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# FRANKINCENSE: A POTENTIAL ANTI-INFLAMMATORY AGENT: AN OVERVIEW

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**Abstract:**
*Boswellia in the family Burseraceae, particularly Boswellia sacra (syn: B. carteri, B. thurifera, B. bhaw-dajiana), B. frereana and B. serrata (Indian frankincense.). Frankincense resin is edible and is used in traditional medicines in Africa and Asia for digestion and healthy skin. For internal consumption, it is recommended that frankincense be translucent, with no black or brown impurities. Exposure to 11-keto-β-boswellic acid (KBA), a lead boswellic acid in the novel solubilized frankincense extract Boswelan, is increased when taken with food.*
**Keywords:** *Burseraceae, resin, traditional medicines, translucent, boswellic acid*

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## INTRODUCTION:

Since time immemorial, plants and their products have been the primary resource of food, shelter, clothing, flavors, and fragrances as also valuable ingredients for medicines for mankind. In this context, natural resins have played an important role. These have also been used as adhesives, as ingredients for cosmetic preparations, as fragrances in daily rituals and in religious ceremonies, as coating materials and also for their different curative powers [1–3]. In ancient times, Hindus, Babylonians, Persians, Romans, Chinese and Greeks as well as the people of old American civilizations used natural resins primarily for embalming and for its incense in cultural functions. They firmly believed that when these materials get in contact with fire, the smoke and the fragrance they produce not only soothe their souls but also please their gods. Burning of these natural resins had become an important component of their cultural life. They burned these resins during sacrificial ceremonies and in their daily rituals to prevent the influence of evil spirits on their souls or to honour the dead or living ones [4–6].

Boswellia serrata (Salai/Salai guggul) (Family: Burseraceae; Genus: Boswellia) is a moderate to large sized branching tree that grows in dry mountainous regions of India, Northern Africa and the Middle East[7,8]. The family of Burseraceae is represented in the plant kingdom with 17 genera and 600 species wide-spread in all tropical regions. There are about 25 known species belonging to Genus Boswellia, most of them occur in Arabia, northeastern coast of Africa and India. Since ancient times, three of these species have been considered as 'true Frankincense' producing trees[9,10].

Boswellia sacra Flueck, the first species, grows in South Arabia and is known amongst Arabians as 'maghrayt d' sheehaz' and the resin produced is known as 'luban dhakar'. Boswellia carterii Birdw, grows in Somalia and in the native language it is called 'moxor' and the resin produced is known as 'luban dhakar'.Boswellia frereana Birdw., is also a Somalian species and in the native language it is called 'jagcaar' and the resin produced is known as 'loban majdi' or 'maydi'. This is the most expensive brand of resin in the market[11]. Another resin producing species is Boswellia serrata Roxb., known as 'Indian olibanum', 'Indian frankincense', 'dhup' and 'salai' or 'salai guggul' is found in the middle and northern parts of Eastern India. It has been available as a high quality extract in India for nearly 25 years and marketed under the name Shallaki.

In India, the main commercial sources of Boswellia serrata are Andhra Pradesh, Gujarat, Madhya Pradesh, Jharkhand and Chhattisgarh. Regionally, it is also known by different names. It is tapped from the incision made on the trunk of the tree, which is then stored in specially made bamboo basket. The semi-solid gum-resin is allowed to remain in the basket for about a month during which its fluid content locally known as 'ras' keeps flowing out. The residue, semi-solid to solid part, is the gum-resin which hardens slowly into amorphous, tear-shaped products with an aromatic scent. Then, it is broken into small pieces by wooden mallet or chopper and during this process all impurities including bark pieces etc. are removed manually. The gum-resin is then graded according to its flavour, colour, shape and size. Generally four grades i.e. Superfine, Grade I, Grade II and Grade III are available in the market. The fresh gum obtained from the tree is hot with pleasant flavour and slightly bitter in taste. It had been the 'frankincense' of ancient Egyptians, Greeks and Romans who used it as prized incense, fumigant as well as a multipurpose aromatic. It is generally used in making incense powder and sticks.

The oleo gum-resins contain 30-60% resin, 5-10% essential oils, which are soluble in the organic solvents, and the rest is made up of polysaccharides (~ 65% arabinose, galactose, xylose) which are soluble in water [12–14]. The resins have a fragrant aroma because of the presence of essential oils and these accounts for their commercial importance. The essential oil of gum-resin is one of the most commonly used oils in aromatherapy, paints and varnishes. Pure oleo gum-resin collected in the optimum season hardens slowly, retaining its golden colour and transparency. But the colour varies from golden brown to dark brown or dark greenish-brown depending on the locality, season, size of the tree and the wound-surface, collection process and storage. Darkening of colour of resin is also due to autoxidation, polymerization and enzymatic reactions. The resin is generally harvested all through the summer and autumn after the tree has been wounded in March or April. Boswellia tree can produce exudates in good quality only for three years. After this period, the quality of the collected resin decreases considerably. Therefore, the tree should be left to rest for some years after harvesting period.

## HISTORICAL/TRADITIONALAPPLICATIONS:

Boswellia serrata is one of the ancient and most valued herbs in Ayurveda. "Gajabhakshya", a Sanskrit name sometimes used for Boswellia, suggests that elephants enjoy this herb as a part of their diet[15]. Three renowned ancient texts form the pillars of classical Ayurvedic Science, which has its roots in India: Charaka'sCharaka Samhita (c.B.C. 700), the first fundamental medical text;

Susruta's Susruta Samhita (c.B.C. 600), which attempted to amass the entire medical knowledge, with special focus on surgery; and the two-volume tome comprising Astanga Samgraha and Astanga Hridaya (c.130-200 A.D.), written by Vagbhata the Elder and Vagbhata the Younger, which synthesized the works of Charaka and Susruta and summarized the eight parts of Ayurveda in prose and verse forms. The first two pillars of Ayurveda describe the antirheumatic (antiarthritis) activity of gugguls-the gum-resins of trees[16–20]. In addition to its beneficial use for arthritis, this gummy resin is also mentioned in traditional Ayurvedic and Unani texts as an effective remedy for diarrhoea, dysentery, ringworm, boils, fevers (antipyretic), skin and blood diseases, cardiovascular diseases, mouth sores, bad throat, bronchitis, asthma, cough, vaginal discharges, hair-loss, jaundice, hemorrhoids, syphilitic diseases, irregular menses and stimulation of liver. It is also diaphoretic, astringent, diuretic and acts both as internal and external stimulant. Modern medicine and pharmacology strongly point out to its use as an antiarthritic, antiinflammatory, antihyperlipidemic (controls blood lipids), antiatherosclerotic (anticoronary plaque), analgesic (pain-reliever) and hepatoprotective (protects the liver)[15,21–24]. Animal models and n vitro studies had shown that boswellic acids inhibit the synthesis of pro-inflammatory enzyme, which cause bronchoconstriction, chemo taxis, and increased vascular permeability [33–38]. Other anti-inflammatory drug like quercetin, also block this enzyme but in other fashion through its anti-oxidant activity whereas boswellic acids seem to be specific inhibitor of enzyme [39]. The enzymes causes inflimation by stumlating the p free radical damage, cell-adesion, calcium displacement, and migration of inflammation-producing cells to the inflamed body area. But the boswellic acids have been shown to significantly reduce glycosaminoglycan degradation [40–43]. In other study it was found that the effect of Boswellia acid extract and ketoprofen occurs in deferent way [44].

In vitro studies it was recorded that boswellic acids were found to inhibit leukotriene synthesis via 5-LO, Boswellic acids has shown to be specific, non-redox inhibitors of leukotriene synthesis, either interacting directly with the enzyme or blocking it 45,46]. Boswellic acids was found to play an important role in chronic bronchitis cystic fibrosis, and acute respiratory distress syndrome [47,48]. It was found that 3-acetyl-11-keto-β-boswellic acid (AKBA) is the most potent inhibitor of 5-LO, an enzyme responsible for inflammation[49][50,51].[52,53]. The boswellic acid from Boswellia serrata, when tested on new model i.e. Papaya Latex Model, showed significant activity of mean 35% inhibition of inflammation. Since the new model is reported to be sensitive to slowly acting remission-inducing drugs, its effectiveness on boswellic acid throws some light on its mechanism of action, which seems to be unlike aspirin and steroidal drugs[54]. Poeckel and Werz in 2006 have summarized the biological actions of boswellic acids on the cellular and molecular level and attempted to put the data into the perspectives of the beneficial effects manifested in animal studies and trials with human subjects related to inflammation and cancer[55]. Sharmaet al.[56] have reported the effect of boswellic acids on bovine serum albumin (BSA)-induced arthritis in rabbits.

Gayathri et al.[57] in 2007 have reported that pure compound from Boswellia serrata extract exhibits anti-inflammatory property in human peripheral blood mononuclear cells (PBMCs) and mouse macrophages through inhibition of tumor necrosis factor-alpha (TNF-alpha), interleukin-1beta (IL-1beta), NO and mitogen activated protein (MAP) kinases. Incensole acetate, a novel anti-inflammatory compound isolated from Boswellia resin inhibits nuclear factor-kappa B activation[58]. Boswellic acids are direct 5-LO inhibitors that efficiently suppress 5-LO product synthesis in common in vitro test models. However, the pharmacological relevance of such interference in vivo seems questionable [59]. Acetyl-11-keto-β-boswellic acid inhibits prostate tumor growth by suppressing vascular endothelial growth factor receptor 2-mediated angiogenesis [60].

Very recently, Pawaret al. in 2011 have reported a simple, rapid, accurate, reproducible, selective and economic HPTLC method for routine quality control analysis as also quantitative determination of β-boswellic acid from Boswellia serrata Roxb. (exudate) and its formulations[62].

## CONCLUSION:

Boswellic acids (triterpenoids), which represents a method of validating the authenticity of the essential oil. The chemistry of the essential oil is mainly monoterpenes and sesquiterpenes, with small amounts of diterpenoid components being the upper limit in terms of molecular weight. Analysis of frankincense from various Boswellia species with inhibitory activity on human drug metabolising cytochrome P450 enzymes. Boswellic acids was found to play an important role in chronic bronchitis cystic fibrosis, and acute respiratory distress syndrome [47,48]. It was found that 3-acetyl-11-keto-β-boswellic acid (AKBA) is the most potent inhibitor of 5-LO, an enzyme responsible for inflammation

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