

## Commiphora mukul Engl. – “Divya” : A Review

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### Abstract:

Plants have been one of the important source of medicines ever since the dawn of human civilization. Medicinal plants are those in which one or more of its organ contains substances that can be used for the therapeutic purposes or which, are precursors for the synthesis of useful drugs. The recent resurgence of plant remedies resulted from several factors, such as effectiveness of plant medicines and lesser side effects compared with modern medicines. *Commiphora mukul* Engl., commonly known as *Guggulu*, is a most important medicinal plant and has been a key component in ancient Indian Ayurvedic, Unani and Siddha system of medicine. It contains several phytoconstituents like essential oils, flavonoids, ellagic acid, camphorene, cembrene, diterpene hydrocarbon, diterpene alcohol, Z -Guggulsterone, E-Guggulsterone, *Guggulsterol-I*, II, & III, cholesterol, etc. *Commiphora mukul* is antiseptic, ecboic, appetizing, aphrodisiac,

emmenagogue, expectrorant and used in menorrhagia, anaemia, leucorrhoea, rheumatism, nervous diseases, bone-fractures, obesity, disorder of lipid metabolism and peptic ulcer, leprosy, muscle spasms, ophthalmia, skin disorders, ulcerative pharyngitis, hypertension, ischaemia, urinary disorders. Hypercholesterolemia, impotence, bronchitis, catarrh, sores, tumors, wounds, bone fractures, facial paralysis, diabetes, and as a tonic for the uterus etc. Oleo-gum resins of this plant used in incense, lacquers, varnishes, and ointments, as a fixative in perfumes, and in medicine. Gugulipid, an extract of *Commiphora mukul*, has recently been paid great attention for its cancer chemo-preventive and chemo-therapeutic potential. Hence, in view of immense medicinal importance this plant, current review is compiled with relevant information related to *Commiphora mukul*.

**Key words:** *Commiphora mukul*, Guggulsterone, *Guggulu*, oleogum resins, gugulipid, anti-inflammatory.

### Introduction:

Many herbal remedies individually or in combination have been recommended in various medical treatises for the cure of different diseases. For the past few decades, compound from natural sources have been gaining importance because of the vast chemical diversity they offer. This has led to a phenomenal increase in the demand for herbal medicines. These herbal drugs have given important lead in drug research, resulting in the discovery of novel molecules and also they are relatively safe, easily available and affordable to the masses.

*Commiphora mukul* (Hook. ex Stocks) Engl. (Syn. *Commiphora wightii*; *Balsmodendron wightii*; *B. roxburghii*; *B. mukul*) is a stunted bush with spinescent branches belonging to family Burseraceae. Its generic name derived from a Greek word Kommi = gum and Phero = to bear because it is rich in gum exudation from the trunk of the plant. *Guggulu* is an oleogum resin that exudes spontaneously as a result of injury from the bark of *Commiphora mukul*, is one of the most important drug used since vedic period. The *Atharva Veda*, one of the four well-known holy scriptures (*Vedas*) of the Hindus, is the earliest reference to the medicinal and therapeutic properties of *Guggulu*. Detailed descriptions regarding the actions, uses, and indications as well as the varieties of *Guggulu* have been

described in the Ayurvedic treatises, *Charaka* (1000 B.C.), *Sushruta Samhita* (600 B.C.), and *Vagbhata* (7th century A.D.). In addition, various *Nighantus* (medical lexicons) were written between the 12th and 14th centuries A.D. that were based on the Ayurvedic literature. Nowadays, *Guggulu* based formulations are very popular in Ayurveda practice. Due to rich medicinal values plant is highly over exploited.

### Classification:

Kingdom: Plantae  
Subkingdom: Tracheobionta  
Superdivision: Spermatophyta  
Division: Magnoliophyta  
Class: Eudicots  
Subclass: Rosidae  
Order: Sapindales  
Family: Burseraceae  
Genus: *Commiphora*  
Species: mukul or wightii  
Botanical name: *Commiphora mukul* (Hook. ex Stocks) Engl.<sup>[1]</sup>

### Vernacular names:

**Sanskrit:** *Guggulu*, *Guggula*, *Gugala*, *Gugguloo*, *Bhavabhishta*, *Bhutahara*, *Devadhupa*, *Deveshta*, *Dhurta*, *Divya*, *Durga*, *Jatala*, *Jatayu*, *Kalaniriyasa*, *Kaushika*, *Kumbha*, *Kumlhi*, *Kumbholu*, *KumbholuKhalaka*, *Kunti*, *Pavandvishta*, *Pura*, *Putra*, *Rakshoha*, *Sarvasaha*, *Shambhava*, *Shiva*, *Uddipta*, *Ulukhalaka*, *Usha*, *Vayughna*.

**English :** Gum-gugul, Indian Bedellium

**Hindi :** *Googal*, *Guggal*, *Guggul*

**Marathi :** *Guggul***Kannada :** *Kanthagana, Guggala, Mahishaksha Guggulu, Guggulugida, Guggulu Guggal***Kashmiri :** *Guggul Dhoop, Kanth Gan***Malayalam:** *Gulgulu, Guggulu, Mahishaksh***Oriya:** *Guggulu***Punjabi :** *Guggal***Telugu:** *Makishakshi Guggulu, Guggipannu***Arabic:** *Moql, Moqle-arzaqi, Aflatan***Urdu:** *Muqil (Shihappu)***Bengali:** *Guggulu, Mukul***Assamese :** *Guggul***Gujarati :** *Gugal, Guggal, Gugar , Googalee***Persian:** *Baijahundana***Tamil:** *Gukkulu Maisatch, Kungiliyam*<sup>[2,3]</sup>**DISTRIBUTION AND HABITAT**

*Commiphora mukul* is widely distributed in tropical region of Africa, Madagascar and Asia and Saudi Arabia. In Indian sub-continent it occur in India, Pakistan, Baluchistan, Bangladesh etc. In India it is distributed in South-Westem India and parts of Central India which is represented by Kerala, Kanataka, Tamilnadu, Andhra Pradesh, Maharashtra, Madhya Pradesh, Gujarat and Rajasthan states, besides stray occurence in other states. The tree is met with in rocky and gravelly land types in

warm and semi dried areas in India found growing on the foot hills, along the slopes of the hills, hillocks and scarecely on hill tops preferring hard rocky soil.<sup>[4]</sup>

**Propagation and cultivation:**

The *Commiphora mukul* (*Guggul* tree) grows as a woody tree in sandy loam soil with more gypsum content, with pH 7.5-9. *Guggul* plant can be propagated both by seed and stem cutting in the arid or semi-arid zones, sloppy well drained lands are preferred for this purpose. The seeds are collected in July September when the viability is more. The plants are raised through nursery beds and transplanted after 6 months. Oleo-gum-resin is collected from at least 5 years old plants. It is tapped from main stem with 7.5 cm diameter on which deep incisions are made. It should be noted that the resin ducts occur only in bark portions near cambial layer. Thick branches of tree give best grade of *Guggul*. Each plant gives from 0.5-1 kg of *Guggul* per year. Gum resin are secrete either in schizolysigenous ducts or secretion cells; in the former case they are formed in the epithelial cells, and discharged into the ducts in the form of milky liquids which exude when the ducts are punctured. Gum resin resides in the ducts of the soft bark of the tree; circular incisions are made on the main stem from which a pale yellow fluid exudates, which is aromatic in nature and quickly solidify to form agglomerates of tears of golden brown or reddish brown colour. The dried resin has bitter aromatic taste & balsamic odour. Application of ether to the incisions enhances *Guggul* production 22 times,

long term application of ether enhance the production but eventually kills the plant due to exhaustion.<sup>[4,27]</sup>

### Part used

*Niryas* (oleo-gum resin)<sup>[6]</sup>

### Description of plant

*Commiphora mukul* is a flowering plant in the family Burseraceae. It is a shrub or small tree, attaining maximum height of 4 m, with thin papery bark, and thorny branches. The leaves are simple or trifoliate, the leaflets ovate, 1-5 cm long, 0.5-2.5 cm broad, irregularly toothed. Flowers are small, unisexual, sessile, brownish red, occurring singly or in groups of 2-3, 8-10 lobed disc and an oblong-ovoid ovary; stamen 8-10. Gynodioecious with some plants bearing bisexual and male flowers and others with female flowers. The individual flowers are red to pink, with four small petals. Fruits are red drupes, ovate, acuminate, separating into 2 fleshy valves, leaving the nut enveloped by a 4-cleft yellow pulp. Nuts ovoid, acute, splitting into two, each 1-celled.<sup>[7]</sup>



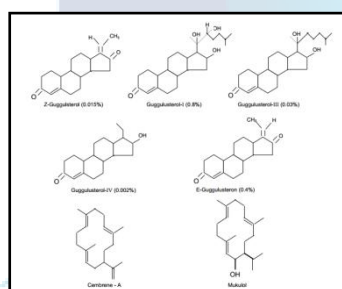
**Fig. 1: Leaves, stem, fruits and gum resin of *Commiphora mukul***

### Phytochemistry:

A detailed chemical study of *Commiphora mukul* revealed that it is a complex mixture of steroids diterpenoids, aliphatic esters, carbohydrates and varieties of inorganic ions. From the gum resin sesamin, cholesterol, few other steroids, essential oil containing steroidal ketones, alcohol and aliphatic triols (mostly as esters of ferulic acid) were reported. The structural elucidation of steroidal constituents viz. *Z-Guggulusterone*, *E-Guggulusterone*, five new sterols *Guggulu sterols* – I, II, III, IV, & V have been established along with partial synthesis of *Guggul sterol* –II from diosgenin. In addition, diterpenoid constituents cembrene – A and mukulol. Some fatty tetrols and octadecan-1,2,3,4-tetrol, eicosan-1,2,3,4-tetrol and nonadecan-1,2,3,4-tetrol were reported. The other chemical compounds reported are : myrcene, dimyrcene and



polymyrcene (from essential oil of resins) along with sugars (in the gum) and aldobiouronic acid; myricyl alcohol,  $\beta$  sitosterol, fifteen amino acids viz., cystine, histidine, lysine, arginine, aspartic acid, serine, glutamic acid, threonine, alanine, proline, tyrosin, tryptophan, valine, leucine and isoleucine along with sugars sucrose, glucose and fructose;  $\alpha$  - camphorene, cembrene and allycembrol; cembrene-A (structure of); flavanoids. Some steroidal components i.e. pregnenones-I, - II & - III (*Guggulsterol*-VI) were isolated from the gum resin of the drug and the structure of the new compound III was detected. Seed oil contains linoleic, oleic, stearic and palmitic acids, while unsaponifiable matter contains sitosterol, stigmasterol, cholesterol, campesterol and  $\alpha$ -spinasterol. [8]



**Figure 2. Structure of major constituents in *Commiphora mukul***

### Pharmacological/ biological activities:

#### 1. Hypolipidemic activity

Typical Guggulipid preparations contain 2.5-5% of the plant sterols Guggulsterone E and Z. These two components have been reported to exert effects on lipids. To evaluate the effects of *Guggul* on disorders of lipid metabolism, with special reference

to atherosclerosis and obesity, Satyavati et al. conducted the first animal study on rabbits, from 1964-1966. It was demonstrated that administration of gum *Guggul* significantly lowered the serum cholesterol levels of hyperlipidemic rabbits, prevented cholesterol-induced arteriosclerosis and decreased the body weight of the animals. The study by Satyavati et al. did not examine the effect of *Guggul* on triglyceride levels; however, another study by Singh et al. examined the effect of Guggulsterone on cholesterol and triglyceride levels in rats, Chander et al. examined the effect of Guggulsterone on serum lipid levels in triton- and cholesterol fed rats, significantly reduced serum lipid levels. [5,9-12]

#### 2. Anti- Arthritis Activity, Analgesics and Anti-Inflammatory Activity

*Guggul* reduced the thickness of the joint swelling during the course of drug treatment, indicating that gum *Guggul* has a beneficial role in experimental arthritis. Gum *Guggul* appeared to be a relatively safe and effective supplement to reduce symptoms of osteoarthritis after 1 month treatment and significantly improve the WOMAC (Western Ontario and McMaster Osteoarthritis Index) total score and continued to further improvement on long term uses and after 2 months of treatment with no side effects were reported during the trial. A well documented ayurvedic literatures and variety of preparations is available on analgesic and anti-inflammatory actions of Guggulsterone. [13]

#### 3. Cardio-protective effects

Several studies have reported the cardioprotective activity of Guggulsterone that showed the reversal of isoproterenol-induced cardiac damage and the associated metabolic changes in rats.<sup>[14]</sup>

#### 4. Neuroprotective effect

Guggulipid reversed streptozotocin induced neuronal damage and memory deficits. In parallel with these reversals, levels of glutathione in the brains of Guggulipid-treated mice were significantly increased, suggesting that Guggulipid inhibits oxidative stress in the brain. Guggulipid has an antioxidant and anti-acetylcholine esterase activities; showed protective effect against streptozotocin-induced memory deficits in the model of dementia. These observations suggest Guggulipid as a potential antidementia drug and cognitive enhancer.<sup>[5]</sup>

#### 5. Hepatoprotective activity

Leaves and bark of *Commiphora caudate* & *Commiphora berryi*; gum extract of *Commiphora mukul* have significant hepatoprotective activities etc.<sup>[15]</sup>

#### 6. Antihelminthic Activity

The antihelminthic effects of mirazid (from *Commiphora mukul*) have been extensively reported.<sup>[16]</sup>

#### 7. Thyroid-stimulatory effect

Several studies have shown that Guggulsterone stimulates the thyroid gland showed that administration of Guggulsterone restored thyroid activity like an increase in iodine uptake by the thyroid and enhanced the activities of

thyroid peroxidase and protease as well as oxygen consumption in hypothyroid rats.<sup>[17]</sup>

#### 8. Antibacterial Activities

It has been reported that the essential oil, chloroform extract and seven sesquiterpenoid compounds from the oleo-gum-resin of *Commiphora mukul* showed the inhibitory action against both gram-positive and gram-negative bacteria.<sup>[18]</sup>

#### 9. Anti Acne effect

Guggulipid has been reported to be effective in the treatment of nodulocystic acne. Patients with nodulocystic acne had shown progressive reduction in lesions when received Guggulipid for 3 months and patients with oily faces the acne responded better to Guggulipid.<sup>[19]</sup>

#### 10. Anti – fertility activity

*Commiphora mukul* caused a reduction in the weight of rat uterus, ovaries and cervix with a concomitant increase in their glycogen and sialic acid levels thereby showing that it might be useful as an antifertility agent.<sup>[20]</sup>

#### 11. Antioxidant effects

*Commiphora mukul* extracts have been reported to possess antioxidant properties possibly mediating protection against myocardial necrosis.<sup>[1,21]</sup>

#### 12. Platelet effects

Guggulipid has been found to inhibit platelet aggregation and increase fibrinolysis.<sup>[22]</sup>

### 13. Anticancer Activities

Guggulsterone has been shown to induce apoptosis and suppress proliferation, invasion, angiogenesis and metastasis of tumor cells. Various mechanisms have been suggested to explain the anticarcinogenic effects of Guggulsterone, including inhibition of ROI, suppression of inflammation and inhibition of nuclear receptors, transcription factors, inflammatory cytokines, antiapoptotic proteins, cell survival pathways, COX2, MMP-9, iNOS and cellcycle-related-proteins.

**Proliferation:** Guggulsterone suppresses the growth and proliferation of a wide variety of tumor cells, including leukemia, head and neck carcinoma, multiple myeloma, lung carcinoma, melanoma, breast carcinoma and ovarian carcinoma(50). It also inhibited proliferation of imatinib mesylate resistant leukemia, dexamethasone-resistant multiple myeloma and doxorubicin-resistant breast cancer cells. Guggulsterone-mediated suppression of cancer cell proliferation has also been reported in leukemia cells, skin cancer cells and colon cancer cells. Guggulsterone-mediated suppression of PC-3 cell proliferation was characterized by the appearance of subdiploid cells and cytoplasmic histone-associated DNA fragmentation.<sup>[5,23,24]</sup>

Ferulates an important bioactive constituent identified from the *Guggul* gum and play a significant role in invitro cytotoxicity by decreasing the cell viability in MCF-7 (breast) tumor cells, PC-3

(prostate) tumor cells, and in parental and transfected P388 cells . Therefore ferulates compounds used in the methods for prevention and treatment of abnormal cell growth and proliferation of inflammation, neoplasia, and cardiovascular disease. Another compound Myrrhanol A (terpene) also isolated from *Guggul* displays its potent ant-inflammatory effect on exudative pouch fluid, angiogenesis and granuloma weights in adjuvant-induced air-pouch granuloma of mice.<sup>[25]</sup>

### Uses

#### Traditional uses-

The oleo-resin-gum is bitter, acrid astringent, aromatic, digestive, anthelmintic, anti-inflammatory, antiseptic, stimulant, liver tonic, diuretic, rejuvenating and general tonic and useful in vitiated conditions of vata, sciatica, facial paralysis, leprosy, leucoderma, cough, asthma, bronchitis and hepatic disorders. The gum is well known for its anti rheumatic and anti-inflammatory actions. It is used for chronic ulcers and in the treatment of diseased bones. Resin is useful in nervous disorders and skin diseases. Resin also stimulates hair growth, acts as stimulant and expectorant in pulmonary diseases and taken internally to reduce obesity.

In India the gum resin has also been used for treating various types of arthritis. Ayurvedic physicians extensively used *Guggul* gum for treating arthritis and related conditions for centuries. Bhils take the powder of bark orally with water to cure cough and cold. They also inhale the

fumes of gum resin to cure fever, bronchitis, nasal congestion, laryngitis and phthisis. Grasiyas tribals dissolve the gum resin in warm water and use for gargling against pyorrhea, tonsillitis and pharyngitis. Tribals of Barmer give the gum orally to the children suffering from speech defects. Saharia tribals apply the paste of gum resin on cuts and injuries for early healing. The Kalbelia nomadic tribals take the fresh decoction of plant orally to cure asthma. The twigs are used as toothbrush.<sup>[1,29]</sup>

#### Modern uses-

Modern therapeutic uses of *Guggul* include treatment of nervous diseases, hemiplegia, leprosy, marasmus, muscle spasms, neuralgia, ophthalmia, pyelitis, pyorrhea, scrofula, skin diseases, spongy gums, ulcerative pharyngitis, hypertension, ischaemia, hypertension, hemorrhoids, and urinary tract disorders More recently, *C. mukul* was found to be a relatively safe and effective supplement for osteoarthritis of the knee. Research studies showed that *Guggul* is effective against aspects of cardiovascular disease. *Guggul* reduced the stickiness of platelets (Herbal Pharmacist, undated), and *Gugulipid* was shown to be an efficacious and cost effective treatment of hyperlipoproteinemia The standardized fraction from *Gugulipid* from *C. wightii* may be used to treat hyperlipidemia and atherosclerosis. It help lower cholesterol, to decrease high blood pressure.<sup>[1]</sup>

#### External uses-

Anti-inflammatory, analgesic, cleaning of wound and healing due to antibacterial action. Paste of *Guggul* is locally applied in rheumatoid arthritis, cervical lymphadenitis, skin diseases, piles etc. It reduces foul smell and swelling of wound. Its vapours are useful as deodorant and disinfectant in the house. Gargling is useful in pyorrhoea and dental disorders.<sup>[6,29]</sup>

#### Ayurvedic properties

- i. *Rasa -Tikta Katu*
- ii. *Virya - Ushna*
- iii. *Vipaka - Katu*
- iv. *Guna – Laghu, ruksha , tikshna , vishada , sara, sugandhi(Purana Guggul) and Snigdha, pichchhila(Navina Guggul)*
- v. *Prabhava – Tridoshar, Rasayana*
- vi *Doshagnata- Vatakaphashamaka*
- vii. *Karma- Bruhana balya (fresh Guggul), vrushya, atilekhana, medohar ( old Guggul), bhagnasandhanakrit, swarya ,rasayana ,deepana, Shothahara, Vedanasthapana, Vranashodhana, Vranaropana, Jantughna, Varnya, Kushthaghna, Nadibalya, , Anulomana, Pittasaraka,Yakridottejaka, Arshoghna, Krimighna, Koshthagatadurgandhinashaka, Hridya, Raktavardhaka, Raktaprasadana, Gandamalanashaka, Kaphadurgandhahara, Ashmaribhedana, Mootrala, Sheetaprashamana.*



viii. Rogagnata- Sandhivata, Amavata, Gandamala, Apachi, Granthi, Charmaroga, Arsha, Durgandha, Krimi, Vrana, Nadishoola, Gridrasi, Ardita, pakshaghata, Vatavyadhi, Vatarakta, Agnimandya, Vibandha, Yakridroga, Hridroga, Hridyavarodha, Pandu, Upadanshajanyaraktavikara, Shotha, Shleepada, Jeerna kasa, Shwasa, Kasa, Kshaya, Mootrashmari, Mootrakrichchhra, Pooyameha, Mootragatavikara, Shukradaurbalya, Klaibya, Kashtartava, yonivyapata, Prameha, Medoroga, Kushtha, Varnavikara, Sheetajanyavikara, Sheetajwara<sup>[6]</sup>

#### **Apathya –**

During the administration of *Guggulu* the patients should be advised not to take *Amla rasa*, *Tikshna guna* predominant drug and diet. Should also not drink *Madya* and to avoid *Ajirna bhojana*, *Maithuna*, *Vyayama*, *Atapa sevana* and *Krodha*<sup>[1,6]</sup>

#### **Precautions-**

Inappropriate dose (*Mithya yoga*) can cause damage to liver and lungs and over doses can cause vertigo, dryness in mouth, impotence, debility, muscle wasting and thus contra indicated in these diseases<sup>[6]</sup>

**Dosage :** 2-4 gms, for rasayan purpose 1 pala.<sup>[6]</sup>

#### **Important formulations –**

*Vatari Guggul*, *Yogaraja Guggulu*, *Simhanada Guggul*, *Kaishora Guggul*,

*Mahayogaraja Guggul*, *Chandraprabha vati* etc.<sup>[6,8]</sup>

**Safety aspects-**The drug used traditionally in prescribed doses may be considered safe.<sup>[2]</sup>

#### **Purification:**

As Oleo-gum resin an exudates of *Commiphora mukul*, external impurities in the form of dust, dry leaves and other foreign materials are accepted in it. Various media of its purifications are mentioned in ayurvedic classics for its medicinal use.<sup>[30]</sup>

#### **Adulterants:**

There are many adulterants used in gum resin of *Commiphora mukul* for commercial purpose. The Indian adulterants used commonly are gum resin of *Boswellia serrata* and *Hymenictyan excusum*. The colour and smell of both the gum resins after solidification almost resemble each other, since both the plants belong to the same family *Burseraeae*. The other known adultrants are *Commiphora myrrha* (Nees) Engl., *C.roxburghii* (Arn.) Engl, *C. opobalsamum* (Linn.) Engl., *Babul*, *Kikar* (Exudate), [*Acacia nilotica*(L) Willd. ex Del.<sup>[28]</sup>

#### **Conclusion**

The herbal medicine suits to the social and cultural needs of the people and influence the patient's physical, mental and emotional states as well. *Commiphora mukul* is most popular plant from ancient to modern period for treatment of several

human ailments. It is an important source of various types of compounds with diverse-chemical structures as well as pharmacological activities. The oleo-gum resins derived from the *Commiphora mukul* is a key ingredient of a large number of Ayurvedic formulations. Hence, it is considered as one of the “*Divyaushadhis*” in Ayurveda. Presence of such wide range of chemical compounds indicate that plant could serve as “lead” for the development of novel agents having good efficacy in various disorders in the upcoming years.

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