Bromelain / Papain
Natural proteolytic enzymes

Bromelain and Papain are part of the family of proteolytic enzymes. They are systemic enzymes, designed to survive the acidity of the stomach and to go into the small intestine where they are absorbed into the bloodstream. There, they degrade proteins, thus exerting multiple beneficial effects for health, including platelet aggregation inhibition, digestive aid and anti-inflammatory effects.

Bromelain is a cysteine protease isolated from pineapple stem, *Ananas comosus*. Bromelain is a mixture of different thiol endopeptidases and other components like phosphatase, glucosidase, peroxidase, cellulase, escharase, and several protease inhibitors. In vitro and in vivo studies demonstrate that bromelain exhibits various fibrinolytic, antiedematous, antithrombotic, and anti-inflammatory activities.

Properties

Its effects are mainly a product of its proteolytic activity, which stimulates fibrinolysis by increasing plasmin, but bromelain also has been shown to prevent kinin production and to inhibit platelet aggregation. It is also used for preventing muscle soreness after intense exercise, and for facilitate digestion.

Effect of Bromelain on inflammatory

Bromelain have the ability to modulate surface adhesion molecules on Tcells, macrophages and natural killer cells and also induce the secretion of IL-1β, IL-6, TNFα by peripheral blood mononuclear cells. Bromelain can block Raf-A and ERK-2 pathways by inhibiting the T cell signal transduction. This induces the decrease of the activation of CD4 T cell and reduce the expression of CD25.

Osteoarthritis

Bromelain is a food supplement that may provide an alternative treatment to nonsteroidal antiinflammatory drug (NSAIDs). It plays an important role in the pathogenesis of arthritis. Bromelain has analgesic properties which are thought to be the result of its direct influence on pain mediators such as bradykinin.

Allergic airway disease

Bromelain was found to attenuate development of allergic airway disease (AAD), while altering CD4+ to CD8+T lymphocyte populations. From this reduction in AAD outcomes it was suggested that bromelain may have similar effects in the treatment of human asthma and hypersensitivity disorders

Inflammatory bowel disease

Investigation on bromelain's anti-inflammatory action as a potential therapy for ulcerative colitis and Crohn's disease, 2 types of inflammatory bowel disease. Bromelain discourages the release of inflammatory chemicals called cytokines and chemokines from diseased tissue (Test tube study ; Duke University gastroenterology).

Digestive Aid

Bromelain is best known for its ability to break down proteins — making this enzyme a popular digestive aid. Bromelain has been used successfully as a digestive enzyme following pancreatectomy, in cases of exocrine pancreas insufficiency and in other intestinal disorders. Because of its wide pH range, bromelain has activity in the stomach as well as the small intestine. It has also been shown to be an adequate replacement for pepsin and trypsin in cases of deficiency.

Papain, a papaya (*Carica papaya*) fruit latex extract, is a cysteine protease that catalyzes the cleavage of peptide bonds using a catalytic triad involving a deprotonated cysteine residue.

Papain is well known for improving digestion and treating infections, diarrhea, and allergies. It has also been used, with other protease to reduce pain, inflammation, and swelling. It's also being studied for potential use in cancer and other diseases.

Antimicrobial action

Papain has shown antimicrobial activity against a number of microorganisms such as *Bacillus subtilis*, *Enterobacter cloacae*, *E. coli*, *Salmonella Typhi*, *Staphylococcus aureus* and *Proteus vulgaris*.

Digestion / Slimness

Papain is used to promote digestion: discomfort, ballooning. This use is based on in vivo studies of hydrolysis of different proteins in the presence of papain. This demonstrated a specificity of action of papain towards the peptide bonds containing lysine or arginine in acid media (pH 3-5).

By diffusing in the body the papain would allow the fractionation of the abnormally secreted proteins, like the collagen fibers of the cellulite, and facilitate their elimination as well as that of the greasy cellulite.

Uses in association of systemic enzymes

Accelerate recovery and healing of muscle damage

Numerous studies in Europe show that supplementation with proteolytic enzymes effectively speeds up recovery after physical exercise and injuries in athletes. It also speeds up tissue repair in patients who have undergone surgery.

In a study of footballers with ankle injuries, supplementation with proteolytic enzymes accelerated their healing and allowed players to return to the field 50% faster than placebo athletes. Several small trials in athletes have shown that enzymes can help reduce inflammation and accelerate healing of tissue lesions (including fractures) and reduce overall recovery time compared to placebo athletes.

In patients undergoing various reconstructive and facial procedures, treatment with proteolytic enzymes significantly reduced swelling and pain compared to placebo patients

Inflammation

The use of systemic enzymes is particularly effective during inflammation because they hydrolyze the peptide bonds that unite amino acids to proteins, thus dissolving clumps of fibrin. This reduction in fibrin allows more oxygen to reach and reactivate the tissue cells. Excess fluid is also reabsorbed, reducing inflammation.

Bromelain

Source: *Ananas comosus* - Stem
Bio-activity: 1 200 to 5 000 GDU / g ≈ 2,4 to 10 FIP / mg
Units correspondence: 1 FIP/mg ≈ 500 GDU/g

Papain

Source: *Carica papaya*
Bio-activity: 1,5 to 3,5 FIP / mg
Units: 1 FIP ≈ 10 to 12 000 USP ≈ 160-180 TU / 100 TU ≈ 6 000 USP ≈ 0,6 FIP

Reasoned culture

Krishna Enzytech cultivates in agreement with the farmers and also has their own farms in the coastal regions of Andhra Pradesh. Papaya is grown between pineapple plants, helping to manage water consumption, in soil maintained at a pH of 5.5 to 6.0. Once harvested, the fruits are sold to the fruit industry and the stem is dried and used for making bromelain.

A double-blind German study of dentist patients showed the anti-inflammatory effects of a mixture of 100 mg pancreatin, 45 mg bromelain, 60 mg papain, 10 mg lipase, 24 mg trypsin and 1 mg of chymotrypsin. Patients took this mixture before and after a dental operation for several days. Three days after the operation, levels of C-reactive protein, a marker of inflammation, were three times higher in the control group.

Other enzymes

DigeZyme® is a unique proprietary blend of specific digestive enzymes that offers much more than just aiding proper digestion and better absorption of nutrients.

DigeZyme® consists of five GMO-free broad acting enzymes obtained from the fermentation process:

- **Amylase :** breaks down carbohydrates such as starch and glycogen, into smaller units
- **Protease**: Breaks down protein and supports immune function
- **Lactase**: Breaks down lactose (milk sugar) and useful for lactose intolerance
- **Cellulase**: Breaks down cellulose and chitin. It helps free nutrients in both fruits and vegetables
- **Lipase**: Breaks down lipids and improves fat utilization and also supports the most healthy gallbladder function

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