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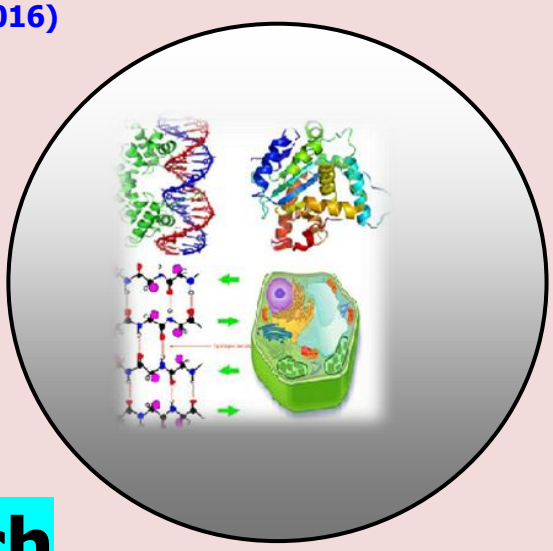

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RESEARCH PAPER

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Pharmacological uses of *Commiphora wightii* (Guggal)

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ABSTRACT

Guggul is a plant which is known for its active ingredients, the guggul sterones. It has been traditionally used for combatting ailments such as high blood lipids, liver dysfunction and obesity. The purification process does not only remove the impurities, but it also makes it suitable for using in various ayurvedic compounds. The plant family of Commiphora wightii is Burseraceae. The oleo-gum-resin extract that is guggul is secreted from the bark of mukul plant. This resin is further processed with triphaladecoction to make it usable in the treatment of various diseases. In literature, Vedas have well described the guggul and its religious and medicinal uses. It has significant religious value in Hindu religion. Its fumes were also used for purifying the surroundings and air. Bhava Mishra has described medicinal properties of guggul in his book bhavaprakasha Nighantu. According to Bhava Mishra, guggul has anti-inflammatory and anti-obesity characteristics Guggul can help losing weight and reducing joint inflammation and arthritic pain. According to him, it is most efficient herb used for joint disorders and VATA disorders (neurological diseases).

Keywords: Guggulsterone, Triterpenoids: Myrrhanone (A, B) and Myrrhanol (A, B, C) are anti-inflammatory, Sesquiterpenoids, Volatile oils and Quercetin.

INTRODUCTION

The guggul plant is widely distributed throughout India and adjacent dry regions. The tree is a small shrub with thorny branches (Fig 1). The gum, called “guggul” or “gum guggulu,” is tapped from the stem of the plant, and the fragrant yellow latex solidifies as it oozes out. Excessive production of the gum eventually kills the plant. Guggul is the most common name for a small medicinal tree *Commiphora Mukul* (Wightii), which is mostly found in the Indian subcontinent. In Ayurveda, guggul dry gum resin is obtained from the stem of the Guggul tree. It has been used for thousands of years in the Ayurvedic medicine system. Guggul is one of the oldest Ayurvedic herbs taken orally for a variety of diseases.

The term “guggul” in Sanskrit means “protects against diseases”. Guggul contains a mixture of sterols, steroids, esters, and alcohols .The active component of guggul is called guggul sterone showing a biological activity in humans. Guggul sterone M, dihydroguggul sterone, and guggulsterol Y are recently discovered steroids. These steroidal components show fat-reducing and anti-inflammatory activities. Myrrhanone (A, B) and Myrrhanol (A, B, C) are anti-inflammatory, Sesquiterpenoids: Cardinene showed neuroprotective activity in cell-based study. Limonene, Eugenol, Pinene, and Cineole are some of the essential volatile oils extracted from guggul. Quercetin shows neuroprotective and anti-inflammatory activities. Muscanone is active against *Candida albicans*[1-3].

HEALTH BENEFITS OF GUGGUL

Guggul decreases “bad” cholesterol, low-density lipoprotein (LDL), very low-density lipoprotein (VLDL), and triglycerides. It increases levels of “good” cholesterol, high-density lipoprotein (HDL). Guggul reduces the absorption of fats and cholesterol in the intestine. It also increases the removal of bile acids and cholesterol, inhibits the production of cholesterol in the liver, and increases the uptake of HDL by liver cells. Guggul blocks the bile acid receptor farnesoid x receptor, a key component for the maintenance of cholesterol and bile acid. It also increases bile excretion, which aids in the removal of cholesterol and bile acids from the liver.

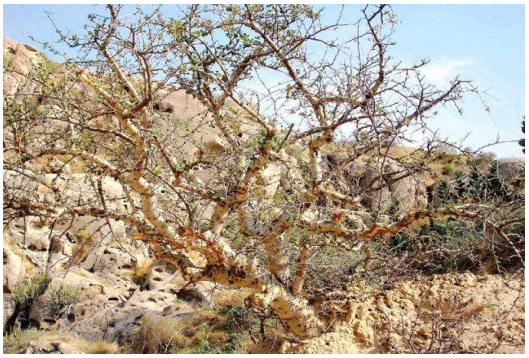

Figure 1. Guggul Tree.

Guggul suppresses the formation of enzymes that cause changes in low-density lipoproteins (LDL) and formation of free oxygen radicals. It increases cholesterol breakdown in the liver and excretion from the body. It also reduces hardening of blood vessels and stickiness of platelets[4].

Guggul has been studied in several animals including chicken, rats, rabbits, pigs, dogs, and monkeys. It significantly decreased fat levels in mice receiving a high-fat diet. Along with decreasing blood cholesterol levels, guggul increases the activity of enzymes that break down fats in rats. Guggul significantly reduces body weight and prevents thickening of blood vessels in rabbits.

Figure 2. Green leaves and Fruit.

Guggul suppresses the activation of the inflammatory cytokine NF-κB and its target molecules and reduces inflammation in a number of inflammatory diseases. Guggul also suppresses the activation of interleukins and prostaglandins[5]. Guggul reduces pain and stiffness and increases tolerability to the treatment in osteoarthritis patients. Guggul also reduces joint swelling in arthritis.

Guggul showed anti-inflammatory effects in mice colon cells. It suppressed enzymes causing inflammation in mice. Also, guggul significantly reduced the severity of colon inflammation in mice. Guggul reduced inflammatory markers produced by bacteria in rat eyes. It reduced endotoxin production and the production of MMP-2, iNOS, and Cox-2. In mice with an inflamed pancreas, guggul inhibited the migration of white blood cells into tissues and suppressed cytokine production, reducing damage. Guggul extract is effective in the treatment of patients with acne. Patients with oily skin responded better to the treatment. Guggul treatment showed a very strong decrease in inflammatory damage of the skin[6]. Guggul was as effective as traditional antibiotics in treating acne. Guggul increased type I collagen production, which gives strength to human skin cells and inhibited the production of enzymes that cause skin damage. Guggul stimulated the thyroid gland in rats, increasing both iodine uptake and the activity of thyroid enzymes.

In mice, guggul increased thyroid hormones and other thyroid functions including tissue oxygen uptake. The increase in tissue oxygen uptake is normally observed as a result of increased thyroid activity. Guggul inhibits the production of oxygen free radicals and thus protects several tissues against damage. Guggul also inhibited the formation of free radicals in rat stomachs. Guggul is useful in oxidative stress-related diseases, such as heart and nerve damage. It showed antioxidant action and protected the brains of mice with dementia[7].

Guggul also protected the heart in rats by reducing free radicals and inadequate blood supply. Guggul reduced drug-related heart damage in rats in a similar degree of effect to other traditional drugs like gemfibrozil.

In a clinical study, guggul reduced chest pain in 200 patients suffering from heart disease. It also protected the heart during low blood supply (ischemia). Gum extract of an Arabic guggul from the same *Commiphora* family, *C. opobalsamum* showed a protective effect on the liver of rats. The gum extracts decreased transaminase and alkaline phosphatase enzymes and increased sulfhydryls (a compound that protects cells) in the liver, which reduced liver damage and increased protection.

In test tube studies, guggul showed antibacterial activity against drug-resistant *Klebsiella pneumoniae*. Guggul extract also inhibits both gram-positive and gram-negative bacteria. Another guggul family member, *Commiphora molmol*, showed anti-parasitic activity by killing worms (*Schistosoma mansoni*) and their eggs and stopped damage to intestinal tissue in mice infected with worms.

Figure 3. Oleo Gum Resin.

Guggul prevented inflammatory signals and thereby prevented pancreatic cell damage in rats. It increased glucose-stimulated insulin secretion and prevented the reduction of pancreatic cell size in rats[8].

Bile acids stimulate insulin secretion via bile acid receptor activation. Guggul blocks these receptors. Therefore, guggul may be beneficial for type 2 diabetes patients. Guggul inhibited inflammatory signals produced by drugs and infections. Guggul prevented damage in mice kidneys by suppressing interleukins and prostaglandins. Guggul also suppressed inflammatory molecules like NF-kB, nitric oxide, IL-6, and TNF-alpha, preventing kidney damage in mice. Bile acids can have direct effects on respiratory function but excess levels are toxic to lung cells. The bile acid receptor farnesoid-X receptor (FXR) is a target for the treatment of respiratory diseases. Guggul is a suppressor of this receptor activity and reduced its effects in rats. Guggul inhibits platelet aggregation, reducing clot formation similarly to other traditional drugs[9].

In heart patients, guggul showed increased blood fibrin, a protein responsible for blood clotting, breaking activity and decreased platelet adhesive activity, which reduces blood clot formation and related heart problems. Guggul reduces cholesterol accumulation in blood vessels and suppresses the transformation of bad cholesterol into toxic substances and, thereby, its effects. Guggul shows activity against cancer by killing cancer cells, reducing cell growth, and decreasing the formation of new blood vessels. Guggul showed this activity on different cancer cells including leukemia, head and neck, breast, lung, and prostate cancer. Guggul acts by various mechanisms, including reduction of reactive oxygen species and inflammation. It also inhibits target receptors, factors, and proteins. It interferes with molecular pathways that prevent cancer cell[10].

CONCLUSION

The plant has been used in traditional Ayurvedic medicine for centuries in the treatment of a variety of disorders, most notably arthritis, and as a weight-reducing agent in obesity. Other traditional uses have included treatment of liver problems, tumors, ulcers and sores, urinary complaints, intestinal worms, swelling, and seizures, and as a heart tonic. In 1986, guggal was approved for marketing in India as a cholesterol-lowering agent.

A commercial product, Guggulow, claiming cholesterol-lowering properties, is widely available on the Internet. Guggul has been used in the traditional Ayurvedic medical system for centuries and has been studied extensively in India. Commercial products are promoted for lowering cholesterol; however, clinical studies do not support this claim. Anti-inflammatory and heart/blood vessel effects are being evaluated, as well as use in cancer, obesity, and diabetes.

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