CODEN (USA): IAJPBB ISSN: 2349-7750

INDO AMERICAN JOURNAL OF
PHARMACEUTICAL SCIENCES

http://doi.org/10.5281/zenodo.198408

Available online at: http://www.iajps.com *Review Article*

A REVIEW ON GUGGULU (*COMMIPHERA WIGHTII*) AND ITS MARKET STRATEGY

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Abstract

Guggulu (Commiphora wightii) is a common medicinal preparation widely used in Ayurveda since time immemorial. The quality extraction and preparation are important for proper therapeutic outcome as well marketing strategy. Many varieties of guggulu are available in market for the treatment of different diseases. Scientific validation for extraction and therapeutic evaluation are essentially needed for viable marketing of the plant.

Keywords: *Guggulu, Commiphera wightii, guggulosterone, market survey*

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Please cite this article in press as Monojit Debnath et al, ***A Review on Guggulu (Commiphera Wightii) and Its Market Strategy****, Indo Am. J. P. Sci, 2016; 3(11).*

INTRODUCTION:

Guggulu is an important medicinal plant used in Ayurveda for various therapeutic uses. The plant has both preventive and curative value for maintenance of health. In Ayurveda Guggulu is known in different names like *Devadhupa, Jatayu, Kaushika, Pura*, etc. Literally the word Guggulu derives as "*Gujo Vyadher Gudhati Rakshatiti"* meaning the drug that protects the body from diseases [1]. Besides Ayurveda, Guggulu is also used in other traditional systems of medicine like Unani, Siddha, Tibia, etc. However, use of Guggulu is wide in Ayurveda in different forms for eradication of different aliments. Bhavamishra, a renowned Ayurvedic authority described five varieties of Guggululike Mahishakha, Mahanila, Padma, Kumuda and Hiranyal; among which Hiranya variety is best and used for human consumption[1]. Because of its use in traditional medicine, *C. wightii* has been overharvested in much of its habitat, and has been listed on the IUCN Red List of threatened species [2]. Several efforts are in place to address this situation. India's National Medicinal Plants Board launched a project in Kutch District to cultivate 500 to 800 hectares (1,200 to 2,000 acres) of guggal [3], while agrass-roots conservation movement, led by IUCN associate Vineet Soni, has been started to educate guggal growers and harvesters in safe, sustainable harvesting methods [4,5].

Marketing of Guggulu and its preparations is a great concern of different Ayurvedic and hurbal pharmaceutical houses. Marketing of this natural product depends upon various factors like cultivation, quality of extraction, quality of preparation, demands of market, availability of raw materials etc. It has been surveyed that good and bulk amount of Guggulu is cultivated in Gujarat and rajasthan. However marketing of Guggulu is not limited only on these two states of India. Common preparations of Guggulu for therapeutic purposes are made with resinous extract of the plant. Marketing of Guggulu also depend upon traditional and modern synthetic purification of the resin. In the present review, a detail analysis is done regarding market available Guggulu at home and abroad.

Review of *Commiphera wightii:*

Botanical description. The plant *Commiphera wightii*(Family Burseraceae) is commonly Known as Guggulu, foundin India. It is woody shrub, small tree, 1.4-1.8mm height, branches spiny found rocky land of Rajsthan, Gujrat, etc. The latex of the plant is used for different therapeutic purposes. Latex can be obtained in summer season by incision of the bark. The branches are thorny. Theleaves are simple or trifoliate, the leaflets ovate, 1–5 cm (0.39–1.97 in) long, 0.5–2.5 cm (0.20–0.98 in) broad, and irregularly toothed. It is 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. The small round fruit are red when ripe. Large shrub or a small tree2-4 m tall; bark exfoliating into thin film branches profuse,zic –zag. Fruits of an ovoide, acute drupe 0.6-1 cm long red in colour ; pyrenes 2-4 number of which one is seed bearing.

Ayurvedic Description

गुग्गुलु- 'गुज्योब्याधेर्गुदतिरक्षतीती' (भा. दी.)

According to Charaka Samhita this plant isincluded under the *Samjna- Sathapana Gana*. According to Susruta samhita this plant is included under the *Eladi Gana*. Every Ayurvedic medicinal plants are considered by their pharmacological properties like Rasa(sense of gustatory organs), Guna (Qualities), Virya(Potency), Vipaka(After effect). The pharmacological properties of Guggulu in Ayurveda are Tikta (Bitter) in Rasa, Laghu (Light) in Guna, Usna (Hot) In Virya and Kutu (Pungent) in Vipaka. Pharmacological action of Guggulu as describe in Ayurveda are Brimhana(Corpulant), Kapha-vatahara(Reduces Kapha and Vata), Pittala (increasespitta), Vrishya (aphrodisiac), lekhana (decease obesity), Deepana (increase gastric enzyme), Balya (provide strength). Therapeutic indication of Guggulu are multiple according to different classical text book like Charaka, Ashtangahridaya, etc. According to Ashtanghridya indication of Guggulu is Sthaulya (obesity), Vatavyadhi (diseases of nervous system), Amavata (Rheumatoid arthaties), Vidradhi (abscess).According to Charaka indication of Guggulu is Udara roga (abdominal disorders), Vatarakta (gouty artharitis). According to Susruta indication of Guggulu is Shopa (Oedema),Urusttambha(Stiffness of thighs), Puktikarna (otitis media). According to Vrinda indication of Guggulu is Kroshtukashirsha, Vriddhi (scrotal enlargement). According to Gadanigraha indication of Guggulu is in Vrana (ulcer).

Chemical constituents: The plant Guggulu contains many active constituents. The plant contains essential oils (0.37%), mainly consisting of myrecene, dimyrecene and polymyrecene, Z-guugulosterone, E-guggulosterone, guugulosteron-I, guugulosteron-II, guugulosteron-III and guugulosteron –IV (fig 1). These isolates have been found useful in caring many diseases like rheumatism, arthritis, hyperlipidemia, obesity, inflammation, atherosclerosis, wrinkle, acne and other diseases [6]. The lipid lowering activity of this plant is due to presence of ketonic fraction, a complex mixture of chemical compounds belonging to steroids.

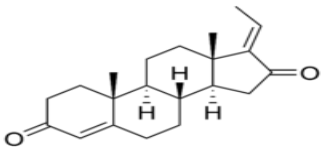

Fig. 1. Guggulosterone

Pharmacological research:

Hypolipidemic activity:

The lipid lowering effect of guggulu with special reference to atherosclerosis and obesity (medoraga) was first reported in a doctorate thesis submitted to the Banaras Hindu University (BHU) in January 1966. Earlier to this work, guggulu was well known as an Ayurvedic drug for the treatment of various types of arthritis. This work was inspired by a rather obscure shloka in Sanskrit in the well-known Ayurvedic treatise Sushruta Samhita. The shloka deals in an extraordinarily lucid and scientific manner, with the etiology, pathogenesis, and treatment of obesity and associated lipid disorders and their complications. The hypolipidemic activity was shown in animals as well as in patients of obesity and hypercholesterolemia [7].The hypolipidemic activity of guggulu and its various fractions has been studied in several animal models and clinical studies [8], highly significant reduction in levels of mean serum cholesterol and triglyceride was observed in groups of animals receiving high-fat diet for one month along with guggulu, which clearly demonstrated its hypolipidemic activity. Additionally, administration of guggulu partially reversed the atherosclerosis in the aorta that was induced by high-fat diet [9].Clinical studies on C. mukul showed its hypolipidemic effect and the outcome of change in lipid profile upon its administration. This study showed significant decrease in total cholesterol and LDL cholesterol after treatment with guggulu [10].

Platelet aggregation and fibrinolytic activity:

The purified steroid mixture from guggulu completely inhibited ADP, adrenaline, or serotonin induced platelet aggregation. No difference was observed between the effectiveness of the steroid mixture and the purified guggulsterone or . The effect of guggulsterones and was very similar to the inhibitory effect of clofibrate. This finding has therapeutic value in myocardial infarction and thromboembolism [11].

Thyroid stimulatory activity:

Administration of ethanolic extract of guggulu to the female albino mice for 15 days enhanced the triiodothyonine (T3) concentration and T3/T4 ratio, while no marked change in the concentrations of serum thyroxine (T4) was observed. Guggulsterone was shown to be responsible for the thyroid stimulatory action of guggulu. Administration of isolated -guggulsterone to rats led to significant increase in all thyroid function parameters, namely, uptake of iodine by the thyroid, enzymes involved in the synthesis of thyroid hormones, and tissue oxygen uptake, thus suggesting thyroid stimulatory action [12].

Anti-atherosclerotic activity:

LDL has been found to accumulate in atherosclerotic lesions and is the major source of the cholesterol accumulation in human foam cells. There is evidence that LDL oxidation is essential for atherogenesis and the antioxidants that prevent this oxidation may either slow down or prevent atherogenesis. Guggulsterones, the lipid-lowering components of guggulu, effectively inhibited in vitro LDL oxidation. Thus the combination of antioxidant and lipid-lowering properties of guggulu makes it especially beneficial against atherogenesis [13].

Anti-microbial activity:

The volatile oil of C mukul was found to be highly effective against *Rhyzopertha dominica* which suggested its role as a fumigant. The ethanolic extract of *C. mukul* exhibited best antibacterial activity at 5 mg/mL against multidrug-resistant *Klebsiella pneumonia* [14]. An active compound, 5(1-methyl,1-aminoethyl)-5-methyl-2-octanone, of the methanolic extract of guggulu gum possessed significant antibacterial activity against Gram-positive bacteria and moderate activity against Gram-negative bacteria [15,16,17].

Clinical application

Anti-arthritic activity:

Anti-arthritic activity of guggulu was performed on selected patients of osteo-arthritis (OA). The anti-arthritic activity of the plant is mainly due to presence of guggulosterone. In a clinical study, it was observed that pain, stiffness and other symptoms of OA was markedly reduced with guggulu [18].

Cytotoxic activity:

Treatment with gugulipid significantly inhibited the viability of human prostate cancer cell line LNCaP (androgen-dependent) and its androgen-independent variant (C-81) with IC_{50} of 1 μM (24 h treatment), thus indicating its possible role in apoptosis and cancer prevention [19]. The results of this study indicated that guggulsterone inhibited proliferation of PC-3 cells in culture by causing apoptosis, whereas a normal prostate epithelial cell line is resistant to growth inhibition and apoptosis induction by this phytoconstituent. These observations provided rationale for further preclinical and clinical evaluation of guggulsterone for its efficacy against prostate cancer [20].

Skin disease:

Administration of gugulipid was reported to be effective in the treatment of nodulocystic acne. A study in 21 patients found that gugulipid was as

effective as tetracycline in the treatment. The patients with oily faces responded better to the gugulipid treatment [21].

Purification of guggulu(Guggulu Shodhana Vidhi):
It has been mentioned in Ayurvedic texts that administration of raw guggulu may lead to skin rashes, irregular menstruation, diarrhoea, headache, mild nausea, and, with very high doses, liver toxicity [7]. In order to overcome unwanted effects of raw guggulu, Ayurveda describes a number of purification processes (shodhan vidhi) using different fluids (dravyas), which not only take care of the adverse effects but also enhance the therapeutic activity. According to Ayurvedic texts, guggulu must be purified before incorporating into formulations. During a process of shodhan, guggulu is treated with specific materials of biological origin, for example, herbal juices, cow urine, and cow milk. It is possible that some of the properties (chemical and biological) of shodhan materials are added to guggulu during the purification process. It is also possible that some of the toxic or harmful constituents of raw guggulu are neutralized, detoxified, or removed during this process.There are a large number of commercial polyherbal anti-inflammatory formulations which are using guggulu as the chief ingredient. However, no scientific study has been done to investigate the process of Ayurvedic purification and its probable effect on therapeutic efficacy except for one report which states that gastric irritancy of guggulu is reduced with purification. During the process of purification, foreign matter is removed from raw guggulu manually and is then broken into small pieces. The broken mass is wrapped in a piece of cloth (called potli) and hanged into an inert container (called dola yantra) containing one of the recommended media which are gomutra (cow urine), triphala kasaya (decoction of triphala), vasapatra kasaya (decoction of Adhatoda vasica leaves), vasapatra savrasa (aqueous extract of Adhatoda vasica leaves), dugdha (milk), and water. The guggulu is kept immersed, while fluid is boiled till all the soluble matter of guggulu is dissolved in the purifying vehicle. The insoluble part of guggulu is taken out and discarded. Further boiling is continued till guggulu solution forms a soft mass. It is then poured out over a smooth wooden board smeared with cow ghee or castor oil and dried in the sun. The dried mass is called purified guggulu (suddh guggulu) [8].

Market survey of *Commiphera wightii:*
Evidence and strategy:
Gugulipid, an ethyl acetate extract of the oleoresin, standardized at CDRI (The Central Drug Research Institute, Lucknow) has been marketed in India since 1988 as a hypolipidemic agent [22]. It contains - guggulsterones and -guggulsterones which are purported to be the compounds responsible for the hypolipidemic activity of the guggulu [23,24]. Gugulipid contains not less than 4 percent and not more than 6 percent of guggulsterones. The decision to use the ethyl acetate extract rather than two guggulsterones was primarily for commercial reasons and was also because of the fact that other components of the ethyl acetate extract showed synergistic (hypolipidemic) effect[7]. In spite there is evidence of guggul marketing in the form of ethyle acetate extract but mostly the preparation of guggul is marketed in the classical form of various preparations like Yogaraj Guggulu, Mahayogaraja Guggulu, Amritadi Guggulu, Gokshuradi Guggulu, Triphala Guggulu, Kanchanara Guggulu, Kaishore Guggulu, etc. Many preparations of Guggulu in combinations of other medicinal plants or minerals drugs are also marketed by various Ayurvedic and other herbal pharmaceutical companies for various therapeutic uses. Now-a-days, it is observed that some of the companies has started marketing of Guggulu as single herb agent. This is being marketed in the form of purified extract. Demands of Guggulu are obviously there in the foreign market, particularly in USA and Middle East but it is to be mentioned that marketing in such countries can only be practically possible in pure compound form with its details chemical fingerprinting utilizing sophisticated techniques like HPLC, HPTLC, LC-MS, GC-MS, etc.

Commonly market available formulations of guggulu [25]:
Yogaraj Guggulu. This synergistic combination of herbs is particularly adept at clearing excess vata from the body, especially when it is lodged in the musculoskeletal system. It is powerfully detoxifying and rejuvenating and it has a special affinity for the joints, muscles and nerves. Guggul helps this preparation to scrape and eliminate natural toxins from the joints and muscle tissues as it rejuvenates and strengthens the skeletal and neuromuscular systems overall.

Kaishore Guggulu. This preparation is especially balancing for pitta, particularly when it is disturbing the musculoskeletal system. Its main ingredients—guduchi, triphala, and trikatu—when combined with guggul, create a powerful detoxifying and rejuvenating combination aimed primarily at removing deep-seated pitta from the tissues. It also acts to nourish and strengthen the system, supporting the overall health and proper function of the joints, the muscles, and the connective tissue.

Punarnavadi Guggulu. This formula is very useful for clearing excess kapha from the urinary system,

kidneys, heart, and joints. Its main ingredients—punarnava, triphala, and trikatu—when combined with guggul, create a powerful detoxifying and rejuvenating combination that supports the healthy elimination of liquids, thereby balancing the water element in the body and releasing deep-seated kapha from the tissues. It also supports the lymph and blood and encourages healthy circulation and comfortable movement of the joints.

Triphala Guggulu. This classic Ayurvedic preparation combines the detoxifying and rejuvenating actions of triphala with the deeply penetrating and cleansing actions of guggul. It decongests the channels of the body, while scraping natural toxins held within the tissues. This preparation is particularly useful for weight management because it kindles agni (the digestive fire), promotes healthy metabolism, and releases excess kapha from the system. In maintaining overall health, it minimizes the accumulation of toxins in the GI tract, blood, and joints by supporting proper digestion and elimination.

Kanchanar Guggulu. This combination of herbs is primarily used to address deep-seated kapha imbalances and is particularly supportive of the thyroid gland and the lymphatic system. Kanchanar is a very astringent herb that helps to clear the moist, stagnant qualities of kapha. When mixed with triphala, trikatu, and guggul, the combination is powerfully detoxifying and removes excess kapha from the tissues. Future accumulation of kapha is also minimized by this formula because it kindles agni (the digestive fire) and promotes healthy elimination.

Gokshuradi Guggulu.This compound has a strong affinity for the genitourinary tract, strengthening and toning the kidneys, the bladder, the urethra, and the reproductive organs, while balancing vata, pitta, and kapha. Its main ingredient, gokshura, is renowned for its rejuvenating action on the kidneys, the prostate, and the reproductive system. This formula, which also contains guggul, triphala, and trikatu, is very effective at detoxifying and balancing the urinary system.

Simhanad Guggulu. This formula is specifically geared toward detoxifying and rejuvenating the joints and is balancing for vata and kapha; in excess, it may aggravate pitta. It combines the scraping and rejuvenating qualities of guggul with the potent cleansing capacity of castor oil and triphala, allowing it to remove natural toxins from the joints, blood, and GI tract. The soothing and lubricating qualities of the herbs then work to nourish and strengthen the joint tissues, supporting proper function and mobility. This preparation also promotes healthy digestion and elimination for improved overall health.

Marketing of guggulu in India [26]:
Many Indian pharmaceutical companies different forms of guggulu for various therapeutics uses. A brief marketing survey of guggulu is being shown in table 1.

Table 1: Trading of Guggulu in India

Sl	Type of Guggulu Preparation	Manufacturing/ Marketing Company
1	Gokshuradi Guggulu	Trimurti Ayuherbals Pvt. Ltd.
2	Guggulu	Dhanushree Trading Co.
3	Natural Guggul	Uma Ayurvedic Pvt. Ltd.
4	Ayurvedic herb guggul	Bhardwaj Pharmaceutical Works
5	Fresh guggul powder	Maharishi Hawan Samagri Dhoop Agarbati Factory
6	Mahayogarag guggul	Shri Ganesh Ayurvedic Pharmacy
7	Commiphora mukul gum extract	GR Herbals
8	Kanchannar guggul	Shriji Herbal Products
9	Guggul extract	Navchetana Kendra
10	Commiphora mukul (Guggul)	Vijay group of companies
11	Guggul	Kishalay Herbals Ltd.
12	Organic Guggul	Cultivator Natural Products
13	Guggul agarbatti	Kartik Perfumery Works
14	Gum guggul	S Mansukhlal & Co,
15	Commiphora guggul capsule	La-Medicca India Pvt. Ltd.
16	Guggul dry extract	Omkar Herbals
17	Guggul herb	National herb co,
18	Guggul lipid extract	Arjuna Natural Extracts Ltd.
19	Shuddha Guggul	Novel Nutrients Pvt. Ltd.
20	Kaishore Guggul	Rasayani Biologics Pvt. Ltd.
21	Amrutadi Guggul	Shree Dhootpapeswar Ltd.

The list cited above are only some of the examples of Indian companies who used to market guggulu as single drug/ agent/ compound for therapeutic purpose but there are companies who used prepare a range of guggulu for different types of therapeutic uses. However, it has been reported by some Ayurvedic outlet of West Bengal is that Kaishore Guggulu is in the top among all varieties of Guggulu sold in the market.

CONCLUSION:

The resin of *Commiphora wightii* (guggulu), has emerged as a good source of the traditional medicines for the treatment of inflammation, arthritis, obesity, microbial infection, wound, pain, fractures, tumor, and gastrointestinal diseases. It is one of the oldest and the most prominent herbs in Ayurvedic medicine. Guggulu is a versatile drug and, because of its paranormal properties, it is very valuable in treating variety of disorders. Pharmacological results have validated the use of this plant in the traditional medicines. This plant contains a number of bioactive constituents including terpenoids, steroids, flavonoids, guggultetrols, lignans, sugars, and amino acids. Guggulsterones and are the chief bioactive constituents of this resin and are endowed with immense pharmacological value. These conclusions could open a new window on the use of this plant in Ayurveda. This review clearly authenticates the Sanskrit definition of the term “guggul” which means one that protects against diseases. It is superbly reflected and proved by the diverse medicinal uses of this Ayurvedic drug.

In vitro studies and clinical trials help improve and advance medical care. They also assist health care professionals to direct resources to the strategies and treatments that would work best for a particular type of ailment. Although the use of guggulu in therapeutic doses appears to be safe and nontoxic more and more of such studies should still be conducted so that chances of any toxicity, if any, can be ruled out. It has also been mentioned that during the course of using guggulu one should avoid foods that are sour or bitter in taste, alcohol, excessive exercise, physical and mental strain, anger, and exposure to direct sunlight. Such data can only be validated when we would choose in vitro studies over in vivo studies.

Also, this plant is listed in IUCN list and thus rationale usage of the plant is the need of the hour so that we do not end up depleting this wonder drug of high therapeutic importance. Keeping this in view, stem, bark, and leaf of this plant should receive more attention so that the complete depletion on account of plant death due to tapping can be checked. This plant still possesses an unexplored potential and expansion of research materials would provide more opportunities for the discovery of novel bioactive principles from this plant [27].

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