



Review Article

OLIBANUM GUM AND IT'S MEDICAL APPLICATIONS

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ABSTRACT

Frankincense is resinous exudate obtained from trees of genus *Boswellia* belonging to family Burseraceae. Widely distributed in regions of Africa, Arabian Peninsula and India. It was used in ancient religious ceremonies for its incense or to perform burial rituals. Historically it was used in Chinese medical tradition as well as in Indian ayurveda for treatment of inflammatory diseases. This article aims at evaluation of the effects of frankincense on major inflammatory diseases like asthma, diabetes and cancer and focusses on the need to incorporate frankincense into a novel drug delivery formulation so as to achieve the maximum therapeutic potential of frankincense.

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1. INTRODUCTION

At the point when the bark of specific trees and bushes is harmed by creepy crawlies or by manual tapping, the plants (commonly those that develop in semiarid conditions) exude a sticky substance that solidifies to seal the injury and give insurance from disease and drying up. The solidified exudate appended to the plant is known as a tear. Tears were articles of business well before written history. They could be effectively assembled, separated, powdered, and solubilized in water to deliver a thick and for the most part sticky glue that was helpful as a sustenance fixing, for restorative applications, for estimating textures, for making early kinds of paper, and for printing.¹

2. GUM OLIBANUM

Gum olibanum (also known as frankincense) is a natural gummy exudate obtained from several varieties of frankincense trees of family Burseraceae. It plays a vital role in both cultural as well as religious aspects. Olibanum has been widely utilized in medical traditions of Arabian Peninsula, India, China and Northeast Africa. It has various

medicinal uses. It is used in aromatherapy, perfumery, skincare and pharmaceutical industry.²

Source & Geographical distribution

Frankincense comes under the family of plants producing balms and resins in uncommon tissue channels that is Burseracea consisting genus *Boswellia*. This family comprise of around 700 species from 18 genera. The class of *Boswellia* is broadly found in the dry regions of Africa (Somalia, Sudan, Ethiopia, and Eritrea), the Arabian Peninsula (Oman and Yemen), and in India.

The genus *Boswellia* has been given different names according to the region from which it is obtained like the name *Boswellia carterii* Birdw. was received from the Somalian tree and the name *Boswellia sacra* Flückiger from the South-Arabian (Oman, Yemen) plant. Nonetheless, a large portion of the creators propose that *B. sacra* Flückiger and *B. carterii* Birdw. are in reality two distinct species. Other members of genus *Boswellia* incorporate *Boswellia serrata* Roxb. ex Colebr. (India), *Boswellia pirottae* chiov. (Ethiopia), *Boswellia dalzielii* Hutch. (West

Africa), *Boswellia rivae* Engl. (Ethiopia), *Boswellia ogadensis* Vollesen (Ethiopia), *Boswellia popoviana* Hepper (Yemen).³

Indian Frankincense

Indian frankincense (*Boswellia serrata* Roxb. ex Colebr). is utilized for grain, timber and is tapped for an oleo-sap referred to universally as Indian olibanum. The fundamental business employments of *B. serrata* oleo-gum are restorative, religious, and in beautifiers and perfumery. India is the main producer of *B. serrata* oleo-gum and most of the part is produced from the parts of Madhya Pradesh, Andhra Pradesh, Gujarat and Jharkhand.⁴

Collection of Olibanum

These plants comes under the category of deciduous trees that can achieve a stature of up to 5 meters yet for the most part are reliant on sort of species and the developing territory to decide their last tallness. The *Boswellia* plants have uncovered stems and branches with a stripping bark and seem hedge or tree like. Parts of *Boswellia* plants have compound leaves and an odd number of handouts.

Frankincense exudes from the trunk of the tree (Fig. 1) After a series of incisions of about 10 cm, at a profundity of ~5 mm and 6–8 cuts in a season. These cuts must be made with caution into the trunk of the tree, whereby a little portion of the bark is stripped off (Fig. 2A). When the smooth substance overflows out from the pitch creating ducts (Fig. 2B) it is solidified by air exposure (Fig. 2C), deeper cuts will result into good quality of exudate, which is collected as a final product (Fig. 2D).⁵



Figure 1. *Boswellia sacra* tree in Dhofar region, south of Oman.

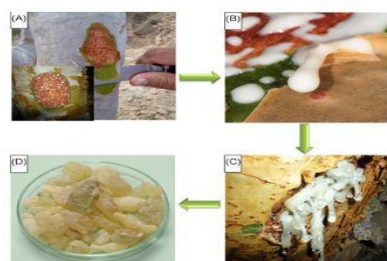


Figure 2. Frankincense resin from *B. serrata* tree.

3. MORPHOLOGICAL CHARACTERIZATION

Different species have different physical appearance including texture, size, colour. This appearance also show variation in different grades of similar species

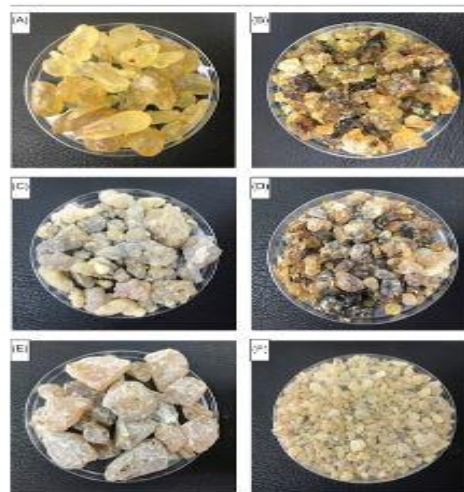


Figure 3. Resins of two main grades of *B. sacra* Hougari (A) and Sha'abi (B), *B. papyrifera* (C), *B. oblongata* (D), *B. serrata* (E), *B. socotrana* (F).

4. CHEMICAL CONSTITUENTS

It contains 30-60% resins, 5-10% essential oils, along with arabinose 65% galactose and xylose (water soluble polysaccharides). The resin exudate contains terpenes: mono(α -thujene), di(incensole, isoincensole oxide, incensole oxide, alcohol serratol), triterpenes (amyriins α and β), tetracyclic triterpenes and pentacyclic triterpenes.⁶

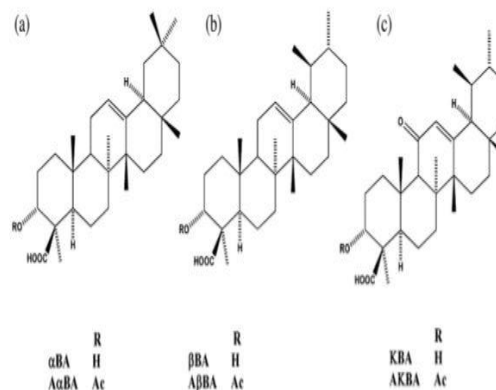
The pharmacological effect is due to pentacyclic triterpenes. Major pentacyclic triterpenes are

α boswellic acid (α BA)

β boswellic acid (β BA)

ketoboswellic acid (KBA)

11 keto acetyl boswelli acid (AKBA)



Characteristics	β -Boswellic acid	Acetyl- β -Boswellic acid	11-keto- β -Boswellic acid	Acetyl-11-keto- β -Boswellic acid
Molecular formula	$C_{30}H_{48}O_3$	$C_{32}H_{48}O_4$	$C_{30}H_{46}O_4$	$C_{32}H_{46}O_5$
Molecular weight	456.7	498.74	470.69	512.73
Chemical name	3 α -Hydroxy urs-12-en-23-oic acid	3 α -Acetoxy urs-12-en-23-oic acid	3 α -Hydroxy urs-12-en-11-keto-23-oic acid	3 α -Acetoxy urs-12-en-11-keto-23-oic acid

Historical aspects

The most established composed record about the utilization of frankincense for the treatment of illnesses was the old Egyptian papyrus

Ebers, and as right on time as in the first century AD, the utilization of frankincense has been accounted for in the Ayurvedic therapeutic writing (Charaka Samhita). Doctors like Dioskurides, Galenus, have utilize frankincense preparations. The principle goal of these early applications was the treatment of a wide assortment of ailments, for example, tumors, edemas, and incendiary ailments, yet in addition of loose bowels and infections of the respiratory tract. The utilization of frankincense lost significance in light of the advancement of current chemotherapeutic mixes. The trust of medicinal specialists in medications from the pharmaceutical business developed, while the centrality of "natural product" was decreasing. However, frankincense returned, and in 2008 Olibanum indicum was again part of the European Pharmacopoeia. The just little difficulty is that there still exists no frankincense-based affirmed proprietary product; this is because of the mind-boggling expense engaged with examinations and endorsement.⁸

Export and Import

The Indian Trade send out code for 'Olibanum or Frankincense' HS 13019032, which empowers evaluation of fare esteem and volume of predominantly *B. serrata* oleo-gum sap. In agrarian years (Apr-Mar) of 2015-2016 (102.8 metric tonnes) and 2016-2017 (75.6 metric tonnes), the fundamental goal for Indian frankincense was the Republic of Trinidad and Tobago pursued by Germany. The UN COMTRADE database gives the idea that Trinidad is without a doubt a noteworthy shipper of regular gums, and mostly from India. Mexico, USA and Guteala were among other importers.⁴

Population Threat

In India decline in population of frankincense is not significantly evident. However in Ethiopia which has a 55 M ha dry forest and woodland cover among which most of the woodlands are the home of frankincense tree species particularly *Boswellia papyrifera* which has been traded and used for domestic purposes for long time, are rapidly declining and degrading. Absence of enrollment through natural regeneration, high rate of deforestation, rapid rate of growing cropland and exceptionally high grown-up mortality are the major factors contributing to population decline.⁹

5. MEDICINAL APPLICATIONS

Antimicrobial activity

Assessment of its in vitro antifungal movement on the mycelial development and aflatoxin creation by two *Aspergillus* species, viz., *A. flavus* (Strain SQU21) and *A. parasiticus* (Strain CBS921.7) showed that the fundamental oil of *B. sacra* frankincense significantly ($p < 0.05$) diminished aflatoxin emission for *A. flavus* (45.8– 83.7%) and *A. parasiticus* (41.3– 83.5%).³

Antioxidant activity

When nitric oxide is produced in large amounts it gives indication of some diseases. The alcoholic extract of olibanum showed moderate NO-scavenging action and weak antioxidant activity at a conc. of $1,000 \mu\text{g} \cdot \text{mL}^{-1}$.¹⁰

Anti-inflammatory activity

Anti-inflammatory activity is particularly due to the following active ingredients α pinene, linalool and 1-octanol which is higher in frankincense oil than frankincense water extract. When the frankincense

oil is applied topically it exhibits anti-inflammatory and analgesic effect by blocking nociceptive inflammatory infiltrates and cox2 overexpression.

Anti-asthmatic activity

Asthma is an inflammatory disease of lungs cause by external stimuli resulting in inflamed airways causing difficulty in breathing. Asthma patients that were given *Boswellia serrata* preparations for 6 weeks 70% of them showed disappearance of signs and symptoms such as dyspnea, rhonchi and number of attacks. Frankincense act by inhibition of leukotriene biosynthesis thus preventing various inflammatory diseases like asthma.¹²

Autoimmune Diabetes

LADA is a slow progressing form of autoimmune diabetes. It occurs as pancreas stop producing insulin due to the damage to beta cells as result of insulinitis. It involves the increase in tyrosinephosphatase antibody (IA₂-A) indicating the inflammation of the islets of Langerhans. *Boswellia* extracts given to LADA patients have shown to reduce IA₂-A antibody. However no significant data is available till now that supports this hypothesis.¹³

Anticancer activity

Studies have shown that boswellic acid derivatives particularly β boswellic have anticancer and antitumor activity. Boswellic acid (AKBA & KBA) implements its cytotoxic activity by inhibiting topoisomerase I and IIa as a result of which cell growth and proliferation retards by inducement of apoptosis via a caspase-8 dependent pathway in human leukemia, colon and other cancer cells. On treatment with AKBA morphological changes occurs in HL-60 cells indicating apoptosis. When boswellic acid derivatives were examined for in vitro antitumor activity they were found to inhibit the synthesis of DNA, RNA and protein in HL-60 cells in a dose dependent manner.¹⁴ The study was also carried evaluate carboxymethyl gellan gum bioadhesive polymer for drug delivery system.

6. CONCLUSION

Frankincense was the part of ancient customs where it was used for its incense and in burial rituals. In Chinese medical tradition it was used for treatment of various inflammatory diseases and had also played a vital role in Indian Ayurveda. Due to its anti-microbial, antioxidant and anti-inflammatory activity it have shown satisfactory results in the treatment of major inflammatory diseases such as asthma, diabetes and cancer diseases. However, instability of boswellic acid in pharmaceutical formulation and lack of its toxic profile or side effects acts as a major hurdle that needs to be crossed in order to be able to successfully formulate the dosage form. The use of frankincense as thiomers in delayed drug release system is one such approach for its optimum therapeutic utilization. However more study on frankincense and clinical data is required to be used it as in novel formulation.

7. CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest.

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