



## A REVIEW ON BIOACTIVE POTENTIAL OF BENZOIN RESIN

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### ABSTRACT :

Styrax benzoin (benzoin resin) is a perennial tree belonging to the family (Styracaceae). It has been cultivated in the different regions of the world for thousands of year for incense and pharmaceutical preparations. Styrax benzoin usually contains benzaldehyde, benzoic acid, benzyl benzoate cinnamic acid and vanillin. Its chemical composition is influenced by the place of its origin, geographical, and climatic conditions. Styrax benzoin has been used traditionally for the treatment of skin diseases, arthritis, wounds, muscle pain, anxiety, and nervous disorders. Benzoin oil is widely used in the food, drinks and alcoholic beverage to give flavor, and for varnishing woods. The methods of production of resins are much traditional so there is a growing need to develop the new methods to maximize the production of resins.

Key words: Benzoin resin, dermatology, cinnamic acid, diuretic

### INTRODUCTION

#### NATURAL PRODUCT

The benzoin resin is used extensively in traditional medicine for its many reported therapeutic properties. The essential oils of three different types of benzoin resin were extracted using the traditional method in this study. The yield of essential oils of the white, red and gray types of resin was 1.01, 0.92 and 0.54%, respectively. The obtained extracts were tested against two types of pathogenic bacteria, *Staphylococcus aureus* and *Escherichia coli*. The tests showed that essential oil of gray type resin is effective against both *Escherichia coli* (14 mm) and *Staphylococcus aureus* (11 mm). The antioxidant activity has been also evaluated to compare the efficiency of different type of resin with DPPH assay. In the DPPH system, the antioxidant activity of the red resin extract (0.01 µg/mL) was superior to that of the white (27.32 µg/mL) and gray (42.90 µg/mL) extracts, with IC<sub>50</sub> values, respectively [Calsamiglia, et al 2007].

The discovery of many therapeutic agents from the natural sources has raised the international interest in the medicinal plant at the national and international levels. The recommendations of the medical and pharmaceutical conferences held in recent years, call for the need to reduce the consumption of synthetic drugs, and to return to medicinal plants and interest in them as a safe source for the manufacture of medicines [M. Front Pharmacol. 2013]. Several studies on the use of these biologically active compounds from natural sources (plants, microbial cultures, etc) as substitutes for many synthetic materials have been considered due to both antioxidant and antimicrobial activities [G. Pharm Biol, et al 2008]. Due to the importance of medicinal plants, we have chosen the benzoin resin as a subject of this study because of its widely popular uses and past scientific studies of its therapeutic properties. An investigation was conducted to test the antibacterial and antioxidant efficacies of some resin plants with the ultimate aim to develop plant based drugs for the management of diseases caused by pathogenic bacteria and free radicals.

#### Antibacterial activity

After extraction of essential oils of resin, the obtained extracts were tested for the two types of pathogenic bacteria *Staphylococcus aureus* (Gram (+), ATCC 25922) and *Escherichia coli* (Gram (-), ATCC 25923). Tests of antimicrobial activity of essential oils were conducted in the Laboratory of Microbiology at Sliman Armart Hospital Touggourt, Algeria. We prepared five concentrates (100, 75, 25, 50 and 5%) for each extract using ethanol as solvent. The antibacterial activity test for the essential oil of three types of resin was followed by the direct method proposed by National Committee for Clinical Laboratory Standards (NCCLS) for the testing of antibiotics with the replacement of antibiotics with essential oils [NCCLS, 2000.]

#### Antioxidant activity

The antioxidant activity of the resin extracts and the standard was evaluated on the basis of the radical scavenging effect of the stable 2,2-diphenyl-1-picrylhydrazyl (DPPH)-free radical activity by the method of Blois [5]. The stock solution of crude extracts (2 mg/mL) was prepared by dissolving a known amount of dry extract in 10% DMSO of ethanol. The working solution (10, 20, 30, 40 and 50 µg/mL) of the extracts were prepared from the stock solution using suitable dilution. Ascorbic acid was used as standard in 1-100 µg/mL solution. 0.1 mM of DPPH was prepared in ethanol and 1 mL of this solution was mixed with 3 mL of sample solution and standard solution in test tubes separately in triplicates. These solution mixtures were shaken vigorously, then were allowed to stand at dark for 30 min and optical density was measured at 517 nm using UV-VIS Spectrophotometer. Ethanol

(3 mL) with DPPH solution (0.1 mM, 1 mL) was used as blank. Ethanol was used for base line corrections in absorbance of sample.

#### Natural Perfumery and Incense

Benzoin resin is most popular as incense. If you are blending your own perfume or incense, you can use benzoin resin as a base note—but use it sparingly, as it is rich and heavy, and you don't want to overwhelm your other ingredients. [M. S. Nature1958].

### Traditional Use and Health Benefits

- The resin and oil of the Benzoin tree has been cherished throughout history. It was deemed equally important as the more expensive and exotic Frankincense and Myrrh. With a strong, sweet, and balsamic scent, Benzoin was beloved by ancient royalty. It appears on ancient Egyptian papyrus records showing that it was traded across the Red Sea to Asia.
- It has a long history of medicinal use as a tonic for skin infections and to provide relief from respiratory conditions such as asthma and bronchitis. Nowadays it is used in cough lozenges and is a common ingredient in perfumes. Like Frankincense and Myrrh, Benzoin resin has a long history of use as a medicine and incense especially in the East. It is a main ingredient in 'Friar's Balsam', which is used as an expectorant and topical antiseptic.

#### Skin Health

Benzoin benefits the skin in many ways. It is antimicrobial, antiseptic, anti-inflammatory and astringent. It accelerates the healing of wounds, ulcers and relieves eczema, psoriasis and rashes. Essential oil of Benzoin is a common ingredient in skincare products. It protects the skin by forming an invisible film which prevents moisture loss, improves elasticity and promotes smooth and supple skin. It can also be used on an itchy scalp, helping to prevent and treat dandruff and give the hair a glossy shine.



- **Emotional Balance**  
Benzoin resin incense can be burned to promote emotional balance, soothe away sadness, grief and anger. With an earthy, balsamic scent and sweet vanilla undertones, it is said to melt away blockages and open up the heart.
- Conversely, this beautiful incense is also energising and uplifting, promoting focus and concentration.
- Respiratory Health**
- With natural expectorant properties, Benzoin essential oil can be inhaled to drive out phlegm and provide relief from congestion in the respiratory tract. Its disinfectant properties will also help to draw out bacteria that cause infections such as coughs and colds.
- If coughing is keeping you awake at night, a few drops of Benzoin essential oil on your pillow can help you sleep by dampening the cough reflex and helping you relax.

### LITERATURE SURVEY

- PLANT PROFILE INTRODUCTION TO PLANT**

Styrax Benzoin (benzoin resins) are perennial trees which belong to the family (Styracaceae). Styracaceae is native to subtropical or

tropical regions, for example Mediterranean, North or South America and Asia. There are approximately 150 species of *Styrax* present which are used for the production of aromatic resin when they are burned. The *Styrax*, genus is different from all the members of the family *Styracaceae* due to the production of the resins which excrete from the trunks and barks of the plants after injured with sharp [G.-L. Zhang et al (2005)]. *Styrax* is self or cross pollinated and variability is present in flowers, fruits shape and colours and stem wood or chemical composition of resins due to cross pollination [M. Lobdell 2013]. *Styrax Benzoin* is known by different names depending where you are in the world. The common names of the *Styrax Benzoin* are benzoin resins, benzoin trees, Sumatra benzoin. *Styrax* in Swedish is known as benzoin. In German, it is called as benzoebaum. In Spanish, it is well known as bálsamo de Benjuí and in French as arbre à benjoin. In Chinese it is known as xi xiang. The species of *Styrax* is divided into two groups 'Siam Benzoin' and 'Sumatra Benzoin'.

### **Botanical Origin**

*Styrax benzoin* is native to the South-East or East Asia from tropical region to warm temperate of Northern Hemisphere. The name *Styrax* originates from the Greek word *sturax* and benzoin is derived from Arabic word *luban jawi* which means java incense. In Roman it was used approximately 2000 years ago. In 15th and 16th centuries, England imported benzoin in powdered form with spices for perfume preparation which was used by Queen Elizabeth I. Benzoin was also used in religious ceremonies and drives away the evil spirits in the culture of ancient Malayan. *Styrax Benzoin* trees are most abundantly present in Indonesia especially in Sumatra therefore it is also known as Sumatra benzoin. 1.3 Demography/Location *Styrax benzoin* grows in warm temperate to tropical regions. Some are found also across the equator in South America. Natural home of *Styrax benzoin* is Sumatra, Indonesia but it is also available in the Western countries from ancients.

*Styrax* species other than *Styrax benzoin* grow in many countries such as China, Laos, Malaysia, Vietnam, Cambodia and Thailand. The plant grows in the rain forests of tropical region of Sumatra. Singapore imports 5330 tons of benzoin, Malaysia 133 tons, China 77 tons, United Arab Emirates, 22 tons, Kuwait 16 tons, India 70 tons, Pakistan 16 tons, Saudi Arabia 10 tons, Japan 25 tons, respectively. Singapore is the biggest importer of benzoin resins and then Europe imports benzoin resins for pharmaceuticals and other direct importers of Sumatra benzoin are Indian sub-continent, Japan and other countries of Middle East. 1.4 Botany, Morphology, Ecology *Styrax benzoin* is a perennial tree of tropical areas which grow up to height of 15-25 meters. *Styrax benzoin* has tap roots which disappear laterally and tree also has shallow root system. Leaves are ovate and arranged alternately in the form of crown around the stem with hairy underside and smooth upper surface having length in the range of 6-10 cm and 3-5 cm wide. Flowers are bisexual and white in colour or bell shaped in the time of blooms in spring and has 5 petals which are arranged in the form of cluster along the branches. Fruits are closed in the hard and flat shell having the diameter approximately 2-3 cm. Seeds dormant after 6-7 months of fruit fall [R. Kiew, 1982]. Resins of *Styrax benzoin* obtained from tapping of the bark which is produced after 15-20 years. *Styrax benzoin* resins are yellow in colour when obtained and later it becomes reddish-brown after hardening and thickening. *Styrax benzoin* originated in rainforest that has medium to high altitude. Cultivation periods require 1300 millimetre rain per year or 3 to 6 dry months. Plants survive in extremely low or high temperatures ranging from -4 to 45°C. Soil having low base saturation and high acid content (pH below than 4.5) is required for best growth.

Chemistry *Styrax benzoin* is acrid, impressively aromatic and have strong vanilla like smell [P. Burger 2016]. Main components of *Styrax benzoin* are benzaldehyde, benzoic acid, benzyl benzoate, cinnamic acid and vanillin. Vanilla like fragrance of plant is due to the presence of vanillin. Cinnamates present in the *Styrax benzoin* are used as flavouring agent and produce chocolate like flavor. 2.1. Chemical composition *Styrax benzoin* contains cinnamyl cinnamate 8-14%, methyl cinnamate 10-17%, cinnamic acid 4-7%, benzyl cinnamate 2-4% and little amount of vanillin, benzoic acid, phenylpropyl alcohol. Before the use of *Styrax benzoin*, a skin test must be taken as it causes allergy. *Styrax benzoin* is composed of 18% of benzoic acid, a little amount of volatile acids and 75% of amorphous resins. Free benzoic and cinnamic acid and their corresponding esters such as coniferyl and p-coumaryl alcohol are present in different amounts and also some other higher molecular weight compounds like pinoresinol is also present. Phyto-chemistry *Styrax benzoin* has vanilla like odour due to the presence of vanillin. Trans-coniferyl alcohol benzoate or trans-p-coumaryl alcohol is obtained from the *Styrax benzoin* [S. Popravko et al 1984]. *Styrax benzoin* contains the cinnamic acid, benzoic acid, methyl cinnamate, coniferyl benzoate, cinnamyl cinnamate, cinnamic acid, phenylethylene, and vanillin. Figure 1 shows structures of important phytochemicals of *Styrax benzoin*. Due to difference in production region and varieties of benzoin such as Siam benzoin and Sumatra benzoin, it has significant differences in chemical composition [M. Hovaneissian et al 2008].

### **Taxonomical classification**

kingdom : plantae  
 Clade: tracheophytes  
 Clade: Angiosperms  
 Clade: Asterids  
 Order: Ericales Family: Styracaceae Genus: *Styrax*  
 Species: *S. benzoin*

**Common Name:-** *Styrax*, Gum benjamin tree

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## Ayurvedic Health Benefits of Benzoin Res Oil

**Benefits to the entire system.**

**Alleviates rheumatic conditions.**

**Keeps skin problems at bay.**

**Relieves congestion and other respiratory problems.**

**Drives away depressive feelings.**

Traditional Use and Health Benefits:

**Vernicular Names:**-gum benzoin or gum benjamin, and in India Sambrani or loban, though loban is Arabic lubān, storax.[USDA January 2018].

**Parts Used:-**

Fruits, Leaves, flower

**-Benzoin resins are two types: [George A. Burdock 2010]**

1) **Sumatra Benzoin:**-- It occurs in the form of lumps of varying sizes or tears are externally yellowish, milky white.- The surface is uneven. When heated, fumes of benzoic and cinnamic acids are produced. Colour - It is greyish-brown or grey.

Odour- Aromatic and characteristic.



Taste-Sweetish and slightly acrid

Sumatra benzoin

2) **Siam Benzoin:**-- It occurs as hard and brittle masses. When heated, it is softened and becomes plastic.

Colour – Yellowish-brown to rusty-brown. Odour – Agreeable and vanilla-like. Taste – It is sweetish and slightly acrid



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## Biological Source

Sumatra Benzoin is obtained from the incised stem of *Styrax benzoin* Dryander and *Styrax parallelo-neurus* Perkins., belonging to family *Styraceae*. It contains about 25% of total balsamic acids, calculated as cinnamic acid [<https://www.researchgate.net/publication>]

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## Geographical Source

The trees are found in Sumatra, Malacca, Malaya, Java, and Borneo

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## Collection:-

The plants are medium-sized trees. Sumatra Benzoin is a pathological resin which is formed by making incision and by attack of fungi. In Sumatra the seeds are sown in rice fields. The rice plants provide protection to benzoin plants during first year. After harvesting of the rice crop the trees are allowed to grow. When they are 7 years old, three triangular wounds are made in a vertical row. Tapping consists of making in each trunk three lines of incisions which are gradually lengthened. The first triangular wounds are made in a vertical row about 40 cm apart, the bark between the wounds being then scraped smooth. The first secretion is very sticky and is rejected. After making further cuts, each about 4 cm above the preceding ones, a harder secretion is obtained.

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## Chemical Constituents

Sumatra Benzoin consists of free balsamic acid (cinnamic and benzoic acids) (25%) and their esters. The amount of cinnamic acid is usually double that of benzoic acid. It also contains triterpenic acids like siarresinolic acid (19-hydroxy-oleanolic acid) and sumaresinolic acid (6-hydroxy-oleanolic acid); traces of vanillin, phenylpropyl cinnamate, cinnamyl cinnamate, and phenylethylene.

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## Allied Drug

Palembang benzoin, an interior variety produced in Sumatra is collected from isolated trees from which the resin has not been stripped for some time. It is very light in weight and breaking with an irregular porous fracture. It consists of reddish-brown resin, with only a few very small tears embedded in it. Palembang benzoin is used as a source of natural benzoic acid.

### *Need of Work*

Aim of this study was intended to analyze and investigate the effect of incense resin on learning, memory, and dendrite complexity of mice. Three months old male Deutch Democratic Yokohama (DDY) mice were injected orally with graded doses of 100, 150, and 200 mg/kg of incense resin aqueous extract daily for 30 days. Spatial learning and memory performance levels were tested with Y-maze alternation, novel object recognition, and Morris water maze. Overall, our results showed that incense resin extract increased learning and memory ability, and the number of dendrite branching in the dentate gyrus.

benzoin has been used as an antibiotic for the superficial wound infections and has well-established uses in both allopathic and traditional forms of medicine. In the form of a tincture (i.e., a solution in alcohol) benzoin is used as an inhalant with steam for the relief of cough, laryngitis, bronchitis and upper respiratory tract disorders. Several national pharmacopoeias - including the British, Chinese, French, Italian, Japanese, Swiss, Thai and American recommend this drug as a local skin antibiotic solution for the topical treatment of itching skin rashes, wounds and ulcers.

The authors observed that tincture benzoin is an efficient and strong local skin antibiotic and could be used effectively prior to surgery. The authors have used tincture benzoin in the preoperative preparation of the skin after completing the regular scrubs for painting for over 15 years. The solution appeared to be simple and safe to handle and for application. Its powerful local antibiotic properties appear to be effective in treating a variety of infections including multiple aerobic, anaerobic and spore-forming bacteria were exposed to tincture of benzoin solution, as well as *Candida albicans* and *Mycobacterium fortuitum*.

Complications related to its use include contact and allergic dermatitis, however, no complications were encountered by the authors in their patients. The postoperative use of tincture benzoin as an antiseptic for wound preparation should be judicious and one should be very careful while applying benzoin as due to its adhesive properties, it can attract dust particles and other impurities from the surroundings. The solution is significantly cheap in comparison to commercial adhesive drapes which are considerably more expensive and could be a good option, particularly in developing countries. In addition to application to teeth, gingiva etc. by painting thereon as a liquid, dryable varnish, one can also apply compositions of the invention as pastes, e.g. in a toothpaste formulation, as a liquid mouthwash, as a chewable tablet or the like, as long as an adherent film of binder and antimicrobial agent is applied in a semi-permanent manner to the site of infection, e.g., at least overnight.

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## FUTURE SCOPE

Benzoin resin is used as a common ingredient in incense-making and perfumery, it is also used clinically as a mild antiseptic agent in over-the-counter products to clean sores, cuts, wounds, and skin abrasions as tincture of benzoin, or benzoin in a solution of alcohol. Benzoin is a white crystalline compound prepared by condensation of benzaldehyde in potassium cyanide, and is used in organic syntheses.

Hippocampus is a part of the brain that has a major role in spatial learning and memory which can be affected by herbal extracts. *Styrax benzoin* has

been used by local communities to improve intelligence. However, there is no scientific evidence of the functions of *Styraxbenzoin* for regulating hippocampal function. Tincture of benzoin is useful in various including medicinally. It soothes and calms irritated skin and also acts as an antioxidant. It is mainly used as a solvent for podophyllin and various cosmetics. It possesses antiseptic, anti-inflammatory and barrier properties due to which it is useful for palmo-plantar fissures, vesicobullous lesions of the mucosae and as a skin hardener. Its adhesive properties are utilized to increase the stickiness of adhesive tapes and surgical drapes. It is cheap, easily available and is a good option particularly in developing countries.

The Benzoin Resins can be used in antibacterial activity, Antioxidant activity, many Pharmacological activities. There is some evidence that benzoin might act as a skin protectant, and also help to break up chest congestion by thinning

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## CONCLUSION:

Benzoin due to the importance of medicinal and aromatic plants in their biological and therapeutic properties, they have been used in many applications in various fields in medicine, pharmacy, cosmetics and agriculture. The aim of this work was the evaluation of biological activity (antibacterial and antioxidant activity) of the three types of benzoin resin. We extracted the essential oils of resins (red, white and gray) by a traditional method. The antibacterial activity results indicate that the essential oils have antimicrobial activity on all tested strains, except for the white type which showed no effect of *S. aureus*.

The obtained results from this study suggest that red resin has stronger antioxidant properties than other resins, which can be attributed to its high content of total phenolics and flavonoids. As a result, it can be said that some of the investigated resins can be used as a good natural source of antioxidants and antibacterial agent. Benzoin production by Batak farmers is based on centuries of indigenous knowledge. Amazingly, benzoin is used for the same purposes (incense, medicine and perfume) all over the world and with an incredible historical continuity. In the same way, present trading channels follow very old trading routes.

The uses of benzoin are so much ingrained in cultural and religious habits that we can imagine there will continue to be a demand for it. The Indonesian consumption, which is possibly the highest in the world at the moment, is the most likely to decrease, as using benzoin in rituals is now perceived as backward.

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