BMI
Bio-Med Ingredients
Where Quality Matters...

Bromelain

The natural and nontoxic protein-digesting enzymes

An effective alternative to multiple chemical ingredients and artificially manufactured medicines

For the use of health professionals I More information available on request

Overview

Bromelain is a complex combination of multiple endopeptidases of thiol and other compounds as phosphatase, glucosidase, peroxidase, cellulase, escharase, and several protease inhibitors derived from the pineapple fruit, stem and/or root.

The pharmacological properties of bromelain is related to its arachidonate cascade modulation, inhibition of platelet aggregation, such as interference with malignant cell growth; anti-inflammatory action; fibrinolytic activity; skin debridement properties, and reduction of the severe effects of SARS-Cov-2.

Bromelain has been widely used in pharmaceutical and medical, food, detergent, cosmetic, and textile industries.

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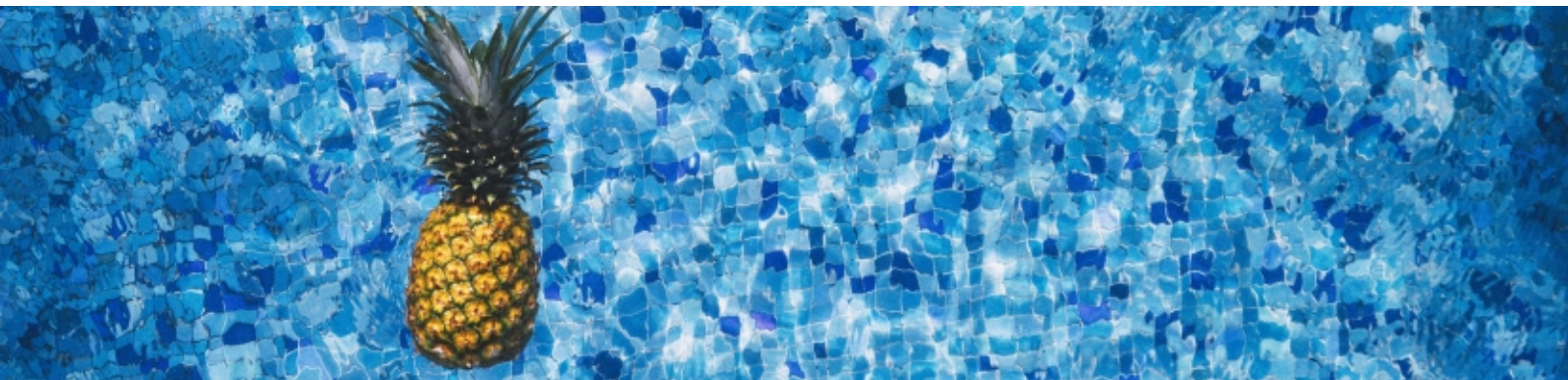
Industry wise application

- **Food industry**
  - Meat tenderization
  - Fruit anti-browning agent
  - Alcohol production
  - Dough improver
  - Fish protein hydrolysate production
  - Food supplement
  - Animal food
- **Pharmaceutical & Medical industry**
  - Anti-inflammatory agent
  - Anticancer agent
  - Digestive aid
  - Potential as antibiotics
  - Debridement cream
  - Platelet aggregation inhibitor
  - Arthritis preventer
  - Anti-diarrhoea
- **Cosmetic**
  - Wrinkle treatment
  - Dry skin treatment
  - Tooth whitening
  - Reduce post-injection bruising
- **Textile**
  - As cocoon softener in silk production
  - Improve dyeing properties
- **Detergent**
  - Detergent formulation

Clinical studies

Bromelain

Fields of Study	Patients (Nos)	Dosage	Outcomes
Anti-inflammatory Activity	25 patients	160 mg/day	Reversed the pathologic effects of inflammation
Treatment of Osteoarthritis	29 moderate to severe arthritis patients	60–160 mg/day	Reduction in soft tissue swelling in 72.4%
	60 patients	540 mg/day	Sum score of various pain (active, pressure, rest, night) and dysfunction (four point category scale) measures
	73 patients	540 mg/day	Lequesne index (pain and function), Reduction in pain
	50 patients	1890 mg/day	Likert scale to assess pain and reduction in pain
	80 patients	945 mg/day	Mobility and pain reduction
Debridement of Burns	154 patients	n.m.	Covered up to 67% TBSA, treated with DGD as a part of the burn care routine of this burn unit. The primary endpoints were percentage of eschar removed and time to wound closure
	20 hospitalized burn patients	1, 2, or 4 g in 20 mL of gel per 1% TBSA	Primarily, time to >95% wound closure or re-epithelialization.
	140 patients	Recommended dose	Finally, number of debridement procedures and percentage debridement of the burn eschar, covering up to 30%
Trauma	59 patients	n.m.	Reduced pain and swelling, early return to function
Dentistry	45 subjects	4 × 250 mg	Reduced erythema, pain, and inflammation
Anti-Edema	47 randomly selected patients	20-mg	The mean bleeding time decreased slightly (from 1.09 to 1.00 min) after a week of bromelain therapy



Pharmaceutical Industry

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Enhances the absorption of drugs, particularly antibiotics and exhibits various fibrinolytic, antiedematous, anti-inflammatory and antithrombotic activities.

Helps in the treatment of arthritic patients, for pain relief for those suffering from osteoarthritis and joint injury.

Helps to dissolve mucus and is used in the treatment of bronchitis and sinusitis.

Reduces the incidence of various cardiovascular disorders as it is an inhibitor of blood platelet aggregation.

Helps in removing the dead and infected tissue and bring about effective healing of the wounds.

Also possesses some anti-cancerous activities and is known to prevent the growth of certain types of tumors as it promotes apoptotic cell death.

May help relieve the inflammation associated with Ulcerative colitis

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Cosmetic and Textile Industry

Bromelain

Treats various skin conditions such as low skin firmness, wrinkles, and dry skin

It is also used as a stain remover in teeth cleaning/whitening

Used to improve the dyeing properties of protein fibers such as wool and silk

Assist in the cocoon-softening process in silk production

Therapeutic activity

Bromelain

Cardiovascular and Circulation

Bromelain prevents or minimizes the severity of angina pectoris and transient ischemic attack. It is useful in the prevention and treatment of thrombophlebitis. It may also break down cholesterol plaques and exerts a potent fibrinolytic activity. A combination of bromelain and other nutrients protect against ischemia/ reperfusion injury in skeletal muscle.

Osteoarthritis

A combination of bromelain, trypsin, and rutin was compared to diclofenac in 103 patients with osteoarthritis of the knee. After six weeks, both treatments resulted in significant and similar reduction in the pain and inflammation. Bromelain is a food supplement that may provide an alternative treatment to nonsteroidal anti-inflammatory drug (NSAIDs)

Immunogenicity

Bromelain has been recommended as an adjuvant therapeutic approach in the treatment of chronic inflammatory, malignant, and autoimmune diseases. In vitro experiments have shown that Bromelain has the ability to modulate surface adhesion molecules on T cells, macrophages, and natural killer cells and also induce the secretion of IL-1β, IL-6, and tumour necrosis factor α (TNFα) by peripheral blood mononuclear cells. Oral therapy with bromelain produces certain analgesic and anti-inflammatory effects in patients with rheumatoid arthritis, which is one of the most common autoimmune diseases.

Therapeutic activity

Bromelain

Blood Coagulation and Fibrinolysis

Bromelain influences blood coagulation by increasing the serum fibrinolytic ability and by inhibiting the synthesis of fibrin, a protein involved in blood clotting. In vitro and in vivo studies have suggested that bromelain is an effective fibrinolytic agent as it stimulates the conversion of plasminogen to plasmin, resulting in increased fibrinolysis by degrading fibrin.

Bromelain on Diarrhea

Evidence has suggested that bromelain counteracts some of the effects of certain intestinal pathogens like Vibrio cholera and Escherichia coli. In E. coli infection, an active supplementation with bromelain leads to some antiadhesion effects which prevent the bacteria from attaching to specific glycoprotein receptors located on the intestinal mucosa by proteolytically modifying the receptor attachment sites

Bromelain on Cancer Cells

Recent studies have shown that bromelain has the capacity to modify key pathways that support malignancy. Presumably, the anticancerous activity of bromelain is due to its direct impact on cancer cells and their microenvironment, as well as on the modulation of immune, inflammatory, and haemostatic systems. In an experiment conducted by Beez et al chemically induced mouse skin papillomas were treated with bromelain and they observed that it reduced tumor formation, tumor volume and caused apoptotic cell death.

Toxicity

Bromelain

After daily administration of bromelain up to 750 mg/kg in dogs, no toxicity was reported after six months. The lethal dose LD50 is greater than 10 g/kg in mice.

No carcinogenic or teratogenic effects were observed when administered to rats with dosages of 1500 mg/kg per day.

No change in food intake, or histology of heart, kidney, spleen, growth, or hematological parameters was provoked, due to bromelain administration.

In one study, Eckert et al. found no significant changes in blood coagulation parameters after the intake of bromelain with doses up to 3000 FIP units per day.

Bromelain is considered to be a high-value enzyme in the therapeutics field as it is an effective treatment for inflammation, cancer, osteoarthritis, severe wounds, dental plaque, gingivitis, and various pathogens. As a natural and nontoxic compound, bromelain can be used as an alternative to multiple chemical ingredients and artificially manufactured medicines.

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