

# A Review Of Guggulu Formulations In Ayurveda: Pharmacological Properties And Clinical Applications.

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**Abstract :** Guggulu, obtained from the resin of *Commiphora mukul*, has been an integral component of Ayurvedic medicine for centuries, renowned for its diverse therapeutic applications. Traditionally, Guggulu has been employed in the management of metabolic disorders, obesity, hyperlipidemia, arthritis, and various inflammatory conditions. This review aims to comprehensively analyze both the traditional and modern scientific perspectives on Guggulu formulations, exploring their pharmacological properties, clinical relevance, and potential health benefits. Various Ayurvedic preparations, including Churna, Guggulu Taila, and Avaleha, exhibit notable therapeutic potential due to their anti-inflammatory, antioxidant, and hypolipidemic activities. Experimental studies have demonstrated that Guggulu and its formulations can modulate lipid metabolism, reduce oxidative stress, and inhibit inflammatory pathways, thereby supporting their use in cardiovascular and musculoskeletal disorders. Despite promising preclinical and clinical findings, there remains a lack of large-scale, standardized clinical trials that could fully validate these traditional claims. Moreover, variations in preparation methods, dosage forms, and treatment duration present challenges for consistent clinical application. This review also emphasizes the importance of integrating traditional Ayurvedic knowledge with contemporary scientific research to enhance evidence-based use of Guggulu in modern healthcare. By critically evaluating current literature, this article highlights both the therapeutic promise and the research gaps surrounding Guggulu formulations. Guggulu is generally well-tolerated, with mild gastrointestinal disturbances or rare allergic reactions reported; when used in polyherbal formulations, it may exhibit synergistic effects that enhance overall efficacy. Additionally, modern dosage forms such as capsules and tablets facilitate its incorporation into contemporary clinical practice. Overall, Guggulu represents a valuable herbal intervention with multifaceted benefits, bridging the gap between ancient Ayurvedic practices and contemporary pharmacological research, and offering potential avenues for novel therapeutic strategies in metabolic, inflammatory, and musculoskeletal disorders.

**Keywords:** Guggulu, Commiphora mukul, Ayurveda, anti-inflammatory, hypolipidemic, antioxidant

## 1. Introduction

Ayurveda, India's ancient medical system, promotes holistic health through the balance of Vata, Pitta, and Kapha. Among its key herbal remedies, Guggulu (*Commiphora mukul*) holds a significant place and is well described in classical texts such as Charaka Samhita, Sushruta Samhita, and Ashtanga Hridaya. Traditionally used for obesity, lipid disorders, gout, osteoarthritis, and other inflammatory conditions, Guggulu is valued for its lipid-lowering, anti-inflammatory, antioxidant, and immunomodulatory actions



**Figure 1 : Plant and Resin of Commiphora mukul**

Modern research supports many of these traditional claims, demonstrating its effects on cholesterol reduction, inflammation control, oxidative stress, and joint mobility. Various Ayurvedic preparations—such as Churna, Avaleha, and Taila—further improve its therapeutic utility. However, gaps remain in standardized clinical evaluation, dosage consistency, and bioavailability. Bridging classical knowledge with contemporary evidence can strengthen the rational, evidence-based use of Guggulu in metabolic, inflammatory, and musculoskeletal disorders.

## 2. Historical Significance of Guggulu

Guggulu (*Commiphora mukul*) has been a cornerstone of Ayurvedic medicine for thousands of years. Its use is extensively documented in classical Ayurvedic texts, including the Charaka Samhita, Sushruta Samhita, and Ashtanga Hridaya, where it is described as a powerful herb with multiple therapeutic properties. Historically, Guggulu was highly valued for its ability to balance the three doshas (Vata, Pitta, and Kapha) and to manage chronic and degenerative disorders. Ancient practitioners recognized its efficacy in conditions such as Medoroga (obesity), Sandhigata Vata (osteoarthritis), Vatarakta (gout), and Twak Roga (skin disorders).

In addition to internal use, Guggulu was also employed in topical applications for joint pain and inflammation. Its resinous nature allowed it to be processed into various formulations suitable for ingestion, topical application, or combined therapy with other herbs. Over centuries, its reputation as a detoxifying, anti-inflammatory, and rejuvenating agent has persisted, making it a vital component of both preventive and curative Ayurvedic practices. Modern pharmacological studies have largely corroborated these traditional claims, confirming its anti-inflammatory, lipid-lowering, antioxidant, and analgesic properties, which form the scientific basis for its continued use.

## 3. Classical Formulations of Guggulu

Ayurvedic texts document several classical formulations of Guggulu, each tailored for specific therapeutic objectives. These formulations are often polyherbal, combining Guggulu with other herbs to enhance its efficacy:

- **Kaishora Guggulu** – Primarily used for detoxification and the management of chronic skin disorders such as eczema and psoriasis. It also supports metabolic balance and reduces inflammation.

• **Yogaraja Guggulu** – Employed in neurological disorders, joint pain, and musculoskeletal conditions. It is recognized for its Vata-pacifying and analgesic properties, making it useful in paralysis, neuropathy, and arthritis.

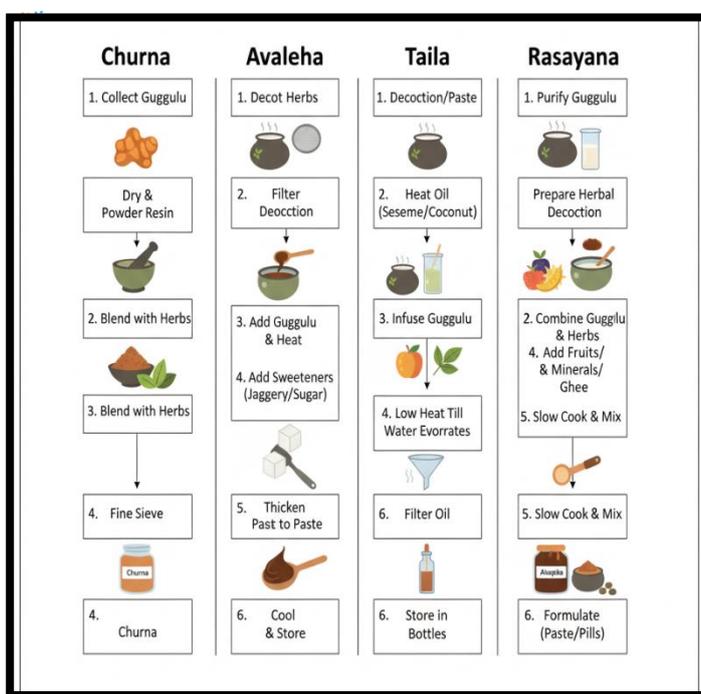
- **Kanchanara Guggulu** – Indicated in thyroid dysfunctions, particularly for glandular swelling (goiter) and weight management. It is often combined with other supportive herbs to enhance endocrine function.
- **Triphala Guggulu** – A formulation combining the benefits of Triphala with Guggulu, known for digestive health, detoxification, and anti-inflammatory effects. It supports gastrointestinal function and overall metabolic balance.

• **Table 1: Classical Guggulu Formulations**

Formulation	Composition (Key Ingredients)	Indications	Dosha Effect
<b>Kaishora Guggulu</b>	Shuddha Guggulu, <b>Triphala</b> (Amalaki, Haritaki, Vibhitaki), <b>Guduchi</b> (Giloy), Trikatu, Vidanga.	<b>Vatarakta</b> (Gout), skin diseases, non-healing wounds, inflammatory conditions, high uric acid.	<b>Tridosha-Balancing</b> , primarily <b>Pitta-Kapha Shamak</b> (pacifying), due to its detoxifying, blood-purifying, and anti-inflammatory action.
<b>Yogaraja Guggulu</b>	Shuddha Guggulu, <b>Trikatu</b> , <b>Triphala</b> , Chitraka, Pippalimoola, Vidanga, and numerous other herbs (often 20+).	<b>Amavata</b> (Rheumatoid Arthritis), chronic Vata disorders, joint pain, muscle stiffness, digestive disorders (Ama-related).	Primarily <b>Vata-Kapha Shamak</b> (pacifying). Powerful <b>Ama Pachana</b> (digests toxins) and enhances <i>Agni</i> (digestive fire).
<b>Kanchanara Guggulu</b>	Shuddha Guggulu, <b>Kanchanara Bark</b> ( <i>Bauhinia variegata</i> ), <b>Triphala</b> , Trikatu, Varuna, cardamom, cinnamon, etc.	<b>Granthi</b> (tumors, cysts, glandular swellings like goitre, lymphadenitis), fibroids, PCOS, obesity/weight management.	Primarily <b>Kapha Shamak</b> (pacifying). Possesses <i>Lekhana</i> (scraping) property, making it excellent for reducing accumulated Kapha and fat tissue.
<b>Triphala Guggulu</b>	Shuddha Guggulu, <b>Triphala</b> (Amalaki, Haritaki, Vibhitaki), <b>Pippali</b> (Long Pepper).	Hemorrhoids (Arsha), fistula-in-ano (Bhagandara), chronic constipation, wounds/abscesses, and detoxification.	<b>Tridosha-Balancing</b> , primarily <b>Vata-Kapha Shamak</b> due to the detoxifying, carminative, and mild laxative properties.

#### 4. Gugulu Formulations in Ayurveda

Gugulu (*Commiphora mukul*) is a versatile herb in Ayurveda, and its therapeutic efficacy is enhanced through various formulations. These formulations are prepared according to classical Ayurvedic principles, considering the disease condition, desired therapeutic effect, and patient constitution. The main categories of Gugulu-based formulations are as follows:



**Figure 2: Preparation Methods of Guggulu Formulations**

#### 4.1 Churna (Powder Form)

Churna refers to a finely powdered form of herbs, which can be administered orally, often with honey, ghee, or warm water. Guggulu Churna is primarily used for conditions like Medoroga (obesity), hyperlipidemia, and metabolic detoxification. The powdered form allows for easy digestion and absorption, making it effective in regulating lipid metabolism, reducing body fat, and supporting weight management. Churna is also considered beneficial for gastrointestinal health and toxin elimination.



**Figure 3: Azanu Sitopladi Churna Powder Ayurvedic Churna**

#### 4.2 Avaleha (Medicated Jam or Linctus)

Avaleha is a semisolid preparation made by cooking herbal powders with sugar, ghee, or honey. Guggulu Avaleha is often combined with herbs such as Gokshura (*Tribulus terrestris*), Shunthi (*Zingiber officinale*), and Ashwagandha (*Withania somnifera*) to enhance its therapeutic potential. This formulation is widely indicated in Sandhigata Vata (osteoarthritis), joint disorders, and musculoskeletal inflammation. The semisolid nature of Avaleha improves palatability, bioavailability, and prolonged action of the active compounds, making it suitable for chronic conditions.

Medicated oils are prepared by infusing herbal extracts into base oils and are primarily used for external application. Guggulu Taila is applied topically in Vata disorders, arthritis, joint pain, and localized inflammation. The oil facilitates penetration of active constituents into deeper tissues, providing anti-inflammatory, analgesic, and Vata-pacifying effects. Taila is also used in Abhyanga (therapeutic massage) and other Panchakarma procedures for rejuvenation and pain management.



**Figure 4 : Basic Ayurveda Guggulu Narayani Oil**

#### **4.4 Guggulu Rasayanas (Herbal Decoctions / Rejuvenative Preparations)**

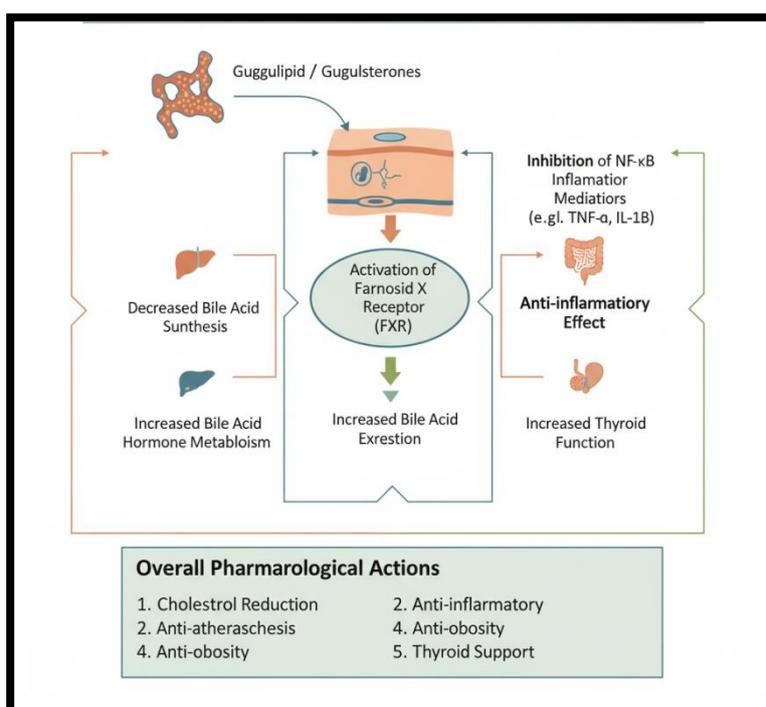
Rasayanas are formulations aimed at promoting longevity, immunity, and metabolic balance. Guggulu-based Rasayanas are often combined with other adaptogenic and immunomodulatory herbs to enhance overall vitality, metabolic health, and resistance to disease. These decoctions may be used as supportive therapy in chronic conditions, cardiovascular disorders, and immune-compromised states.

#### **4.5 Other Proprietary or Polyherbal Formulations**

In addition to classical forms, modern Ayurvedic practice and pharmaceutical industries have developed polyherbal capsules, tablets, and syrups containing standardized extracts of Guggulu for precise dosing, enhanced stability, and targeted therapeutic outcomes. These formulations are increasingly used for hyperlipidemia, obesity, arthritis, and inflammatory disorders, bridging traditional practice with modern clinical requirements.

### **5. Pharmacological Properties of Guggulu**

Guggulu (*Commiphora mukul*) has been extensively studied for its pharmacological activities, which provide a scientific basis for its traditional uses in Ayurveda. The resin contains a variety of bioactive constituents, including guggulsterones, diterpenoids, flavonoids, and volatile oils, which contribute to its diverse therapeutic effects. Modern research has validated its efficacy in metabolic, musculoskeletal, cardiovascular, and inflammatory disorders.



**Figure 5 : Mechanism of Pharmacological Action of Guggulu**

#### 4.6 Anti-inflammatory Activity

Guggulu exhibits potent anti-inflammatory effects, making it effective in managing arthritis, osteoarthritis, gout, and other inflammatory conditions. Studies have shown that guggulsterones inhibit key pro-inflammatory mediators such as TNF- $\alpha$ , IL-1 $\beta$ , and NF- $\kappa$ B, thereby reducing inflammation and associated tissue damage. Topical and oral formulations of Guggulu have been found to alleviate pain, swelling, and stiffness in joints.

#### 4.7 Hypolipidemic Effects

One of the most well-documented properties of Guggulu is its lipid-lowering effect. It reduces serum cholesterol, triglycerides, and low-density lipoprotein (LDL) levels while increasing high-density lipoprotein (HDL) levels. Guggulsterones act as farnesoid X receptor (FXR) antagonists, modulating cholesterol metabolism and promoting lipid clearance. Clinical trials have confirmed its efficacy in hyperlipidemia and associated cardiovascular risk reduction.

#### 4.8 Anti-diabetic and Metabolic Effects

Guggulu has demonstrated antihyperglycemic activity in experimental models of diabetes. It improves insulin sensitivity, enhances glucose uptake, and reduces blood sugar levels, supporting its traditional use in managing metabolic syndrome and obesity. The combination of lipid-lowering and anti-diabetic effects makes it a valuable agent in cardiovascular and metabolic health management.

#### 4.9 Antioxidant Activity

The resin exhibits significant antioxidant properties, neutralizing free radicals and protecting cells from oxidative stress. This activity contributes to its protective effects in chronic diseases, including cardiovascular disorders, diabetes, and degenerative joint diseases.

#### 4.10 Other Pharmacological Effects

In addition to the above, Guggulu demonstrates analgesic, immunomodulatory, and anti-obesity effects. It has been shown to promote weight reduction, enhance immunity, and improve overall metabolic function, aligning closely with its traditional applications in Ayurveda.

**Table 2: Pharmacological Properties of Guggulu**

Property	Bioactive Constituents	Mechanism of Action	Therapeutic Applications
<b>Hypolipidemic / Anti-atherosclerotic</b>	Z- and E-Guggulsterones, Steroids (e.g., $\beta$ -sitosterol)	Act as antagonists of the <b>Farnesoid X Receptor (FXR)</b> and <b>Bile Acid Receptor (BAR)</b> , promoting the conversion of cholesterol to bile acids and increasing their excretion. May also increase hepatic LDL receptor binding sites or decrease hepatic cholesterol synthesis.	Hypercholesterolemia, Hyperlipidemia, Atherosclerosis, Obesity, Cardiovascular disorders (e.g., hypertension, ischemia).
<b>Anti-inflammatory &amp; Analgesic</b>	Z- and E-Guggulsterones, Myrrhanol A, Myrrhanone A, other Terpenoids and Flavonoids.	Potently inhibits the activation of the transcription factor <b>Nuclear Factor-kappa B (NF-<math>\kappa</math>B)</b> , a critical regulator of inflammatory responses. Downregulates the production of inflammatory mediators (e.g., TNF- $\alpha$ , IL-1 $\beta$ , NO, PGE-2, COX-2).	Arthritis (Osteoarthritis, Rheumatoid Arthritis), Gout, Inflammation, Skin disorders (Acne, Eczema, Psoriasis), Inflammatory Bowel Disease (IBD).
<b>Thyroid Stimulatory / Metabolic</b>	Ketosteroids, Z-Guggulsterone	Increases the conversion of <b>Thyroxine (T4)</b> to <b>Triiodothyronine (T3)</b> by enhancing the activity of 5' deiodinase (DIO1). May increase iodine uptake by the thyroid gland.	Hypothyroidism, Sluggish metabolism, Obesity.
<b>Anti-obesity</b>	Guggulsterones, other constituents	Promotes fat breakdown, supports T3 synthesis which enhances overall metabolism, and aids in the reduction of "Ama" (toxins in Ayurveda) due to its Lekhana (scrapping) and Deepan/Pachan (appetizer/digestive) properties.	Obesity, Metabolic Syndrome.
<b>Antioxidant</b>	Flavonoids, Eugenol (monoterpenoid)	Scavenges nitric oxide (NO) free radicals and inhibits lipid peroxidation (LPO). Increases the activity of defensive enzymes like superoxide dismutase (SOD) and Catalase (CAT).	General protection against oxidative stress and related disorders.

## 6. Materials and Methods of Preparation

Guggulu (*Commiphora mukul*), a resinous exudate obtained from the bark of the tree, serves as the primary ingredient in most Ayurvedic formulations. Its bioactive constituents, including guggulsterones, diterpenoids, and flavonoids, are responsible for its therapeutic activities. Depending on the intended use, Guggulu is combined with various herbal adjuvants to enhance efficacy, bioavailability, and palatability. Common adjuvants include:

- Shunthi (*Zingiber officinale*) – Improves digestion, enhances bioavailability, and provides anti-inflammatory support.
- Guduchi (*Tinospora cordifolia*) – Acts as an immunomodulator and detoxifying agent.
- Gokshura (*Tribulus terrestris*) – Supports urinary health, joint function, and weight management.
- Other herbs may be included depending on the classical or proprietary formulation.

### 6.1 Preparation Methods

Guggulu formulations are traditionally prepared using time-tested Ayurvedic procedures. The methods vary depending on the dosage form (Churna, Avaleha, Taila, Rasayana) and therapeutic purpose. Common preparation techniques include:

#### 6.2 Decoction (Kwath / Kashaya)

Guggulu resin and selected herbs are boiled in water to extract soluble constituents. Decoctions are concentrated under controlled temperature and then administered as oral formulations or as a base for other preparations. This method enhances water-soluble bioactive compounds and facilitates rapid absorption.

#### 6.3 Powdering (Churna Preparation)

The resin is dried, cleaned of impurities, and finely powdered using traditional grinding methods. Herbal adjuvants may be co-ground to create a synergistic mixture. The resulting Churna can be administered orally with honey, ghee, or warm water, targeting metabolic and detoxification disorders.

#### 6.4 Oil Extraction (Taila Preparation)

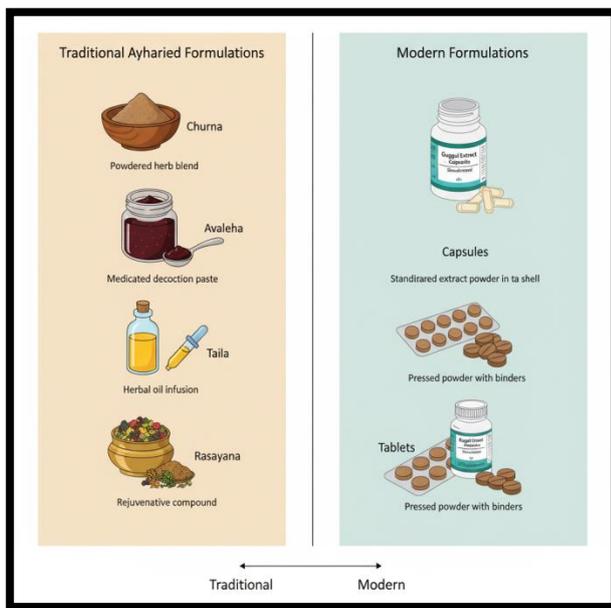
Guggulu is infused in base oils, often with decoctions of auxiliary herbs. The mixture is heated under controlled temperatures to ensure complete transfer of lipophilic bioactive constituents into the oil. The resulting Guggulu Taila is suitable for topical application, massage therapy, and Panchakarma procedures.

#### 6.5 Medicated Jam (Avaleha / Linctus)

The powdered resin is cooked with sugar, honey, or ghee along with decoctions or extracts of other herbs to form a semisolid paste. Avaleha formulations provide prolonged therapeutic action, enhanced bioavailability, and improved palatability, particularly useful in chronic conditions.

## 6.6 Rasayana (Herbal Decoctions / Rejuvenate Preparations)

Guggulu is combined with adaptogenic and immunomodulatory herbs and prepared as a decoction or semi-solid preparation to enhance vitality, immunity, and systemic health.



**Figure 6 : Traditional vs. Modern Guggulu Formulations**

## 7 Recent Advantages of Guggulu in Clinical Applications-

### 7.1 Antidiabetic + Cardioprotective Effects via DPP-4 Inhibition

Manjusha K. Borde et al., (recent) — In a rat model of diabetes combined with induced myocardial infarction, *C. mukul* treatment significantly lowered blood glucose, HbA1c, DPP-4 enzyme levels, and cardiac injury marker CPK-MB; it also showed histopathological evidence of myocardial protection.

### 7.2 Thyroid Hormone Modulation

Panda & Kar (year ~2001) — Guggulu administration increased the triiodothyronine (T3) levels in mice, raising the T3/T4 ratio without markedly affecting T4. This was associated with reduced lipid peroxidation in the liver. Suggests potential use in hypothyroid conditions or metabolic slowdown.

### 7.3 Cognitive Improvement in Diabetic Rats

Study in UMsha (recent) — The hydroalcoholic extract of *C. mukul* improved passive-avoidance learning and memory in diabetic rats; showed enhancement in antioxidant defenses in the brain, reducing oxidative damage. Indicates potential in managing diabetes-associated cognitive decline or neurodegeneration.

### 7.4 Hemorrhoid Management

Randomized Controlled Trial, Iran — Patients with grade 1-2 uncomplicated hemorrhoids given *Commiphora mukul* resin (3g/day for 4 weeks) showed better improvements in symptoms (flatulence, dyspepsia, anal symptoms, colonoscopic grading) than control group (laxatives + anti-hemorrhoid suppository). Also lower recurrence.

### 7.5 Antitumor / Cancer Cell Growth Inhibition

Bharti, V. et al., (2015) — *C. mukul* extract and guggulsterone inhibited proliferation of oral cancer cell lines (SCC-4, KB), induced apoptosis, arrested the cell cycle, suppressed NF- $\kappa$ B and Cyclin D1, and restored p53 expression. Indicates potential as a chemopreventive/therapeutic agent.

## 7.6 Skin Anti- Aging / Anti-Wrinkle Benefits

GU-TC7 formulation study — A preparation of *C. mukul* resin + triheptanoin boosted type I collagen synthesis in skin fibroblasts, reduced expression of MMP-1 and elastase, indicating beneficial effects for wrinkle reduction and skin integrity.

## 7.7 Cytotoxicity Against Skin Cancer Cells

Phytochemical and cytotoxicity study (MDPI) — Extracts of *C. mukul* showed strong cytotoxic activity against malignant melanoma and epidermoid carcinoma cell lines, with IC50 values comparable or superior to standard chemotherapeutics in some cases, and relative selectivity versus normal keratinocytes.

## 7.8 Antidepressant-like Activity

Pendyala et al. — In animal models (tail suspension test, forced swim test), various fractions (hydroalcoholic, ethyl acetate, petroleum ether) of *C. mukul* reduced immobility time in a dose-dependent manner, similar to standard antidepressant, suggesting possible use as adjuvant in mood disorders.

## 7.9 Lipid-Lowering and Mixed Outcomes in Hyperlipidemia

Natural Standard Review — Earlier clinical and folkloric evidence showed Gugulu / guggulipid reducing total cholesterol, LDL, triglycerides, and raising HDL. Some more recent trials show mixed results, sometimes small or no effect, especially on LDL. Shows promise, but also the need for precise standardization and patient selection.

## 7.10 Thyroid & Metabolic Rate Enhancement

From Restorative Medicine monograph / various animal studies — *C. mukul* appears to increase conversion of T4 to T3, enhancing thyroid hormone action, which can help with metabolic rate, lipid metabolism, and obesity (along with antioxidant support).

## 8 Summary

Gugulu (*Commiphora mukul*) is a prominent Ayurvedic herb with diverse therapeutic applications, traditionally used to balance Vata and Kapha doshas and manage conditions such as obesity, arthritis, gout, and skin disorders. Its classical formulations—including Churna, Avaleha, Taila, and Rasayanas—enable targeted treatment for metabolic, musculoskeletal, cardiovascular, and immune-related disorders. Modern research has validated many of these uses, demonstrating anti-inflammatory, hypolipidemic, antioxidant, analgesic, and anti-diabetic activities, primarily due to bioactive compounds like guggulsterones, diterpenoids, and flavonoids. Combining Gugulu with herbal adjuvants such as Shunthi, Guduchi, and Gokshura further enhances efficacy and bioavailability, exemplifying polyherbal synergy. However, gaps remain in large-scale, standardized clinical trials to confirm safety, optimal dosing, and long-term efficacy, highlighting the need for further research to integrate traditional knowledge into evidence-based modern therapeutics.

## 9 Conclusion

Gugulu (*Commiphora mukul*) is a versatile and historically significant herb in Ayurveda, traditionally used to balance Vata and Kapha doshas and manage conditions such as obesity, arthritis, and metabolic disorders. Modern research has validated its pharmacological properties, including anti-inflammatory, hypolipidemic, antioxidant, analgesic, and anti-diabetic effects. Its diverse formulations—Churna, Avaleha, Taila, and Rasayanas—enable targeted therapy and enhanced bioavailability, often in combination with synergistic herbs. Despite promising evidence, further standardized clinical trials are needed to confirm optimal dosing, long-term safety, and efficacy across populations. Overall, Gugulu represents a successful integration of traditional wisdom and contemporary science, offering a safe, effective, and evidence-supported herbal intervention for metabolic, inflammatory, and degenerative conditions.

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