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CHEMICAL COMPOSITION AND PHARMACOLOGICAL USES OF BOSWELLIA SERRATA- A SHORT REVIEW

Ghulam Mohmmad Jan*[1], Gh. Hassan Bhat[2], Abdul Wahid Shah[3]

[1]Department of Chemistry, Govt. Degree College for Boys Anantnag J&K (India)
[2]Department of Botany, Govt. Degree College Dooru Anantnag J&K (India)
[3]Department of Zoology, Govt. Degree College Bemina Srinagar J&K (India)

Abstract:
An enriched extract of "Indian Frankincense" (usually Boswellia serrata) was used in a randomized, double-blinded, placebo-controlled study of patients with osteoarthritis. Patients receiving the extract showed significant improvement in their arthritis. "behavioral effect [of insensole actetate] a main chemical constituent of frankincense was concomitant to reduced serum corticosterone levels, dose-dependent down-regulation of corticotropin releasing factor and up-regulation of brain derived neurotrophic factor transcripts IV and VI expression in the hippocampus. These data suggest that IA modulates the hypothalamic–pituitary–adrenal (HPA) axis and influences hippocampal gene expression, leading to beneficial behavioral effects supporting its potential as a novel treatment of depressive-like disorders."

Keywords: *osteoarthritis, corticosterone, insensole actetate, neurotropic factor*

Corresponding author:
Ghulam Mohmmad Jan,
Department of Chemistry,
Govt. Degree College for Boys Anantnag ,
J&K (India).
E Mail: gmjan64@gmail.com

QR code

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INTRODUCTION:

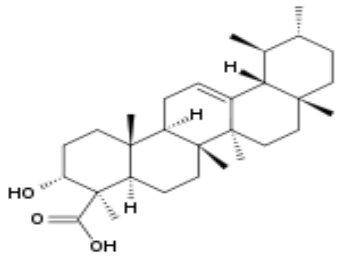
Myrrh is oleo-gum resin exudates obtained from several species in the genus Commiphora. It contains ca. 57–61% water-soluble gum, 7–17% volatile oils, and 25–40% alcohol-soluble resins and 3–4% impurities (Karamalla, 1997; Massoud et al.,2001) [1-3]. The alcohol-soluble resins of myrrh consist of camphoric acids, commiphorinic acid, heeraboresene, heerabomyrrhols, and commiferin (Bradley, 1992; Leung and Foster, 1996; Newall etal., 1996; Rao et al., 2001)[4-6]. Furthermore, the resins were found to contain α-, β-, and γ-commiphoric acids, commiphorinic acid, α- and β-herrabomyyhols, heerboresene, commiferin, kertosteroids, compesterol, β-sitosterol, cholestrerol, α- amyrone and 3-epi-α-amyrin (Rao et al., 2001) [7-9]. Two triterpenes have been identified in the resins of C.incisa and C. kua and their potential chemotaxonomic significance indicated (Provan and Waterman, 1986).The volatile oil fraction contains different terpenes, sesquiterpenes, esters, elemol, cinnamaldehyde, cuminaldehyde, cumicalcohol, eugenol, heerabolene, limonine, dipentene, pinene, m-cresol, cadinene and numereous furanosesquiterpenes (Rao et al., 2001), myrcene and α-camphorarene; steroids including Z-guggulsterol, and I, II, III guggulsterol (Kapoor, 1990; Huang,1999), aldehydes and alcohols (Treas and Evans,1978) [10-12].The water-soluble gum or mucilage fraction is composed mainly of acidic polysaccharide with galactose, xylose, 4-0-methyl-glucuronic acid and arabinose in a ratio of 8: 7: 2 with ca. 18–20% protein (Bradley, 1992; Wichtl and Bisset, 1994), and also on hydrolysis the gum yields arabinose, galactose, xylose and 4-0-mythylglucuronic acid (Leung, 1980; Evans, 1989 [14-16]. Characteristic constituents of myrrh are mainly terpenoids, including furanosensequiterpenoids with eudesmane, germacrane, elemane, or guaiane structures (Bradley, 1992; Witchtl and Bisset, 1994), wheras íts characteristic odor is due to the furanosesquiterpenes (Bruneton, 1995), which may also be the characteristic components of pharmaceutical myrrh (Wichtl and Bisset, 1994). Extraction of gum myrrh with 90% alcohol yield a crude polysaccharide (PS) in the ranged of 27%–60% (Treas and Evan, 1978) while the crude PS ofmyrrh is found to contain 18% protein (Andersonet al., 1965) [17-20].

The gum portion was found to contain 2 polysaccharides: I) composed of 1 galactose: 1arabinose and II) composed of 2 galactose: 1 galacturonic acid (El-Khadem and Megahed, 1956). The terpenoid portion contains boswellic acids and albanoresin. The boswellic acids components are shown to be the active constituents in Boswellia for many of its medicinal uses (Safayhi et al., 1992; Ammon et al., 1993). Boswellic acids are further known to contain β-boswellic acid, acetyl-α-boswellica acid, and acetyl-β-boswellic acid, and associated 3-acetyl-11-hrdroxy-β-boswellic acid and 11-keto-β-boswellic acid acetate chemicals (Corsano and Iavarone, 1964; Huang et al., 2000).Today, extracts for frankincense are typically standardized to contain 37.5–65% boswellic acids (Ammon et al., 1993).13C NMR analysis of crude steam distillation of frankincense from B. papryfera in Ethiopia indicated that the main component (88%) of the resin is octyl acetate, a result also confirmed by GCMS analysis supported by NIST and Wiley database(Ermias Dagne et al., 1997). The purified PS from B. papyrifera has 4–8 % protein (Anderson et al., 1965) while Abdel Kariem (1992) has recently reported That the protein content of crude PS of B. papyriferais only 3.9%.

Chemical composition

These are some of the chemical compounds present in frankincense:

- Acid resin (56 per cent), soluble in alcohol and having the formula $\mathbf{C_{20}H_{32}O_4}$"
- gum (similar to gum arabic) 30–36%
- 3-acetyl-beta-boswellic acid (Boswellia sacra)
- alpha-boswellic acid (Boswellia sacra)
- 4-O-methyl-glucuronic acid (Boswellia sacra)
- incensole acetat e
- phellandrene



Frankincense is used in perfumery and aromatherapy. It is also an ingredient that is sometimes used in skincare. The essential oil is obtained by steam distillation of the dry resin. Some of the smell of the frankincense smoke are products of pyrolysis. Frankincense is used in many Christian churches including the Eastern Orthodox, Oriental Orthodox and Catholic churches. According to the gospel of Matthew , gold, frankincense, and myrrh were among

the gifts to Jesus by the biblical magi "from out of the East." The Judaic, Christian and Islamic Abrahamic faiths have all used frankincense mixed with oils to anoint newborn infants, initiates, and members entering into new phases of their spiritual lives.

PHARMACOLOGICAL USES:

Several folklore claims about natural drugs have continued to be verified on modern scientific grounds. Similarly, both frankincense and myrrh have found modern pharmacological applications for several disease treatments most of them as predicted by the traditional therapies. Particularly, their unique chemical compositions, pharmacological activities and non-toxicity tend to support the safe use of these popular traditional drugs in modern therapies (Michie and Cooper, 1991). Recently, two compounds of myrrh,furanoeudesma-1, 3-diene and curzarene, are reported to have indeed pronounced pain relieving (analgesic) properties as claimed by traditional therapies (Archaeology, 1996). The anti-inflammatory, antipyretic and antihistaminic effects of Commiphora myrrha (Tariq et al., 1985), hypolipidemic (Malhotra et al., 1977), hypocholesteremic, antiartheroscerotic (Lata et al., 1991), antiarthritic potential (Duwiejua et al., 1993), antigastric ulcer and cytoprotective effect (Al- Harbi et al., 1997), anti-tumour potential (Queshi et al., 1993; Al-Harbi et al., 1994), smooth muscle relaxing effect of C. guidottii (Claeson et al., 1991), anti-inflammatory effect of C. mukul and C. incise (Duwiejua et al., 1993), antiulcer effect (Al-Harbi et al., 1997); anti-schistosomiasis (Massoud et al., 1998), anti-fascioliasis (Massoud et al., 2001), reduction of cholesterol and triglycerides (Michie and Cooper, 1991), hypolipidemic (Malhotra et al., 1977), hypocholesteremic and antiartherosclerotic (Lata et al., 1991), pediatric and blood lipid remedies in Children (Michie and Cooper, 1991), and without toxicity side effects (Rao et al., 2001; Massoud et al., 2001) were verified. Myrrh also has astringent properties and has a soothing effect on inflamed tissues in the mouth and throat. Studies continue on the potential anticancer actions of myrrh resin (Al Harbi et al., 1994; Dolara et al., 1996) [21]. In addition to its antiseptic and expectorant abilities, myrrh destroys putrefaction in the intestines and prevents the absorption of toxins in the blood; it stimulates blood flow to the capillaries and promotes menstruation (Nadkarni, 1976; Frawley and Lad, 1986). The resinous portion of myrrh/guggal carries significant anti-inflammatory, ant rheumatic and hypocholesterolemic/hypolipaemic activity. It is also known for a rich source of steroids, which may find use as an alternative raw material for the synthesis of important corticosteroid drugs such as dexamethasone and betamethasone (Bhatt et al., 1989). For instance, a preparation by name ‘Guglip’ developed from guggal (gum resin from Commiphora wightii) by the Central Drug Research Institute, Lucknow in India is reported to possess hypolipiemic activity equivalent to that of clofibrate (ethyl p-chlorophenoxyisobutyrate)-the present drug of choice (Bhatt et al., 1989). As Clofibrate is being discontinued and phased out in the USA on account of its toxic manifestations, there is ample scope for introducing guglip on a commercial scale (Bhatt et al., 1989). In Chinese medicine, myrrh from C. myyrha (syn C. molmol) is used as a component in many patent medicines, including bu-gu-zhi-wan (Psoralea Pills) and zhi-wan (Hemorrhoid Pills), as well as various topical plaster-adhesives and lotions, including die-da-yao-jing (Traumatic Injury Medicine Essence) (Fratkin, 1986; Yen, 1992). In Germany, myrrh gum-resin and myrrh tincture are both official in the German Pharmacopeia, approved in the Commission E monographs, and the tincture dosage form is official in the German Standard License monograph (Wichtl and Bisset, 1994; Deutsches Arzneibuch (DAB), 1997). The tincture is used as a mono-preparation and also as a component of various dental remedies and mouthwashes, toothpaste, ointments, paints, and coated tablets,where the applications by paint, gargle, and/or rinse are used in dentistry (Wichtl and Bisset, 1994). For example, the product Merfluan® is an effervescent dentifrice salt with myrrh (Mielck, 1970). Pediatric medicine, tincture of myrrh is used in Germany to treat oral condidiasis (thrush), which is common in infants (Schilcher, 1997). In the United States, myrrh was formerly official in the United States Pharmacopeia and National Formulary (Leung and Foster, 1996). It was used as an aromatic astringent mouthwash (Taber, 1962). Myrrh’s constituents include aldehydes and phenols, which stimulate drying and cleansing actions through topical administration. As a salve, myrrh is used to treat hermorrhoids, wounds, and bedsores. In tincture form, gargles and mouthwashes are considered useful in treating sore throats or other oral mucosal or gingival irritations (Tyler, 1993). The British Herbal Pharmacopoeia (BHP) reported antiseptic action of myrrh (BHP, 1996). The Merck Index reported its therapeutic action as carminative and astringent (Budavari, 1996). Myrrh has also shown to have disinfecting, deodorizing, and granulation-promoting properties (Wichtl and Bisset, 1994). The British Herbal Compendium indicates the use of myrrh tincture as a gargle to treat pharyngitis and tonsillitis

(Bradley, 1992). In France, its topical use is approved for the treatment of small wounds, for nasal congestion from the common cold, and for local application as an anodyne to treat affections of the buccal cavity and the oropharynx (Bradley, 1992; Bruneton, 1995). The approved modern therapeutic applications for myrrh are based on its long history of use in well-established systems of traditional and conventional medicine, case studies, in vitro studies, pharmacological studies in animals, and on phytochemical studies of its volatile oil, gum and resin fractions (Blumenthal et al., 1998). Frankincense has also been employed for medicinal purposes since antiquity. In all human civilizations (Egyptians, Greeks, Romans, Chinese, Arabs, Indians, etc.) it was used as anti-catarrhal, anti-depressant, anti-intiseptic, anti-tumoral, diuretic stimulant, emmenagogue, for treatment of cough and asthma, as expectorant, immune stimulant, and sedative (Wahab et al., 1987; Gore enterprises (1999). In today's world as well, it is used for asthma, ulcers, aging, allergies, snake and insect bites, bronchitis, cancer, carbuncles, catarrh, colds, coughs, diarrhea, diohtheria, headaches, healing, hemorrhaging, herps, high blood pressure,inflammation jaundice, laryngitis, meningitis,nervousness, prostate, pneumonia, respiratory problems, scarring sciatic pain, soars, spiritual awareness, staph, strep, stress, syphilis, T.B., tension, typhoid, wounds, warts and to strengthen the immune system (Leung and Foster, 1996). Pharmacological applications recently justified that frankincense can be used as anti-tumor and anti-carcinogenic (Huang et al., 2000), anti-inflammatory activity (Shao et al., 1998; Safayhi et al., 2000; Krieglstein et al., 2001), anti-proliferative effects (Glaser et al., 1999; Hoernlein et al., 1999), anti-chronic colitis (Gupta et al., 2001), antibronchial asthma (Gupta et al., 1998; Safayhi et al., 2000), anti-human leukemia HL-60 cells and the DNA, RNA and protein synthesis in HL-60 cells (Shao et al., 1998). Controlled, double blind studies have shown that Boswellia extracts are very helpful for ulcerative colitis (Singh and Atal, 1986). The anti-inflammatory effects of treatment with Boswellia extract or AKBA (Acetyl-11-keto-β- boswellic acid) in experimental ileitis in rats arecomparable to those achieved by treatments with standard drugs of Inflammatory Bowls Disease (IBD) such as prednisolone and sulfasalazine (Yamada et al., 1993), and pilot study in human ulcerative colitis of the same procedure reported fewer side effects of treatment with Boswellia extract than with steroids (Gupta et al., 1997). Boswellia extracts inhibits pro-inflammatory mediators in the body, such as leukotrienes (Singh and Atal, 1986), and as opposed to NSAIDS, long-term use of boswellia extracts (crude) does not lead to irritation or ulceration of the stomach (Gupta et al., 2001).

CONCLUSION:

Boswellia serrata oil is used to appear to distinguish cancerous from normal bladder cells and suppress cancer cell viability." Cancer Studies and Molecular Medicine announced the findings after a year studying the AKBA compound with ovarian cancer cell lines in vitro that showed it is effective at killing late stage cancer cells. Among surprising findings were that some cells that had become resistant to chemotherapy were killed during the in vitro study. The efficacy of AKBA as a potential medicine for treatment of cancers(colon, breast and prostate) has been tested. The results are based on the preliminary and unverified findings of the laboratory study.

REFERENCES:

[1] Anderson, D.M.W., Cree, G.M., Marshall, J.J. and Rahman, S. (1965). Studies on uronic acid materials part XI.

[2] The carbohydrate component of the oleo-resin from B. papyrefera. Carbohydrate Research **1**:320–323.

[3] Angeel, A.M., Mossa, J.S., Tariq, M., Al-Yahya, M.A. and Al-Said, M.S. (1987). Plants Used in Saudi Folk Medicine. King Saud University Press, Riyadh, 121 pp.

4. Anonymous (2001). Tapping Ethiopia's gum Arabic. http://www.telecom.net.et. Accessed on November2, 2001.

5. Archaeology (1996). News brief–medicinal myrrh. Vol. 49 Issue 3. Archaeological Institute of America.

6. Bhatt, J.R., Nair, M.N.B. and Mohar Ram, H.Y. (1989). Enhancement of oleo-gum resin production in Commiphora wightii by improved tapping technique. Current Science **58**(7):349–357.

7. Blumenthal, M., Busse, W.R. and Goldberg, A. (eds).Klein, S. and Rister, R.S. (trans) (1998). The Complete Commission E Monographs: Therapeutic Guide to Herbal Medicines**.** American Botanical Council, Austin; Integrative Medicine Communications, Boston, pp. 173–174.

8. Bradley, P.R. (ed.) (1992). British Herbal Compendium**.** Vol. 1. British Herbal Medicine Association, Bournemouth.

9. BHP (1996). British Herbal Pharmacopoeia (BHP**).** British Herbal Medicine Association, 141, Exeter, U.K.

10. Brown, D. (1995). Encyclopedia of Herbs and their Uses. DK Publishing, Inc., New York, 265 pp.

11. Bruneton, J. (1995). Pharmacognosy, Phytochemistry and Medicinal Plants. Lavoisier Publishing, Paris.
12. Budavari, S. (ed.) (1996). The Merck Index: An Encyclopedia of Chemicals, Drugs, and Biologicals, 12th ed.Whitehouse Station, Merck & Co Inc., N.J.
13. Chopera, R.N., Handa, K.L. and Kapoor, D. (1958). Indigenous Drugs of India, 2nd ed. Dhar & Sons,Calcutta.
14. Claeson, P., Andersson, R. and Samuelsson, G. (1991). T-Cadinol: A pharmacologically active constituent of scented myrrh: Introductory pharmacological characterization and high field 1Hand13 C- NMR data. Plant Med. **57**:352–356.
15. Claeson, P. and Samuelsson, G. (1998). Screening of some Somalian medicinal plants for antidiarrhoeal
effects in mice. Phytother. Res. **3**:180–183.
16. Clifford, T. (1984). Tibetan Buddhist Medicine and Psychiatry. Samuel Weiser, Inc., York Beach, ME.
17. Corsano, S. and Iavarone, C. (1964). Isolamento dall'incenso dell'acido 3-acetil-11-ossi-β-bosvellico. Gazz. Chem. Ital. **94**:328–339.
18. Council of Europe (1981). Partial agreement in the Social and Public Health Field. Flavouring substances
and natural sources of flavourings. List N2, no. 150. Editeur Maisonneuve, Strasbourg, SA.
19. DAB (1991). Deutsches Arzneibuch (DAB), 10th ed. Vol. 1–6, Kommentar. Wissenschaftliche Verlagsgesellschaft, Stuttgart, Germany.
20. Dolara, P., Luceri, C. and Ghelardini, C. (1996). Analgesic effects of myrrh. Nature **376**:29.
21. Dörr, A. (1973). Frankincense, myrrh and opoponax. Dragoco. Rep. **20**:100–102.