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Phytochemical and pharmacological review on guggul (*Commiphora wightii*)

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Abstract
Guggul known to possess various pharmacological activities. Guggulu is an oleo-gum resin which obtain as a result of injury from the bark of *Commiphora wightii*.it contain volatile oil. presence of terpenoidal constituents such as monoterpenoids, sesquiterpenoids, diterpenoids, and triterpenoids; steroids; flavonoids; guggultetrols; lignans; sugars; and amino acids. over the last several decades, the population of guggul is decrease due to habitat loss and degradation, and unregulated harvesting. guggul is Critically Endangered and enlisted in the IUCN red list of threatened species. Aim of this review is compile all the information available on all of its chemical constituents which are accountable for its therapeutic potential.

Keywords: guggul, antioxidant, anticancer, guggulsterone, guggulipid

Introduction
Guggul or Indian Myrrh is the yellowish gum-resin produced by the stem of the guggul tree (*Commiphora spp*.) Indian traditional system of medicine, guggulu has been worn for many years in the treatment of arthritis, inflammation, gout, rheumatism, obesity, and disorders of lipids metabolism.it is known by different names like guggula, guggul, guggal, gugar, and Indian bdellium. administration of raw guggulu may lead to skin rashes, irregular menstruation, diarrhoea, headache, mild nausea, and, with very high doses, liver toxicity [39].

Classification of Plant

Table 1

Kingdom	Plantae
subkingdom	Tracheobionta
Division	Magnoliophyta
Class	spermatopsida
Subclass	Magnoliidae
order	Sapindales
family	Burseraceae
Genus	commiphora
Species	wightii

Vernacular Names
Latin name: Commiphora wightii
English name: Indian bdellium
Sanskrit name: Gugglu
Urdu name: Muqil
Hindi name: Guggul
Gujrati name: Gugal
Kashmiri name: Guggul dhoop
Bengali name: Guggula
Malyalam name: Gulgulu
Tamil name: mahisaksi guggalu
Telugu name: Guggipannu

Plant Discription
Commiphora wightii belongs to Burseraceae family. this is a kind of small tree grows up to 6 m with spiral, brown colored ascending branches ending in Sharp scented spines. This plant has shiny, yellowish white barks that come off in rough scales exposing under bark of Green color. This barks also seals off in the form of papery roll. Guggul is the name given to yellow color resins produced By its stem. leaves of the guggul are small shaped with quadrilateral vessel like structure, present one to three in number. Flowers are unisexual, small, of brown red color sessile with oblong void ovary. These flowers are present in the group of Two or three. fruits are of ovoid shape, six to eight mm in diameter. seeds contain an under developed embryo [39].

Biological Diversity
Guggulu is a small, beard tree with spiky branches.it produce a yellowish gum resin (guggulu) in ducts located alloverthe bark. Resin are obtained by making an incision on the bark. The resin which come out is allowed to harden before it is collected. A guggul tree yields between 250 to 500 g of dry resin during each collection season. Guggulu found in pale yellow or brown coloured mass with aromatic odour and bitter astringent taste. Sample of guggulu contain 1 percent of volatile oil and between 1.0 and 1.5 percent of guggulsterones (*Z* and *E*) [36, 37].

Phytochemistry
There are 66 chemical constituent are present in the guggul.it shows the presence of steroids, sterols, terpenoids, cembrenoids, flavones, tannins, ferrulates and lignans.it shows gums (32%), oleo-gum-resin (38%) and essential oils (1%)[59]The commercial product also contains minerals (20%), foreign organic matter (4%) and other compounds (5%).[60]Diterpenoid constituents from guggulu include *α*-camphorene**,** cembrene and other cembrenoids [19, 33].

Pharmacological Activity
Hypolipidemic Activity
Various mechanism have been proposed for the hypolipidemic activity of guggul. out of which the one is

that guggulu may decrease the hepatic steroid production so that it increases the catabolism plasma LDL cholesterol another one is active constituent Guggulsterone E and Z may increase the hepatic binding site for LDL cholesterol, thus increasing LDL clearance various clinical studies have been carried out on various animal for testing the hypolipidemic activity and they concluded that administration of Guggulsterone Z and E significantly lowered the serum lipid levels of animal which includes albino rat, white leghorn chicks, domestic pigs. Highly significant reduction in level of mean serum cholesterol and triglycyrhide was observed in groups of animals who has received high fat diet for one month along with guggulu which confirmed the hypolipidemic activity of guggul [1, 9, 21].

Effect on Platelet Aggregation and Fibrinolytic Activity

Study was carried out on the effect on fibrinolysis and platelet adhesiveness in coronary heart disease. petrolium ether extract of Guggulu named as A fraction in daily dose of 1 g was administered to healthy individuals (group I) and to patients of coronary artery disease (CAD) (group II) for a period of 30 days and concluded that increased in Serum fibrinolytic activity. In view of this, guggulu fraction A may be a useful therapeutic agent in the management of coronary artery disease [2, 10].

Anti-Inflammatory and Antiarthritic Activity

The results of several studies confirm anti-inflammatory and antiarthritic activities of guggulu. The study was carried out using hydroalcoholic extract and methanolic extract of guggul. The the hydroalcoholic extract was found to exhibit an anti-inflammatory effect on adjuvant-induced air pouch granuloma in mice. The methanolic extract inhibited nitric oxide production in lipopolysaccharide activated mouse peritoneal macrophages. from petroleum ether extract of guggul the steroid was isolated and this steroid was tested in rats for inhibition of inflammation Induces by Freunds adjuvant and concluded that it inhibit the full development of primary lesion in adjuvant arthritis and also reduced the severity of secondary lesions as compared with the untreated control group [11, 13, 14].

Antimicrobial Activity

The ethanolic extract of *C. mukul* exhibited best antibacterial activity at 5 mg/mL against multidrug-resistant *Klebsiella pneumoni*. [5] An active constituent of methanolic extract of guggul gum 5(1-methy l, 1-aminoethyl)-5-methyl-2-octanone, possessed significant antibacteril activity against Gram-positive bacteria and moderate activity against Gram-negative bacteria [4, 27]. The volatile oil of commiphora mukul was effective against Rhyzoperthadomnicaa which confirmed its role as fumigant. antibacterial activity was shown C.mukul at 5mg/ml. against multidrug resistant klebsiella pneumonia. and it also effective against various gram positive and negative bacteria [22, 23, 26].

Antifertility Activity

The study was carried out where Guggulu administered orally (2 and 20 mg/100 g body weight) to female rats which shows that it decreased the weight of the uterus, ovaries, and cervix. level of glycogen and sialic acid in the organs increased. This suggested that guggulu may be useful as an antifertility agent [6].

Antioxidant activity

The antioxidant activity of guggul first found in 1990 but in a recent study Wang *et al* have reported that gugulipid and guggulsterone significantly inhibit LDL oxidation. the antioxidant activity was tested *in vitro* against the formation of oxygen free radicals.the metal chelating capacity of guggulsterone might be contributing the antioxidant activity. because it was found that guggulsterone stop the lipid peroxidation in liver.it also reported that guggulsterone stop the generation of thiobarbitonic acid, reactive species and lipid hydroperoxide of low density lipoprotein [15, 16, 17].

Cytotoxic Activity

In vitro anticancer activity were shown by decreasing the cell viability in MCF-7 (breast)tumor cell,PC-3 (prostate) tumor cells, parentral and transfected P388 cell. study has shown that ethylacetate extract of guggul shown the *in vitro* cytotoxic activity. treatment with guggulsterone shown that it will inhibit the proliferation of PC-3 cell in culture of apoptosis [12, 20].

Thyroid Stimulatory Activity

Study has been shown that use of ethanolic extract of guggulu to the female albino mice for 15 days increased the triiodothyonine (T3) concentration and T3/T4ratio,while no change in the concentrations of serum thyroxine (T4) was observed and concluded that *Z*-Guggulsterone was shown to be responsible for the thyroid stimulatory action of guggulu. Use of isolated *Z*-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 [40].

Cardioprotective Activity

Guggulsterones are shown to be effective cardioprotectives. Study has been carried out by inducing myocardial necrosis by isoproterenol in rats it was observed that it caused marked increase in serum creatine phosphokinase and glutamate pyruvate transaminase. And concluded that Treatment with guggulsterone at a dose of 50mg/kg significantly protected cardiac damage as assessed by the reversal of blood and heart biochemical parameters in ischemic rats [38].

Safety and Toxicity

Various study has been carried out and concluded that administration of raw guggulu may sometime leads to skin rashes, Irregular menstruation, diarrhoea, headache and very high doses of gugggulu leads to liver toxicity. In order to decrease the side effect the shodhna (purification) can be done. The clinical trials done with standardized gum guggul extract reported transient side effects. Study was carried out on 22 individuals receiving 2160 mg of guggulu daily for 2 weaks to person experienced one or another side effect including G.I.T distress, fatigueand skin rash [8, 39].
Henceforth it is generally accepted as relatively safe. caution may be warranted during guggul consumption.

Conclusion

It is concluded that the commiphora wightii, guggulu, has come out as a good source of traditional medicine for treatment of inflammation, arthritis, obesity, microbial infection, wound, pain, G.I.T tumor.it has so many property in its self hence it is used in various disorder. Guggulu

contain various bioactive constituent such as terpenoids, steroids, flavonoids, lignan, guggulsterone and amino acid. the guggulsterone E and Z are main bioactive constituent and they show various biological activity. itsi pharmacological activity is proved by diverse medicinal uses of Ayurvedic drug.*in vitro* studies and clinical trials help to improve and advanced medical care.it should be conclude that durinng the course of using guggul one should avoid foods that are sour bitter in taste, excessive exercise, alcohol, anger, and exposure to sunlight. Due to unexplored potential of guggul plant it is still in demand for various researchers.

Refrences

1. Chander R, Khanna AK, Kapoor NK. Lipid lowering activity of guggulsterone from *Commiphora mukul* in hyperlipaemic rats. Phytotherapy Research, 1996:10(6):508–511.
2. Bordia A, Chuttani SK. Effect of gum guggula on fibrinolysis and platelet adhesiveness in coronary heart disease. Indian Journal of Medical Research, 1972:70(6):992-996.
3. Arora RB, Taneja V, Sharma RC, Gupta SK. Anti-inflammatory studies on a crystalline steroid isolated from *Commiphora mukul*. Indian Journal of Medical Research,1972:60(6):929-931.
4. Sharma A, Kumar Patel V, Rawat S, Ramteke P, Verma R. Identification of the antibacterial component of some Indian medicinal plants against *klebsiella pneumoniae*. International Journal of Pharmacy and Pharmaceutical Sciences,2010:2(3):123-127.
5. Goyal P, Chauhan A, Kaushik P. Assessment of *Commiphora wightii* (Arn.) Bhandari (Guggul) as potential source for antibacterial agent. Journal of Medicine and Medical Sciences,2010:1(3):71-75.
6. Amma MKP, Malhotra N, Suri RK, Arya OP, Dani HM, Sareen K. Effect of oleoresin of gum guggul (*Commiphora mukul*) on the reproductive organs of female rat. Indian Journal of Experimental Biology,1978:16(9):1021-1023.
7. Thappa DM, Dogra J. Nodulocystic acne: oral gugulipid versus tetracycline. Journal of Dermatology,1994:21(10):729-731.doi: 10.1111/j.1346-8138.
8. Hasani RS, Nayebi N, Moradi L, Mehri A, Larijani B, Abdollahi M. "The efficacy and safety of herbal medicines used in the treatment of hyperlipidemia; a systematic review," Current Pharmaceutical Design,2010:16(26):2935-2947.
9. Yu BZ, Kaimal R, Bai S *et al*. "Effect of guggulsteroneand cembranoids of *Commiphora mukul* on pancreatic phospholipaseA2: role in hypocholesterolemia," Journal of Natural Products,2009:72(1):24-28.
10. Chaudhary G. "Pharmacological properties of *Commiphora wightii* Arn. Bhandari-an overview," International Journal of Pharmacy and Pharmaceutical Sciences,2012:4(3):73-75.
11. Khanna D, Sethi G, Ahn KS *et al*. "Natural products as a goldmine for arthritis treatment," Current Opinion in Pharmacology,2007:7(3):344-351.
12. Karan M, Sarup P, Suneja V, Vasisht K. "Effect of traditional ayurvedic purification processes (sodhanvidhi) of guggulu on carrageenan-induced paw oedema in rats," Journal of Pharmaceutical and Biomedical Sciences,2012:21(5):1-5.
13. Verma S, Jain A, Gupta VB. "Synergistic and sustainedanti-inflammatory activity of guguul with the ibuprofen: apreliminary study," International Journal of Pharma and Bio Sciences,2010:(1):1-7.
14. Singh BB, Mishra LC, Vinjamury SP, Aquilina N, Singh VJ, Shepard N. "The effectiveness of *Commiphora mukul* for osteoarthritis of the knee: an outcomes study,"*Alternative Therapies in Health and Medicine*,2003:9(3):74-79.
15. Chander R, Khanna AK, Pratap R. "Antioxidant activity of guggulsterone, the active principle of guggulipid from Commiphora mukul," Journal of Medicinal and Aromatic Plant Sciences,2002:(24):371-375.
16. Bellamkonda R, Rasineni K, Singareddy SR *et al*. "Antihyperglycemic and antioxidant activities of alcoholic extractof *Commiphora mukul* gum resin in streptozotocin induced diabetic rats," Pathophysiology,2011:18(4):255-261.
17. Wang X, Greilberger J, Ledinski G, Kager G, Paigen B, J¨urgens G. "The hypolipidemic natural product *Commiphora mukul* and its component guggulsterone inhibit oxidative modification of LDL," Atherosclerosis,2004:172(2):239-246.
18. Chander R, Rizvi F, Khanna AK, Pratap R. "Cardioprotective activity of synthetic guggulsterone (*E* and *Z*isomers) in isoproterenol inducedmyocardial ischemia in rats: a comparative study," Indian Journal of Clinical Biochemistry,2003:18(2):71-79.
19. Zhu N, Rafi MM, DiPaola RS *et al*. "Bioactive constituents from gum guggul (*Commiphora wightii*)," Phytochemistry,2001:56(7):723-727.
20. Xiao D, Zeng Y, Prakash L, Badmaev V, Majeed M, Singh SV. "Reactive oxygen species-dependent apoptosis by gugulipid extract of ayurvedic medicine plant *Commiphora mukul* in human prostate cancer cells is regulated by c-Jun Nterminal kinase," Molecular Pharmacology,2011:79(3):499-507.
21. Sharma B, Salunke R, Srivastava S, Majumder C, P Roy. "Effects of guggulsterone isolated from *Commiphora mukul* in high fat diet induced diabetic rats," Food and Chemical Toxicology, 2009:47(10):2631-2639.
22. Sharma A, V Kumar Patel, Rawat S, Ramteke P, R Verma."Identification of the antibacterial component of some Indianmedicinal plants against *klebsiella pneumoniae*," InternationalJournal of Pharmacy and Pharmaceutical Sciences,2010:2(3):123-127.
23. Goyal P, Chauhan A, Kaushik P. "Assessment of *Commiphora wightii* (Arn.) Bhandari (Guggul) as potential source for antibacterial agent," Journal of Medicine and Medical Sciences,2010:1(3):71-75.
24. Bhati A. "Essential oil from the resin of *Commiphora mukul*, Hook. Ex. stocks," Journal of the Indian Chemical Society,1950:(27)436-440.
25. Saxena VK, Sharma RN. "Constituents of the essential oil from *Commiphora mukul* gum resin," Journal of Medicinal and Aromatic Plant Sciences,1958:(20):55-56.
26. Ishnava KB, Mahida YN, JSS Mohan. "*In vitro* assessments of antibacterial potential of *Commiphora*

wightii (Arn.) Bhandari. gum extract," Journal of Pharmacognosy and Phytotherapy,2010:2(7):91-96.
27. Romero CD, Chopin SF, Buck G, Martinez E, Garcia M, Bixby L. "Antibacterial properties of common herbal remedies of the southwest," Journal of Ethnopharmacology,2005:99(2):253-257.
28. Nohr, LB Rasmussen, Straand J. "Resin fromthe mukul myrrh tree, guggul, can it be used for treating hypercholesterolemia? A randomized, controlled study," Complementary Therapies in Medicine, 2009:17(1):16-22.
29. Szapary PO, Wolfe ML, Bloedon LT *et al*. "Guggulipid for the treatment of hypercholesterolemia: a randomized controlled trial," Journal of the American Medical Association,2003:290(6):765-772.
30. Karan M, Kumar V, Suneja V, Vasisht K. "Commercial herbal anti-inflammatory formulations—a survey," Pharmacos,2009:(36):14-25.
31. Sangle VD, Nadkarni SD, Vahalia MK, Darp MS. "The study of effect of ayurvedic processing of *Commiphora wightii* on gastric irritancy index in experimental animals," Indian Drugs,2004:41(5): 268-271.
32. Francis JA, Raja SN, Nair MG. "Bioactive terpenoids and guggulusteroids from *Commiphora mukul* gum resin of potential anti-inflammatory interest," Chemistry and Biodiversity,2004:1(11):1842-1853.
33. Matsuda H, Morikawa T, Ando S *et al*. "Absolute stereostructures of polypodane-type triterpenes, myrrhanol A and myrrhanone A, from guggul-gum resin (the resin of Balsamodendron mukul)," Chemical and Pharmaceutical Bulletin,2004:52(10):1200-1203.
34. Kimura, Yoshikawa M, Kobayashi S *et al*. "New triterpenes, myrrhanol A and myrrhanone A, from guggul-gum resins, and their potent anti-inflammatory effect on adjuvant-induced airpouch granuloma of mice," Bioorganic and Medicinal Chemistry Letters,2001:11(8):985-989.
35. Hanus LO, Rezankab T, Dembitskya VM. Moussaieffa A. "Myrrh—Commiphora chemistry," Biomedical Papers,2005:149(1):3-28.
36. Ucker GR. "Monocyclic diterpenes from Indian gugul resin (Commiphoramukul)," Archiv der Pharmazie, 1972:305(7):486-493.
37. Prasad RS, Dev S. "Chemistry of ayurvedic crude drugs—IV: guggulu (resin from commiphora mukul—4 absolute stereochemistry of mukulol," Tetrahedron, 1976:32(12):1437-1441.
38. Chander R, Khanna AK, Kapoor NK. "Lipid lowering activity of guggulsterone from Commiphora mukul in hyperlipaemic rats," Phytotherapy Research, 1996:10(6):508-511.
39. Masten SA. Gum Guggul and Some of Its Steroidal Constituents: Review of Toxicological Literature, vol. 2, US Department of Health and Human Services, National Toxicology Program (NTP), National Institute of Environmental Health Sciences (NIEHS), National Institutes of Health, Durham, NC, USA, 2005.
40. Vijay kumar, Simranjeet singh, Ravindra Singh Phytochemical Constituents of Guggul and their Biological Qualities, 2020, 17(3).