

# Boswellia SAP

Science-based nutraceutical for healthy inflammatory response

**Boswellia SAP** provides a standardized dose of *Boswellia serrata* oleogum resin extract, used in traditional medicine for centuries for a number of ailments related to acute and chronic inflammation.\* Boswellic acids, especially 11-keto- $\beta$ -boswellic acid (KBA) and 3-O-acetyl-11-keto- $\beta$ -boswellic acid (AKBA) are the main active constituents responsible for the anti-inflammatory effects of *B. serrata*, are specific inhibitors of 5-lipoxygenase (5-LOX), and thereby suppress leukotriene synthesis.\* **Boswellia SAP** can be used to maintain healthy inflammatory response and reduce pain associated with osteo- and rheumatoid arthritis.\* **Boswellia SAP** could be very useful in the management of inflammatory bowel diseases (IBD) and to improve quality of life in patients during the remission phase.\* In addition, **Boswellia SAP** could help improve lung and immune function in asthma patients.\* **Boswellia SAP** can also be used to reduce peritumoural brain oedema, support neurorecovery following traumatic brain injury (TBI), and potentially as an adjunctive support in cancer treatment.\* Evidence supports the use of **Boswellia SAP** for promoting clinical benefits in blood-glucose control and lipid metabolism in type 2 diabetic patients.\*

## SUPPLEMENT FACTS

Serving Size: 3 Capsules  
Servings Per Container: 30

|  | Amount Per Serving | % Daily Value |
|--|--------------------|---------------|
| Boswellia ( <i>Boswellia serrata</i> ) oleogum resin,<br>35% boswellic acid and 70% organic acid | 1140 mg            | **            |

\*\*Daily Value not established

**Other ingredients:** Microcrystalline cellulose, hypromellose, purified water, vegetable magnesium stearate, and silicon dioxide.

**This product is non-GMO and vegan friendly.**

**Contains no:** Gluten, soy, wheat, corn, eggs, dairy, yeast, citrus, preservatives, or artificial colours and flavours.

**Boswellia SAP** contains 90 capsules per bottle.

## SUGGESTED USE

**Adults:** Take 3 capsules daily or as directed by your healthcare practitioner.

## INDICATIONS

**Boswellia SAP** can:

- Be used to promote healthy inflammatory responses.\*
- Help relieve pain associated with arthritis.\*
- Help manage IBD and improve the quality of life in patients.\*
- Improve lung and immune function in asthma patients.\*
- Be used to reduce peritumoural brain oedema and support neurorecovery following traumatic brain injury.\*
- Be used as an adjunctive support in cancer treatment.\*
- Help control blood glucose levels and improve lipid metabolism in type 2 diabetic patients.\*

## CAUTIONS AND WARNINGS

Consult a healthcare practitioner prior to use if you are pregnant or breast-feeding. Consult a healthcare practitioner if symptoms worsen. Hypersensitivity (e.g. allergy) has been known to occur; in which case, discontinue use. Some people may experience mild gastrointestinal disturbances such as diarrhoea, abdominal pain, heartburn, nausea, and vomiting; in which case, discontinue use.

## PURITY, CLEANLINESS AND STABILITY

All ingredients listed for each **Boswellia SAP** lot number have been tested by an ISO 17025 accredited third-party laboratory for identity, potency, and purity.

**\* These statements have not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure, or prevent any disease.**

Scientific Advisory Panel (SAP):  
adding nutraceutical research  
to achieve optimum health



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## INTRODUCTION

*Boswellia serrata* (Salai guggul / frankincense) is a moderate- to large-sized deciduous tree that grows in the dry mountainous regions India, Northern Africa, and the Middle East.<sup>[1]</sup> *B. serrata* yields a gummy oleoresin exudate, and the extracts prepared from this resin have been traditionally used for centuries in Ayurvedic medicine as an antiarthritic, astringent, stimulant, expectorant, and antiseptic.<sup>[1][2]</sup> The oleoresin contains monoterpenes ( $\alpha$ -thujene), diterpenes (incensole, incensole oxide, iso-incensole oxide, serratol), triterpenes (as  $\alpha$ - and  $\beta$ -amyrins); pentacyclic triterpenic acids (boswellic acids), and tetracyclic triterpenic acids (tirucall-8,24-dien-21-oic acids).<sup>[2]</sup> The pharmacological effects of *B. serrata* have been mainly attributed to boswellic acids, especially 11-keto- $\beta$ -boswellic acid (KBA) and 3-O-acetyl-11-keto- $\beta$ -boswellic acid (AKBA).<sup>[1]</sup>

## ANTI-INFLAMMATORY AND IMMUNOMODULATORY EFFECTS

Boswellic acids, the main constituents responsible for the anti-inflammatory property of *B. serrata*, are specific and nonredox inhibitors of 5-lipoxygenase (5-LOX), and they do not affect 12-lipoxygenase and cyclooxygenase (COX) activities.<sup>[2]</sup> The main mechanism considered underlying their anti-inflammatory effect is through the suppression of leukotriene synthesis by inhibiting 5-LOX. Among the known boswellic acids, AKBA is reported to possess the most potent inhibitory activity on 5-LOX.<sup>[1][2]</sup> *B. serrata* also exerts immunomodulatory actions including decreased cytokines (interleukins and TNF- $\alpha$ ) levels and diminished complement system and leukocyte elastase activities, reduction of ROS formation and P-selectin-mediated recruitment of inflammatory cells.<sup>[3]</sup>

## ARTHRITIS

In a randomized, double-blind study, 30 patients with osteoarthritis of the knee consumed 3 capsules of *B. serrata* extract (333 mg of extract per capsule) or placebo for 8 weeks in a crossover fashion. A significant decrease in knee pain, increased knee flexion, and increased walking distance was reported. Also, the frequency of swelling in the knee joint was profoundly decreased.<sup>[4]</sup> In another randomized, double-blind study, 75 osteoarthritis patients consumed either 100 mg ( $n = 25$ ) or 250 mg ( $n = 25$ ) of *B. serrata* extract daily, or a placebo ( $n = 25$ ), for 90 days. The treatment group supplemented with 250 mg of the extract reported significant improvements in pain score and functional ability as early as 7 days after the start of treatment. In addition, substantial reduction in synovial fluid matrix metalloproteinase-3 was found in the treatment groups compared to placebo.<sup>[5]</sup> Similarly, in another study with 60 osteoarthritis patients receiving either 100 mg ( $n = 30$ ) of *B. serrata* extract or placebo ( $n = 30$ ) daily for 30 days, the treatment group exhibited clinically and statistically significant improvements in pain scores and physical function score compared to placebo at 5 days of treatment.<sup>[6]</sup>

## INFLAMMATORY BOWEL DISEASE

Treatment of bowel disease symptoms with *B. serrata* extract has been a long tradition.<sup>[1]</sup> Based on the anti-inflammatory properties observed in animal models and in vitro studies, *B. serrata* extract has been suggested for the treatment of inflammatory bowel diseases (IBD).<sup>[1]</sup> IBD, especially Crohn's disease and ulcerative colitis (UC), affect more than four million people in the world.<sup>[3]</sup> Intestinal mucosa of patients suffering from IBD synthesizes increased amounts of leukotrienes LT<sub>B<sub>4</sub></sub>, LTD<sub>4</sub>, and LTE<sub>4</sub>, inducing contraction of the smooth muscle of the gastrointestinal tract.<sup>[1][3]</sup> Especially, IL-1 and TNF- $\alpha$  have been implicated in intestinal inflammations.<sup>[7]</sup>

## Ulcerative Colitis

UC is a chronic inflammatory disease with remissions and exacerbations affecting almost the entire colon.<sup>[1]</sup> In an open-label, observational study in patients with UC in remission phase ( $n = 43$ ), an oral daily dosage of *B. serrata* extract attenuated the symptoms associated with mild UC in remission compared to the controls.<sup>[8]</sup> In another study, patients suffering from UC grades II and III receiving *B. serrata* preparation (350 mg thrice daily for 6 weeks) showed improved remission rate compared to the controls receiving sulfasalazine.<sup>[9]</sup>

## Crohn's Disease

In a double-blind, parallel-group study in 102 patients with Crohn's disease, 44 patients were randomized to receive *B. serrata* extract, while 39 patients received mesalazine. The study results showed that *B. serrata* extract was as effective as the standard medication for the treatment of Crohn's disease during its active state.<sup>[10]</sup>

## Collagenous Colitis

In a randomized, placebo-controlled, double-blind study, supplementation with 400 mg of *B. serrata* extract three times a day for 6 weeks resulted in better quality-of-life and histology in 25 patients compared to the placebo.<sup>[11]</sup>

## ASTHMA

The beneficial effects of *B. serrata* extract were demonstrated in a 6-week, double-blind, placebo-controlled study where 80 patients with bronchial asthma were randomized to receive either 300 mg of *B. serrata* extract or placebo three times daily. Significant improvements in lung and immune function were observed in the *B. serrata* group compared to the placebo group.<sup>[12]</sup>

## PERITUMOURAL BRAIN OEDEMA

Administration of *B. serrata* extract is useful in the management and treatment of peritumoural brain oedema. Preliminary clinical evidence suggests that *B. serrata* extract could reduce oedema and improve neurological symptoms as well as muscle strength.<sup>[13][13][14][15]</sup>

## TRAUMATIC BRAIN INJURY

*B. serrata* contains the bioactive incensole acetate (IA), that is considered to possess neuroprotective properties and has been shown to profoundly reduce posttraumatic brain injury (TBI) cognitive/motor complications and ischaemic neuronal damage in mice.<sup>[16]</sup> In a 12-week clinical study, the effect of *B. serrata* extract on neurorecovery following diffuse axonal injury (DAI) was investigated in DAI patients.<sup>[16]</sup> Although *B. serrata* extract did not significantly affect general outcome, the study results demonstrated a positive enhancement of the cognitive outcome in the patients, suggesting the usefulness of *B. serrata* in TBI therapy including neurorecovery following mild TBI such as concussion.<sup>[16]</sup>

## CANCER

Boswellic acids from *B. serrata* have been shown to exhibit antineoplastic activity through their antiproliferative and proapoptotic properties in multiple human cancer-cell lines. Especially, AKBA has been shown to inhibit the growth of a number of tumour cells, including glioma, colon cancer, leukemia, human melanoma, hepatocellular carcinoma, and prostate cancer.<sup>[17][18][19][20][21]</sup> One of the proposed mechanisms of action for boswellic acids in the induction of apoptosis in cancer cells is through the activation of proapoptotic Bcl-2 family and caspase-3, and upregulation of cell death receptors DR4 and TNFR1 levels, leading to caspase-8 activation. Overall, *B. serrata* extract demonstrates potential as a useful anticancer agent, with significantly lower toxicity on normal liver tissue.<sup>[21]</sup>

## DIABETES AND LIPID METABOLISM

In a study investigating the effect of orally administered 900 mg of *B. serrata* extract daily for 6 weeks in 60 type 2 diabetic (T2D) patients, a significant increment in blood HDL levels as well as reductions in total and LDL cholesterol, fructosamine, and hepatic enzymes were observed in the intervention group compared to the control group.<sup>[22]</sup> In another study, T2D patients on metformin were treated with *B. serrata* extract (400 mg twice a day) or placebo for 12 weeks. Significant reductions in fasting blood glucose, HbA<sub>1c</sub>, insulin, and improvement in lipid parameters, without any adverse effects, were observed compared to the placebo.<sup>[23]</sup>

## SAFETY

*B. serrata* extracts are well-tolerated, and most human studies report no adverse side effects.<sup>[1][4][5][6][12][23]</sup> Noteworthy, *B. serrata* extracts have been found to cause no disruption to glycosaminoglycan synthesis compared to nonsteroidal anti-inflammatory drugs that could potentially result in articular damage in arthritic conditions.<sup>[24]</sup>

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