

"The Medicinal Virtues of Commiphora Mukul: A Critical Review"

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Abstract: *Commiphora mukul*, also called *guggul*, is a plant that makes resin as well as is often used in Ayurvedic medicine because it has multiple medicinal benefits. This review thoroughly explores its detailed taxonomy, common distribution, along with thorough phytochemistry, meaningful pharmacological activities, as well as diverse medicinal applications. The plant has bioactive ingredients such as guggulsterones, diterpenoids, and necessary oils, and these contribute to its effects against conditions like inflammation, high cholesterol, obesity, and arthritis. Its therapeutic effectiveness in the treatment of many metabolic conditions, cardiovascular ailments, and multiple skin problems is completely confirmed by well-known customary and scientific research. Different removal methods improve how well the body can use it. This makes it a helpful, natural treatment in current healthcare.

Keywords: Commiphora mukul, Guggul, Phytochemistry, Pharmacological activities, Medicinal applications, Metabolic disorders, Ayurvedic medicine.

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Introduction:

Commiphora mukul, also known as **guggul**, is a flowering plant in the family Burseraceae. It produces a fragrant resin called gugal, guggul, or gugul, which is used in incense and vedic medicine (or ayurveda). The gum resin from the stem is tapped and used in various Ayurvedic preparations. Guggul is highly valued in Ayurveda and is used for treating rheumatoid arthritis, lipid disorders, and obesity. It is commonly found in India, particularly in arid climates.

Commiphora mukul, (Hook.ex Stocks) Engl also called *Commiphora wightii*, *Balsmodendron wightii*, *B. roxburghii*, or *B. mukul*, is a stunted bush with spinescent branches that belongs to the Burseraceae family. The plant's generic name is derived from the Greek words *Kommi*, which means gum, and *Phero*, which means to bear, because of the copious amounts of gum exudation from the trunk. *Commiphora mukul* bark injuries naturally produce *guggulu*, an oleogum resin that has been used since the Vedic era as one of the most significant medications. The first mention of Guggulu's therapeutic and medicinal qualities can be found in the Atharva Veda, one of the four well-known Hindu holy texts (Vedas). *The Ayurvedic treatises Charaka (1000 B.C.), Sushruta Samhita (600 B.C.), and Vagbhata (7th century A.D.)* all contain thorough explanations of the activities, uses, indications, and variants of Guggulu. Furthermore, between the 12th and 14th centuries A.D., a number of Nighantus (medical lexicons) based on Ayurvedic literature were composed. Formulations based on guggulu are currently highly common in Ayurvedic treatment. The plant is greatly overused because of its many medical uses. ⁽⁴⁾

Taxonomical Classification:⁽⁴⁾

Botanical name: *Commiphora mukul* ⁽²⁵⁾

Kingdom: Plantae

Subkingdom: Tracheobionta

Superdivision: Spermatophyta

Division: Magnoliophyta

Class: Eudicots

Subclass: Rosidae

Order: Sapindales

Vernacular names:

Tamil: Erumaikan, Gukkulu Maisatch, Kungiliyam

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

Sanskrit: Guggulu, Guggula, Gugala, Gugguloo, Bhavabhishta, Bhutahara, Devadhupa, Deveshta, Dhurta, Divya, Durga, Jatala, Jatayu, Kalaniriyasa, Kaushika, Kumbha, Kumlihi, Kumbholu, KumbholuKhalaka,

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Distribution and Habitat

The tropical regions of Africa, Madagascar, Asia, and Saudi Arabia are home to *Commiphora mukul*. It is found throughout the Indian subcontinent, including Bangladesh, Pakistan, India, and Baluchistan. In addition to sporadic occurrences in other states, it is scattered throughout South-West India and portions of Central India, which are represented by the states of Kerala, Kanataka, Tamilnadu, Andhra Pradesh, Maharashtra, Madhya Pradesh, Gujarat, and Rajasthan. The tree grows on the foothills, along the

hill slopes, on hillocks, and sparsely on hill tops in warm, semi-arid regions of India that have rocky and gravelly land types. It prefers hard, rocky soil.

Description of *Commiphora mukul* Plant: ^(8,9,10)

The prickly shrub *Commiphora mukul* can grow up to nine feet in height. It is a member of the Burseraceae family. It looks like a thick thorny bush or shrubs. When the tree reaches maturity, its height is typically between one and four meters, and tough, ash-colored bark peels off in flakes.

Picture of plants	Description
	Flowers; The tiny, reddish-brownish flowers are either unisexual or bisexual, and they have a few solitary or clustered pedicles. The campanulate, glandular, hairy calyx has four to five lobes. The petals are brownish, crimson in general, three times as long as the calyx, and reflex at the base. 8–10 stamens, alternating between long and short, are present. Disc 8–10 lobed
	Fruits; They have four valved pyrens ovate, are spherical, fleshy, and red in color. When ripe, they are 6–8 mm in diameter, ovoid, acute, epicarp, and easily split in two.
	Leaves: The leaves are rhomboid, ovate, 1-3 foliolate, sub-sessile, and have serrated teeth on the upper portion. The lateral leaflets are glossy and smooth.

Phytochemistry: ^(43,51,54,60)

Commiphora mukul was found to be a complex mixture of steroids, diterpenoids, aliphatic esters, polysaccharides, and various inorganic ions after a thorough chemical analysis. Sesamin, cholesterol, a few other steroids, alcohol, aliphatic triols (mainly as esters of ferulic acid), and essential oil containing steroidal ketones were all reported from the gum resin. The structural clarification of five novel sterols and their steroidal components, Z and E-guggulsterone Guggulu sterols I, II, III, IV, and V have been identified, and Guggulu sterol II has been partially synthesized from diosgenin. Moreover, diterpinoid components mukulol and cembrene-A.

There have been reports of a few fatty tetrols, octadecan-1,2,3,4-tetrol, eicosan-1,2,3,4-tetrol, and nonadecan-1,2,3,4-tetrol. 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, β 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 sugarssucrose, glucose and fructose; α - camphorene, cembrene and allycembrol; cembrene-A (structure of); flavanoids. From the drug's gum resin, several steroidal components, including pregnenones I, II, and III (guggulsterol-VI), were separated, and the structure of the novel chemical III was found. Linoleic, oleic, stearic, and palmitic acids are found in seed oil, whereas unsaponifiable matter contains sitosterol, stigmasterol, cholesterol, campesterol and α -spinasterol.⁽⁸⁾

Actions of *Commiphora mukul* : ^(26,20,27,28,29,30,31,32,33,34,35,36)

Numerous actions of *Commiphora mukul* have been detailed in ethnomedical and Unani literature, including anti-inflammatory, thrombocytic, diuretic, emmenagogue, anti-obesity, anti-hyperlipidemia, anti-inflammatory, thrombocytic, concocitive, desiccant, anti-arthritis, laxative, carminative, resolvent, astringent, nervine tonic, lithotriptic, liver tonic, expectorant, ecboic, detergent, alternative, antidote, tonic, aphrodisiac, rejuvenating, disinfectant, antitoxin, antihelminthic, expectorant, and thermogenic properties.

Medicinal uses: (26,36,37,38,39)

According to traditional Unani literature, mukul is recommended for the following conditions: piles, fistulas, ulcers, and heal fractures. nausea, discharges from the urine, Leucoderma tumors, inflammation, neck's tubercular glands, asthma, ascites, Clear the ear of any undesirable secretions. Anticipatory, Rheumatism of the muscles, Dyspepsia skin conditions, disorders of the nerves, Calm, Scrofulous love, discomfort in the abdomen, Boils, Incipient, Acne, nasty ulcers and abscesses, kidney stone diuretic, stiffness and soreness in the muscles, persistent endometritis, Amenorrhea, Menorrhagia, and Leucorrhea, Injured, ache in the throat, persistent cough, counteragent, Warts infections caused by fungi, Hysucels Rectal inflammation, Plague, Gout, Alopecia appetizer, dental cavities, spongy gum and bleeding, Pyorrhea Pharyngitis, persistent tonsillitis, persistent diarrhea, persistent colitis, Bowel tubercular ulceration, diarrhea, pulmonary TB, pleural effusion, peritonitis, marasmus, anemia, debility from neutropenia, laryngitis, bronchitis, pneumonia, whooping cough, gingivitis, otitis media and uveitis, eczema, and psoriasis.

Commiphora mukul ectraction with various types:

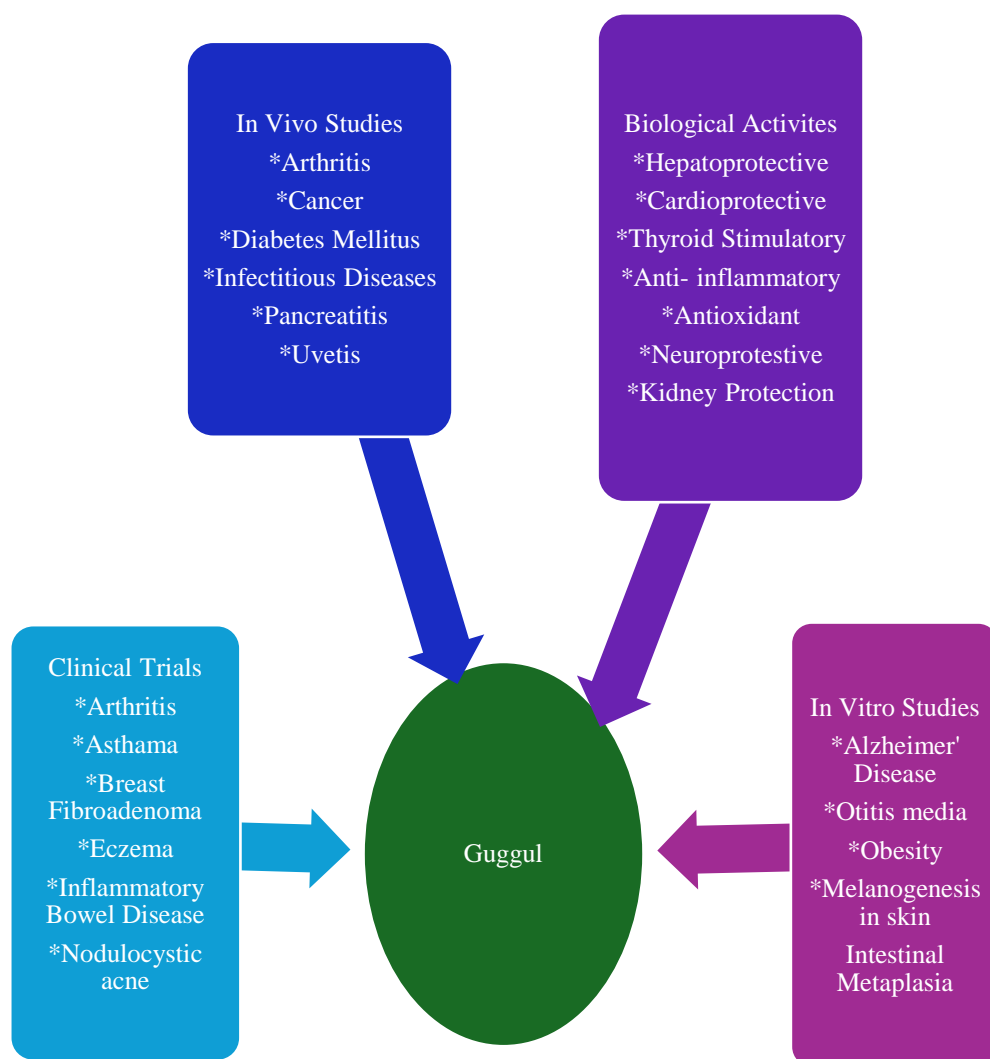
Guggul, also known as *Commiphora mukul*, is a resinous plant that has been used medicinally for a very long time. Its bioactive components, mainly guggulsterones, are extracted using a variety of methods. Here are a few typical techniques:

Table:

No	Solvent	solubility
1	Distilled Water	Insoluble
2	Methanol	Sparingly Soluble
3	Ethanol	Sparingly Soluble
4	Chloroform	Sparingly Soluble
5	Acetone	Soluble

Pharmacology activity: (2,8,10,20,24,29,33,34,50,58,59)

Here go see about the, they In vitro studies, Clinical Trails, In Vivo studies, Biological Activies.



Medicinal Use	Primary Active Components	Mechanisms
Joint Disorders	Guggulsterones, Diterpenes	Anti-inflammatory action via NF-kappaB inhibition
Cardiovascular Health	Guggulsterones	Antagonism of FXR and cholesterol metabolism regulation
Metabolic/Weight Management	Fatty Acid Alcohols, Lignans	Enhancement of metabolic rate and detoxification
Skin Conditions	Antioxidants, Guggulsterones	Reduction of inflammation and oxidative stress
Thyroid Support	Guggulsterones	Regulation of thyroid hormones and metabolic balance
Liver & Kidney Protection	Antioxidants	Mitigation of oxidative stress and detoxification support

Scientific reports:

*Scientific research has demonstrated that *Commiphora mukul* is beneficial for obesity, arthritis, hyperlipidemia, and hypercholesterolemia (WHO).⁽⁶¹⁾

*Research has shown that C.mukul functions as a strong antagonist to the androgen, mineralocorticoid, and glucocorticoid receptors.⁽⁶²⁾

*According to Wu et al. (2002), Owsley and Chiang (2003), Brobst et al. (2004), and Burris et al. (2005), it is also an agonist to estrogen and progesterone receptors.

*» It is also useful in ischemic heart disease.⁽⁶²⁾

Conclusion:

Commiphora mukul has great therapeutic properties, in addition to its oleo-gum resin being widely used in the treatment of different conditions, such as metabolic disorders, arthritis, along with hyperlipidemia. Its bioactive compounds display truly encouraging pharmacological potential. That potential is firmly supported from customary knowledge and through strict scientific research. However, its presence is threatened by large habitat loss and meaningful overexploitation, which makes conservation efforts important. Further research focusing on how it works, how safe it is, and standard ways to make it could really help it be used as a treatment in integrative medicine.

References

1. The Ayurvedic Pharmacopoeia of India. Government of India, Ministry of Health and Family Welfare. New Delhi, India: Department of AYUSH. 2007 (1).
2. Katti A, Anitha C. Effect of Diet Therapy and Guggulu (*Commiphora Mukul*) on Obesity-A Comparative Clinical Study.2019;9:122-7.
3. Anonymous. Indian Pharmacopoeia, The Controller of Publications. New Delhi, India, 1996.
4. Khan MB, Sathe N, Chavan R. *Commiphora mukul* Engl.-"Divya": A Review. Ayurlog: National Journal of Research in Ayurved Science-2015. 2015;3(2):1-2.
5. The Ayurvedic Pharmacopoeia of India Part- I Volume – I Government of India Ministry of Health And Family Welfare Department Of Ayush Page No. 43
6. Santosh Sharma And Ashwani Kumar, Traditional Uses of Herbal Medicinal Plants of Rajasthan: Guggal, IJLP Vol 2/Issue 4/Oct-Dec 2012
7. Kulloli R. N. and Suresh Kumar, *Commiphora wightii* (Arnott) Bhandari: A threatened plant of conservation concern, Journal of Medicinal Plants Research, June, 2013
8. Kirtikar K.R. Basu, B. D; "Indian Medicinal Plants" 1995; Vol I, 2nd ed., International Book Distributors Dehradun.pg- 521-523, 526-528. Vol IV .2435-2437.
9. Nadkarni, K. M; "Indian Materia Medica", Bombay: Popular Prakashan, 1976; Vol IV :167, 211- 212; Vol I: 1308-1314.
10. Warrier P.K, Knambia V.P, Ramankutty C, "Indian Medicinal Plants – A Compendium of 500 species", Orient Longman publishers Madras, 1996; Vol I: 297-300; Vol II: 164-172; Vol III: 431-438.
11. Dymock, W. Warden, C.J.H. Hooper D Bishan Singh, M. Chandra Lal Singh "Pharmacographia Indica", 1976; Vol I: 295-303, 304-312, 420-25.
12. Affaque S.H, Siddiqui M.M.H; "Pharmacogonosy phytochemistry, pharmacology and clinical studies of Unani medicinal plants", 1984; Vol I: 46-72.
13. K.K, Purushothsman. S, Chandrasekharan, "Gugulesterols from *Commiphora mukul* (Burseraceae)" Ind. J. Chem. B, 1976; 14: 802-804
14. Delay F, Ohloff G "Syntheses and absolute configuration of (E)- and (Z)- alpa- bisabolenes". Helv. Chim. Acta, 1979; 62:369-377.
15. Raldugin V.A., Shelepina O.B., Sekatsis I.P., Rezvukhin A.I, Pentegova V.A., "Configuration of C3 double bond and Partial synthesis of allylcembrol", Khim. Prir. Soedin, 1976; 1: 108-109.
16. Kakrani H.K, "Physiochemical examination of seed oil from *Commiphora mukul* Hook ex Stock", Indian Drugs, 1982; 19: 339-341.
17. Mesrob B.C., Nesbitt C, Misra R, Pandey R.C, "High Performance liquid chromatographic method for fingerprinting and quantitative determination of E-and-Z-guggulsterones in *Commiphora mukul* resin and its products", J. Chromatogr. B, 1998; 720: 189-196.
18. Mastudi H, Morikawa T, Ando S, Oominami H, Murakami T, Kimura I, Yoshikawa M , "Absolute Stereostructures of polypodane- type triterpenes, myrrhanol A and myrrhanone A, from guggul-gum resin (the resin of *Balsamodendron mukul*)" Chem. Pharma. Bull, 2004; 52: 1200-1203.
19. Abassi M.A., Ahmad V.U. Khan M., Lodhi M.A, Choudhary M.I, "alpha -glucosidase and chymotrypsin inhibiting lignans from *Commiphora mukul*. " " Proc. Pak. Acad. Sci, 2005; 42: 23-26.

20. Arora R.B., Basu N, Kapoor V, Jain A.P., "Anti-inflammatory studies on *Curcuma longa* (Turmeric)"', Indian J. Med. Res., 1971; 59: 1289-1295.
21. Khan MA. Muhīt-i-Azam. Ist ed. New Delhi: CCRUM; 2018. Vol IV. pp. 630-632, 925, 926.
22. Rushd AWM. Kitāb al Kulliyāt. 2nd ed. New Delhi: CCRUM; 1987: pp. 269, 319, 320, 354.
23. Betar ZA. Al Jami'al Mufarridāt al-Adviya wal Aghzia. New Delhi: CCRUM; 2003. Vol IV. pp. 256,257,354,355,436-439.
24. Khare CP. Indian medicinal plants, An Illustrated Dictionary. New York: Springer Science + business media, LLC; 2007: pp. 32, 33, 79, 101, 238, 239, 263, 653, 654.
25. Om Prakash Rout et al, Oleogum Resin Guggulu: A Review of The Medicinal Evidence for Its Therapeutic Properties Medical College, Chandkhuri, Durg, Chhatisgarh, India. / IJRAP 3(1), Jan – Feb 2012
26. Ghani N., "Khazainul-Advia", Naval Kishore Publication, Lucknow, 1920; Vol VI: 865-867.
27. Kabiruddin M., "Makhzanul-Mufradat, Kitabul Advia", Shiekh Mohd Bashir and Sons Lucknow, 1937;463, 547, 366.
28. Kirtikar K.R. Basu, B. D; "Indian Medicinal Plants" 1995; Vol I,2nd ed., International Book Distributors Dehradun.pg-521-523,526-528.Vol IV .2435-2437.
29. Warriar P.K, Knambia V.P, Ramankutty C, "Indian Medicinal Plants – A Compendium of 500 species"', Orient Longman publishers Madras, 1996; Vol I: 297-300; Vol II: 164-172; Vol III: 431-438.
30. Wagner H, Fransworth N.R, "Economic and medicinal plants research. Plants and Traditional Medicine"', Academic Press New York, 1991; Vol V 50-82.
31. Arora R.C., Aggarwal N, Arora S, Kanchan S.N, "Flora and Fauna .," 1995; 1 (2): 203-205.
32. Ibn-e-Sena, "Al Qanoon Fitibb Urdu translation (1930), G.H. Kantoori,"' Naval Kishore Publication reprinted by Shiekh Bashir and Sons Lahore, (980-1038); Vol II :115-137, 118, 143, 88. Vol IV: 215 285.
33. Warriar P.K., Knambia V.P., Ramankutty C, "Indian Medicinal Plants- A Compendium of 500 species"',Orient Longman Publisher Madras, 1997;Vol I:297-300; Vol II: 164-172; Vol III:431-438.
34. Aggarwal R.C., Singh S.P., Saran R.K., Dass S.K., Sinha N., Asthna P., Gupta P., Nityanal S., Dhawan B.H., Aggarwal SS, "Clinical trial of Standardised Extract- A new hypolipidemic agent of plant origin in Primary Hyperlipidemia", Ind.J. Med. Res, 1986;82: 626-634.
35. Haleem, A; "Mufradati Azazi", Sahitya Mandir Press, Lucknow, 1948;51,44,43
36. Ibn-Baitar Z.A, Aljameul Mufaradat Al Adviya Wa Aghzia, (1248-1197); Urdu translation by C.C.U.R.M, New Delhi:349
37. Kabiruddin M. Makhzanul-Mufradat, KitabulAdvia. ShiekhMohd Bashir and Sons Lucknow, 1937;463, 547, 366.
38. Hakeem A. Bustanul – Mufradat. Idarah Taraqqui Urdu Publication Lucknow. 1311; 56, 261, 286.
39. Khan A. Muheet-e- Azam. Nizami Press, Kanpur, 1313; 2 (4): 129-132, 96-98; (3): 108- 109.
40. O. A. Bhati, "Essential oil from the resin of *Commiphora mukul*, Hook. Ex. stocks," Journal of the Indian Chemical Society, vol. 27, pp. 436-440, 1950.
41. V. K. Saxena and R. N. Sharma, "Constituents of the essential oil from *Commiphora mukul* gum resin," Journal of Medicinal and Aromatic Plant Sciences, vol. 20, pp. 55-56, 1998.
42. V. D. Patil, U. R. Nayak, and S. Dev, "Chemistry of ayurvedic crude drugs-II. Guggulu (resin from *Commiphora mukul*)-2: diterpenoid constituents," Tetrahedron, vol. 29, no. 2, pp. 341 348, 1973.
43. J. A. Francis, S. N. Raja, and M. G. Nair, "Bioactive terpenoids and guggulosteroids from *Commiphora mukul* gum resin of potential anti-inflammatory interest," Chemistry and Biodiversity, vol. 1, no. 11, pp. 1842-1853, 2004.
44. R. S. Prasad and S. Dev, "Chemistry of ayurvedic crude drugs IV: guggulu (resin from *commiphora mukul*-4 absolute stereochemistry of mukulol," Tetrahedron, vol. 32, no. 12, pp. 1437-1441, 1976.
45. H. Matsuda, T. Morikawa, S. Ando 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, vol. 52, no. 10, pp. 1200-1203, 2004.
46. I. Kimura, M. Yoshikawa, S. Kobayashi 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, vol. 11, no. 8, pp. 985-989, 2001.
47. J. Xu, Y. Guo, P. Zhao et al., "Neuroprotective cadinane sesquiterpenes from the resinous exudates of *Commiphora myrrha*," Fitoterapia, vol. 82, no. 8, pp. 1198-1201, 2011.
48. L. O. Hanus, T. Rezankab, V. M. Dembitskya, and A. Moussaieffa, "Myrrh-*Commiphora* chemistry," Biomedical Papers, vol. 149, no. 1, pp. 3–28, 2005.
49. V. D. Patil, U. R. Nayak, and S. Dev, "Chemistry of Ayurvedic crude drugs-I: Guggulu (resin from *Commiphora mukul*)-1: steroidal constituents," Tetrahedron, vol. 28, no. 8, pp. 2341 2352, 1972.
50. K. K. Purushothaman and S. Chandrasekharan, "Guggulsterols from *Commiphora mukul* (Burseraceae)," Indian Journal of Chemistry Section B, vol. 14, pp. 802-804, 1976.
51. A. G. Bajaj and S. Dev, "Chemistry of ayurvedic crude drugs-V. Guggulu (resin from *Commiphora mukul*)-5 some new steroidal components and, stereochemistry of guggulsterol-I at C-20 and C-22," Tetrahedron, vol. 38, no. 19, pp. 2949-2954, 1982.
52. M. O. Fatope, S. K. S. Al-Burtomani, J. O. Ochei, A. O. Abdunour, S. M. Z. Al-Kindy, and Y. Takeda, "Muscanone: a 3-O-(1,8,14 trimethylhexadecanyl) naringenin from *Commiphora wightii*," Phytochemistry, vol. 62, pp. 1251-1255, 2003.
53. H. K. Kakrani, "Flavonoids from the flowers of *Commiphora mukul*," Fitoterapia, vol. 52, no. 5, pp. 221-223, 1981.
54. V. Kumar and S. Dev, "Chemistry of ayurvedic crude drugs-VII guggulu (resin from *Commiphora mukul*)-6: absolute stereochemistry of guggultetrols," Tetrahedron, vol. 43, no. 24, pp. 5933-5948, 1987.
55. S.-L. Su, J.-A. Duan, Y.-P. Tang et al., "Isolation and biological activities of neomyrrhaol and other terpenes from the resin of *Commiphora myrrha*," Planta Medica, vol. 75, no. 4, pp. 351 355, 2009.

56. H. Matsuda, T. Morikawa, S. Ando et al., "Absolute stereostructures of polypodane- and octanordammarane-type triterpenes with nitric oxide production inhibitory activity from guggulgum resins," *Bioorganic and Medicinal Chemistry*, vol. 12, no. 11, pp. 3037–3046, 2004.
57. S. Bose and K. C. Gupta, "Structure of Commiphora mukul gum I: nature of sugars present and the structure of aldobiouronic acid," *Indian Journal of Chemistry Section A*, vol. 2, pp. 57-60, 1966.
58. M. A. Ali and M. Hasan, "Chemical investigation of Commiphora mukul Engl. (Burseraceae)," *Pakistan Journal of Scientific and Industrial Research*, vol. 10, pp. 21-23, 1967.
59. G. V. Satyavati, "Guggulipid: a promising hypolipidemic agent from gum guggul (*Commiphora wightii*)," *Economic and Medicinal Plant Research*, vol. 5, pp. 48-82, 1991.
60. Jain A, Gupta VB. Chemistry and Pharmacological profile of Guggul – A Review, *Indian Journal of Traditional Knowledge* 2006; 5(4):478-483.
61. Khare CP. Indian medicinal plants, An Illustrated Dictionary. New York: Springer Science + business media, LLC; 2007: pp. 32, 33, 79, 101, 238, 239, 263, 653, 654.
62. Sarup P, Bala S, Kamboj S. Pharmacology and Phytochemistry of Oleo-Gum resin of *Commiphora wightii* (Guggulu). *Scientifica* [internet]. 2015 [cited on 2019 Jun 30]; 2015:138039. Available from <https://www.ncbi.nlm.nih.gov> [PubMed]