guggulsterone. This bioactive compound aids in cholesterol metabolism by regulating bile acid synthesis and transport. Guggulsterone also has anti-inflammatory effects, suppressing nuclear factor κ B (NF κ B), a key regulator of inflammation. The resin's chemical composition includes minerals, gum, terpenes, sterols, essential oils, and other bioactive compounds (Verma *et al.*, 2022). Moreover, guggulsterone has shown potential in cancer therapy by inhibiting metastasis and inducing apoptosis (Choudhary and Tomar, 2020). Therefore, it is necessary to conserve guggul plant for sustainable use in medicine and related fields.



Fig. 1: *Commiphora wightii* Plant

Ecology and Climate

Guggul thrives in the dry, arid regions of India, particularly in the deserts of Rajasthan and Gujarat, where it has evolved to endure some of the harshest environmental conditions. Further, it is also reported to parts of Pakistan and northeastern Africa, where similarly arid conditions prevail. This wide geographic distribution across dry and desert-like environments demonstrates guggul's impressive adaptability. The plant is naturally adapted to extreme climates, such as high temperatures, low rainfall, and poor soil fertility. Guggul's plant can survive in these arid zones is largely due to its resilience to drought and high temperatures, often exceeding 45°C during summer. It can grow in rocky, well-drained soils that are typically deficient in organic content and can even withstand saline conditions to some extent. The annual rainfall required for its growth is minimal, ranging between 150-200 mm, making it suitable for regions with erratic or sparse precipitation (Chakraborty and Muthukumar, 2016).

Furthermore, it is observed that its survival is becoming increasingly threatened due to factors such as habitat destruction, overgrazing, and unsustainable harvesting practices. In

India, deforestation and land degradation have led to significant habitat loss for the species, reducing the number of wild populations. The unsustainable extraction of resin, a key economic resource from the plant, further exacerbates its decline (Bhardwaj *et al.*, 2021).

Economic Importance

Guggul, is of considerable economic significance due to its extensive use in Ayurvedic medicine and increasing global demand for natural health products. The resin extracted from the plant, known as guggul gum or guggulipid, has been used for centuries in traditional medicine to treat a range of health conditions, including arthritis, cardiovascular diseases, obesity, high cholesterol, and skin disorders. The medicinal properties of guggul are primarily attributed to its active compounds, such as guggulsterones, which have anti-inflammatory, cholesterol-lowering, and antioxidant effects. These compounds make guggul a highly sought-after ingredient in both traditional and modern medicinal formulations (Chen *et al.*, 2007).

The rise in popularity of herbal medicines, both in India and globally, has significantly increased the demand for guggul. Ayurvedic products that include guggul are not only sold in local markets but are also exported internationally, contributing to the economic well-being of rural communities involved in its collection and sale.

Conclusion

Guggul is an important medicinal plant, which exudates the gum called guggul. This chemical compound (guggulipids) is widely used to prepared the products for traditional, medicinal and economic significance. Further, due to unsustainable harvesting practices, habitat destruction, and poor natural regeneration are threatening its survival. Hence, it is need to protect and propagation of this plant with the help of sustainable harvesting, conservation practices, and advancements in cultivation techniques such as tissue culture. However, offer hope for preserving this critical plant species, ensuring its availability for future generations and continued economic benefit. Through a combination of conservation efforts, technological innovation, and sustainable practices, it is possible to safeguard the future of guggul while still capitalizing on its immense medicinal potential.

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