



BOSWELLIA SERRATA: UNVEILING ANTI-ARTHRITIC POTENTIAL OF INDIAN HERBAL TREASURE

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ABSTRACT:

Olibanum, or salai guggal, is an oleo-gum-resin derived from *Boswellia serrata* that contains gum, essential oil, and resin. It is highly prized for its ability to relieve a wide range of human ailments. Ancient Americans, Hindus, Babylonians, Persians, Romans, Chinese, Greeks, and people from ancient America mostly employed this resin for embalming and incense during ceremonial occasions. The most significant component of salai guggal is resin, which is primarily composed of pentacyclic boswellic acid, 3-O-acetyl-e-boswellic acid, 11-keto-boswellic acid, and 3Oacetyl-11-ketoboswellic acid are all produced by triterpenic acids. The oleo gum-resins are composed of polysaccharides and 30–60% resin, with the remaining 5–10% consisting of essential oils that are soluble in organic solvents. For millennia, *Boswellia serrata* gum-resin extracts have been utilized in traditional medicine to treat a range of chronic inflammatory conditions. Acetyl11keto-β-boswellic acid is the most effective of these four boswellic acids at inhibiting the inflammatory enzyme 5-lipoxygenase.

KEY WORDS: *Boswellia serrata*, Salai/Salai guggul, Oleo-gum-resin.

INTRODUCTION:

Boswellia has long been utilized in medicine for a wide range of conditions, such as varicosities, infections, wound healing, and skin diseases. Powders and teas made from *boswellia* were used to heal injuries, menstruation problems, and rheumatic illnesses in traditional Chinese medicine. One of the most revered and ancient plants in Ayurveda is *boswellia serrata*. The Sanskrit term "Gajabhakshya," which is occasionally applied to *boswellia*, implies that elephants consume this herb. It belongs to the family Burseraceae.

Botanical Descripton : Taxonomical classification [7]

- Division : Spermatophyta
- Subdivision: Angiospermae
- Tribe : Rosopsida
- Sub-tribe : Rosidae S. lat.
- Class : Anacardiales
- Family : Burseraceae
- Genus : *Boswellia*
- Species : *Serrata*

Composition of *Boswellia serrata* Resin:

Boswellia serrata's resinous portion contains the following: monoterpenes (α -thujene); diterpenes (macrocyclic diterpenoids such as incensole, incensole oxide, iso-incensole oxide, and a diterpene alcohol [8,9] [serratol]); triterpenes (α - and β -amyryns); pentacyclic triterpenic acids (boswellic acids); and tetracyclic triterpenic acids (tirucall-8,24-dien-21-oic acids).

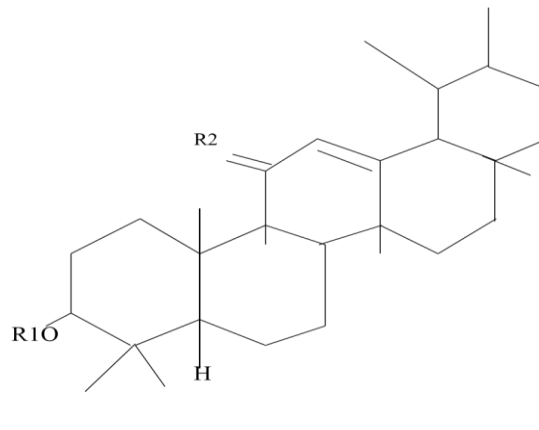


Fig 1. :-Structure of four pentacyclic triterpenic acids (Boswellic acids)

GEOGRAPHIC DISTRIBUTION, COLLECTION & CULTIVATION:

Geographic distribution:

The plant known as Indian frankincense, or *Boswellia serrata*, is indigenous to most of India, Pakistan, and the Punjab region [11]. The tree is predominantly found in the Indian states of Madhya Pradesh, Andhra Pradesh, Gujarat, and Jharkhand. In conclusion, *Boswellia serrata* is primarily distributed across India and the Punjab region extending into Pakistan, with the main commercial production areas being the states of Madhya Pradesh, Andhra Pradesh, Gujarat, and Jharkhand [14].

Collection of Boswellia Serrata Resin:

- **Tree Identification:** Mature *Boswellia serrata* trees are distinguished by their papery bark and sticky droplets, which are used by harvesters to identify these trees.
- **Scoring the Bark:** A sharp instrument, like an axe or chisel, is used to make incisions in the tree's bark. The tree's resin can now flow out from these cuts.
- **Resin Harvesting:** Tear-shaped droplets are formed when the resin, which is exuded from the incisions, solidifies and solidifies in contact with air.
- **Drying and Cleaning:** To get rid of extra moisture, the gathered resin tears are sundried. After that, they are cleansed to get rid of contaminants and foreign objects.

Cultivation of Boswellia Serrata:

- **Site Selection:** Well-drained soils, lots of sunshine, and arid or semi-arid environments are favorable for *Boswellia serrata* growth. Climate, altitude, and soil type are taken into consideration when choosing agriculture areas.
- **Propagation:** Cuttings or seeds can be used to multiply *Boswellia serrata*. Direct seeding takes place in raised beds or pots with well-drained soil. For propagation, mature tree cuttings can also be utilized.
- **Management of Nurseries:** Seedlings are raised in nurseries until they are large enough to be transplanted. To encourage healthy growth, they receive enough water, sunlight, and nutrition.
- **Transplantation:** At the start of the rainy season, seedlings are moved onto the field after they reach a specific size. To ensure ideal growth, plants are kept at the proper distance from one another.
- **Weed and Pest Management:** To shield young *Boswellia serrata* plants from competition and harm from weeds, insects, and diseases, regular weeding and pest control procedures are carried out.
- **Harvesting:** It usually takes several years for *Boswellia serrata* trees to reach a specific age and size at which point they are ready to be harvested for their resin. To maintain the trees' long-term health and productivity, harvesting is done sustainably.

PHYTOCONSTITUENTS:

Table 2: Phytoconstituents of *Boswellia Serrata*

Sr No	Phytoconstituents	Description	Reported uses
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1.	Boswellic Acids	Triterpenes that are pentacyclic and have anti-inflammatory qualities. β -boswellic acid and acetyl- β boswellic acid are typical examples	Anti-inflammatory activity - Management of arthritis and joint pain - Potential anti-cancer effects
2.	Triterpenoids	Bioactive substances with a variety of pharmacological actions, including as antioxidant and antiinflammatory properties.	Anti-inflammatory effects - Antioxidant properties
3.	Essential Oils	Aromatic chemicals, frequently comprising monoterpenes and sesquiterpenes, that are isolated from <i>Boswellia serrata</i> resin. could have an impact on the plant's therapeutic qualities.	Aromatherapy - Topical application for joint pain relief Respiratory support
4.	Polysaccharides	<i>Boswellia serrata</i> resin contains complex polysaccharides that may have immunomodulatory and antioxidant properties.	Immunomodulation - Antioxidant properties
5.	Flavonoids	Polyphenolic substances possessing anti-inflammatory and antioxidant characteristics. lesser amounts than those of boswellic acids.	Antioxidant activity - Antiinflammatory effects - Potential role in managing inflammatory conditions
6.	Phytosterols	Sterols generated from plants that may have anti-inflammatory and cholesterol-lowering properties. Found in trace levels in resin made from <i>Boswellia serrata</i> .	Cholesterollowering properties - Anti-inflammatory effects.

USES :

- Anticancer:** Tsukada [15] discovered that the alcoholic extract of Salai guggal (AESG) has anti-carcinogenic properties because it interferes with the formation of proteins, RNA, and DNA. KBA, BA, and On HT29 colon cancer cells, AKBA demonstrated an anti-proliferative and apoptotic impact [16,17] as well as an activation of the caspase-8 pathway that results in apoptosis [18,19]. Boswellic acids have an antiedema impact on glioblastoma patients and promote concentration-dependent suppression of glioma cell growth. It was observed that boswellic acids, as opposed to steroids, work in concert with CD-50 ligand and cytotoxic cytokines to induce apoptosis in glioma cells .
- Anti inflammatory activity:** Research on alcoholic salai guggal (AESG) showed antiinflammatory effect in paw edema in mice and rats generated by carrageenan; in rats induced edema was also shown in rats that had undergone adrenalectomy [28]. According to research done in 2003 by Shrivastava et al., the way that the BAs work is by preventing the synthesis of 5-LOX derivatives. Additionally, they inhibit the enzymes C-3 convertase, elasase, and topoisomerase [29].
- Anti-Arthritic:** In a study aimed at treating arthritis in rabbits induced with bovine serum albumin (BSA), it was found that oral treatment of BAs at doses of 25, 50, and 100 mg/kg/day decreased the number of leucocytes in the BSA-injected knee and altered the electrophoretic pattern of synovial fluid protein.
- Muscle relaxant :** The oleo-gum-resin essential oil of *B. serrata* was found to have a spasmogenic impact on the smooth muscle of the guinea pig ileum and a stimulating effect on the skeletal muscles [30]. An previous publication stated that the activity of *B. serrata*'s essential oil was not caused by non-specific effect on cell membranes, but rather by selective action on biological tissues [31].
- Hypoglycemic :** In a streptozocin-induced diabetic rat model, a herbal formulation containing *B. serrata* oleo-gum-resin as one of the ingredients has been shown to produce significant anti-diabetic activity, with a reduction in blood glucose levels comparable to that of phenformin, for non-insulin dependent diabetes mellitus. The formula in question affected the phosphoenol pyruvate carboxykinase and pyruvate carboxylase systems by affecting hepatic gluconeogenesis [32].
- Anti-Diarrhoal activity:** *Boswellia serrata* extract (BSE) was found to be useful in treating IBS patients' diarrhea without making them constipated in a recent study. Additionally, it was discovered to be beneficial in preventing diarrhea caused by cholinergic and barium chloride by preventing the contraction of intestinal smooth muscles.
- Activity in Crohn's Disease:** *B. serrata* extract outperformed masalazine, a drug frequently used to treat Crohn's disease, in terms of safety and efficacy in a comparative research on the management of the condition (68).

MARKETED FORMULATION:

Some of the branded formulations containing *B. serrata* available in the market are as follows:

- Boswellin®, a registered trademark of the Sabinsa Company, was first offered to the US and European markets in 1991. This comes in the form of tablets or pills and also as a lotion that contains capsaicin to soothe irritation. Taking BA medications orally two to three times a day, the dosage ranges from 150 to 250 mg/capsules or tablets.
- Excellent anti-inflammatory and analgesic qualities make Shallaki®, a product of Himalayan Drug Company, Makali, Bengaluru, a Licensed User of the Trade Mark owned by MMI Corporation, include 125 mg of *B. serrata* per capsule, making it effective for the relief of joint pain. One capsule used twice daily, the cost of sixty capsules is Rs. 75/- • Niltan® is a 15 g jar of external cream. It was created by Dr. Reddy's Laboratories Limited, Hyderabad, and consists of a blend of active herbal extracts (coriander seed oil, liquorice extract, boswellin, and arbutin in a cream base). It lessens the activity of the skin's tyrosinase enzyme, which inhibits the production of melanin and, as a result, the development of dark skin.
- With 901 mg of natural extracts, 120 vegetable capsules, and no adverse effects, Colox® is a herbal supplement that reduces inflammation, joint pain, and stiffness. It is acceptable for Jains, vegans, and vegetarians, and it has been registered by the Vegan Society of the UK.
- Along with a number of other ingredients, Rheumatic-X® contains 20 mg of "Shallaki" from Sunrise Herbals in Varanasi, Uttar Pradesh, India. It is meant to treat rheumatoid arthritis, gout, osteoarthritis, and sciatic pain. Two capsules should be taken twice day, or as directed by a doctor.

Type (Formulation)	Brand name	Company name	Dose
Tablet/ Pills	Boswellin	Sabinsa Company	150-250mg
Capsule	Shallaki	Himalayan Drug Company	125mg
Cream	Niltan	Dr.Reddy's Laboratories Limited	15g/ Jar
Capsule	Rheumatic-X	Sunrise Herbals in UP	20mg

CONCLUSION:

Commonly referred to as Indian Frankincense, *Boswellia serrata* is a priceless medicinal gem with a long history of traditional use and growing body of scientific confirmation. Boswellic acids are among the several bioactive chemicals that give this miracle of a plant promise in terms of their antiinflammatory, analgesic, antiarthritic, and maybe anti-cancer effects. Moreover, ongoing studies are revealing new aspects of its medicinal potential, which confirms that *Boswellia serrata* is a worthy candidate for more study and practical application. Using Indian Frankincense's age-old expertise in conjunction with contemporary scientific analysis presents intriguing opportunities for optimizing its health-promoting properties.

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