



Seebio Product Catalog for Enzyme



Seebio Biotech (Shanghai) Co., Ltd.

Contents

Transglutaminase (TG).....	1
Acid Xylanase	2
Cellulase	3
Fungal α -Amylase	5
Catalase	6
Acid Xylanase	7
Mid-temperature α -Amylase	8
Cellulase	10
Acid Pectinase	11
Acid Protease	12
β - Glucanase	14
Pullulanase	15
Glucoamylase	16
Compound Glucoamylase	17
High-Temperature α - Amylase	18
β -Amylase	19
Wide Temperature Desizing Enzyme	20
Phytase	21

Transglutaminase (TG)

Description:

Enzyme obtained through deep fermentation of *Streptomyces mobarensis* and widely used in the manufacturing of processed meats, bakery goods, dairy products, and vegetable protein products, such as tofu.

Technical information:

- White to light yellow powder
- Temperature range: 30 to 55°C (Optimum temperature: 40-55°C)
- pH range: 2.0 -12.0 (Optimum pH: 2.5-9.0)
- Time and temperature affect its performance; high temperature will shorten reaction time, while lower temperatures will increase it.
- TG enzyme activity can be customized to 100; 120; 160; 1,000 and 2,000 u/gr.
- Activity definition: Amount of enzyme required to catalyze the substrate to produce 1 μmol of hydroxamic acid per minute at 37°C and at a pH 6.0.

Mode of Action:

Formation of cross-linked protein polymers that improve the firmness, texture (mouthfeel), flavor and water holding capacity of food products such as, processed meats, dairy products, bakery goods, flour products (pasta, noodles) and vegetable protein products such as tofu.

Uses:

★ Processed meats

As a binding agent in ham; meatballs; minced meat, bacon, surimi, and crabmeat.

Improves consistency, flavor, water holding capacity and yield.

Recommended dosage: 0.1 to 1.0%*

★ Bakery goods

It is a binding agent in gluten and gluten-free products, thus improving dough stability, elasticity, and shelf life of bread, pastries, pasta, and flour tortillas. TG also improves fermentation tolerance thus, enhancing the flavor of bread and pastries. In noodles and pasta, improves elasticity and boiling resistance.

Recommended dosage: 0.1-0.4%*

★ Dairy

Yogurt: Increases water holding capacity; as a replacement of stabilizers.

Cheese: Incorporation of whey proteins into caseinates with subsequent improvement in firmness and yield.

Recommended dosage: 0.05-0.2%*

★ **Vegetable Protein Foods**

In products such as tofu and protein powder, TG improves emulsification, texture, sensory properties, and extends shelf life of tofu.

Recommended dosage: 0.1-0.4%*

*Recommended dosage based on enzyme activity of 100 µ/g.

Packaging, Storage & Handling

- Packaging: 1 and 5 kg bags. 20 kg carton. Packaging can be customized
- Storage & handling: Because it is a biologically active product, TG must be kept in dry and cool areas. Avoid exposure to sunlight and extreme alkaline or acid conditions.

Acid Xylanase

Description:

Acid Xylanase is obtained by submerged fermentation of *Trichoderma reesei*; it is widely used in the manufacturing of baked goods, brewing and alcoholic beverages, feed, and wheat products.

Technical information:

- 📍 Available in liquid form (black/brown; 50,000 and 100,000 iu/ml.) and also in powder form (white to gray; 50,000; 100,000 iu/gr). Food grade quality 290,000 iu/gr.
- 📍 Temp range: 30 to 65°C (Optimum temp: 40-60°C).
- 📍 pH range: 3.0-7.0 (Optimum pH: 4.8-5.5)
- 📍 Unit definition: One unit will release 1 µmol of reducing sugar measured as xylose equivalents from oats xylan 10 mg/ml per min at a of pH 4.8 at 50°C.

Mode of Action:

Acid Xylanases are hydrolases that breakdown xylan, the second most abundant polysaccharide, into Xylo-oligosaccharide and xylose. Acid Xylanases are used in animal feed, for the manufacturing of bread, food and alcoholic drinks, textiles, bleaching of cellulose pulp, and xylitol production.

Uses:

★ **Baking**

Acid Xylanases are often used to improve cereal processing to improve product quality. In wheat, Acid Xylanase helps in separating wheat gluten from starch thus, increasing gluten and starch yield and

purity. In combination with Fungal- α -Amylase or refined α -Amylase, Acid Xylanase, will have a synergistic effect.

Recommended dosage: 0.02 to 0.15 kg/t based on 290,000 iu/gr.

★ **Feed**

In poultry, improves feed conversion ratio (FCR) as a result of a better digestibility. In corn and soy diets, it has a synergistic effect when used in combination with glucanase.

Recommended dosage: 0.01-0.05 kg/ton raw material. Based on 10,000 iu/g.

★ **Beer, sake, wine**

Acid Xylanase will breakdown starches into sugar through saccharification in wheat beer and during the squeezing process in the manufacturing of fermented beverages such as sake and wine.

A synergistic effect occurs when used with β -glucanase or neutral protease.

Recommended dosage: 0.1 to 0.5 L/ton.

★ **Fruit juice**

Acid Xylanase diminishes the turbidity caused by polysaccharides normally present resulting in the clarification of the juice. Best results are obtained when used in conjunction with pectinase and α -Amylase.

Recommended dosage: 0.1 to 0.2 L/ton based on 5,000 iu/ml.

★ **Xylo-oligosaccharides (XOS)**

Acid Xylanase can be used in the production of XOS, a prebiotic known as the "Super Bifidus Factor" which is obtained from the hydrolysis of corncobs.

Recommended dosage: 0.2 to 0.4 L/ton on dry basis at 50,000 iu/ml

Packaging, Storage & Handling

- Liquid: Plastic drums of 22; 200; 840 and 1,000 L.
- Powder: 20 kg cartons; 25 kg bags and 25 kg drums.
- Storage & handling: Due to its organic nature, high temperature, strong acid & strong alkaline conditions will inactivate the enzyme.
- Avoid exposure to sunlight, keep in clean, cool, and dry place

Cellulase

Description:

Cellulase is obtained through submerged fermentation of *Trichoderma reesei*, it is available in liquid and powder and has the ability to degrade cellulose into cello-oligosaccharide, cellobiose and glucose. It is widely used in the feed, distilling and textile industries.

Technical information:

- 📍 Available in liquid (brown) 100,000-200,000 u/ml and powder form (off white) 40,000; 100,000;

200,000 u/g. Food grade 400,000 u/g.

- ◉ Temperatura range: 30 to 75°C (Optimum temperature: 55 to 60°C).
- ◉ pH range: 4.3-6.0 (Optimum pH: 4.5-5.0)
- ◉ Unit definition: (CMCA ENZYME): The amount of enzyme needed to hydrolyze cellulose in one hour at a pH 4.8 at 50°C, producing the equivalent to 1 mg of glucose (Standard: QB 2583-2003)

Mode of Action:

Cellulase is a linear polysaccharide of glucose residues connected by β -1.4 linkages. Cellulases are a multicomponent enzymatic system with endoglucanases (EG) that randomly hydrolyze cellulase chains into cellobiohydrolases (CBH) that hydrolyze cellobiose from the polymer ends and cellobiases that hydrolyze cellobiose into glucose and β -glucanases.

Uses:

★ Feed

Because of its cellulolytic properties, Cellulase improves the digestibility and utilization of fibrous nutrients, and it is commonly used in monogastric and ruminant diets.

Recommended dosage: 0.03-0.1 kg/ton of raw material based on 100,000 u/ml.

★ Textiles

In textiles, Cellulase is used for stonewashing by reducing the tear strength and dye uptake and to soften the texture of fabrics.

Recommended dosage: 0.5-2.0 (owf) at pH 4.5-5.5 at 45-55°C. Bath ratio: 1:10-25 for 30 to 60 minutes.

★ Alcohol

Because of its high starch content, cassava is an attractive feedstock for ethanol production. The use of Cellulase, in solid fermentation, will enhance alcohol production by converting unused glucan components into glucose and then into ethanol. A similar effect occurs when Cellulase is used in the elaboration of rice wine.

Recommended dosage: 0.15-0.25 kg/ton of raw material.

★ Juice production

Cellulase helps to eliminate haziness in apple juice by hydrolyzing the cellulose naturally present in apples.

Recommended dosage: 0.05-0.4 L/ton of pulp based on 100,000 u/ml for 1 to 5 hrs. at a of pH 4.5-5.5, and at 45-60°C

Packaging, Storage & Handling

- Liquid: Plastic drums of 22; 200; 840 and 1,000 L.
- Powder: 20 kg cartons; 25 kg bags and 25 kg drums.
- Storage & handling: Due to its organic nature, high temperature, strong acid & strong alkaline conditions will inactivate the enzyme.
- Avoid exposure to sunlight, keep in clean, cool, and dry place

Fungal α -Amylase

Description

Fungal α Amylase is produced by *Aspergillus oryzae*. It is used in commercial starch modification, fermentation of bread and beer, as well as in animal feed supplements.

Technical information

- Available in liquid (brown) 20,000 u/ml. and powder form (light yellow) Food grad: 100,000 u/g.
- Temperature range: 35 to 65°C (Optimum temperature: 50 to 60°C).
- pH range: 4.5-6.0 (Optimum pH: 4.8 -5.5)

Unit definition: The amount of enzyme needed to hydrolyze 10 mg of reducing sugar from glucose in 30 minutes at 40°C and at a of pH of 5.0 (Standard: QB 2526-2001)

Mode of Action

Fungal- α -Amylase is an endo-amylase that randomly degrades a wide variety of starch-containing substrates into amylose and amylopectin producing maltose, glucose, and other oligosaccharides.

Uses

★ Bread

Fungal- α -Amylase fermentable and reducing sugars that will accelerate yeast fermentation and generate the CO₂ needed for the expansion of the dough during proofing and baking. Fungal- α -Amylase Intensifies the aroma and flavor of the bread and darkens the crust through browning and caramelization reactions. The addition of Fungal- α -Amylase provides consistent quality in the production of bread.

★ Beer

Fungal- α -amylase allows brewers convert fermentable sugars into alcohol and CO₂, mostly maltose. Fungal- α -amylase helps to ensure that starch conversion is complete during mashing, thereby allowing the expected final attenuation desired.

★ Feed

Fungal- α -Amylase hydrolyzes the starch contained in feed to generate dextrans and sugars, in addition, it facilitates the contact between the digestive enzymes and chyme to improve nutrient absorption, thus lowering feed conversion ratio (FCR) which results in better animal production performance.

Packaging, Storage & Handling

- ▶ Liquid: Plastic drums of 22; 200; 840 and 1,000 L.
 - ▶ Powder: 20 kg cartons; 25 kg bags and 25 kg drums.
 - ▶ Storage & handling:
 - ▶ Avoid exposure to direct sunlight; keep in clean, cool, and dry place
-

Catalase

Description:

Catalase is produced by submerged fermentation of *Aspergillus niger*. Catalase will degrade hydrogen peroxide into water and oxygen, and it is commonly used in the textile, food, beer, and paper industries.

Technical information:

- 📍 Available in liquid (brown) 50,000 to 200,000 u/ml.
- 📍 Temperature range: 20-60°C (Optimum temperature: 40 to 55°C).
- 📍 pH range: 5.0-9.5 (Optimum pH: 6.0-8.0)
- 📍 Unit definition: The amount of enzyme needed to liberate 1 μmol of hydrogen peroxide in one minute at a pH of 7.0 at 30°C (Standard: LDZJ 03.05-2010)

Mode of Action:

Pending

Uses:

★ Textiles

Catalase will shorten the processing time by removing residual oxygen after bleaching and will reduce water utilization and consumption of energy, making it an ecofriendly product.

Recommended dosage: 0.06-0.1 g/L solution based on the activity of 50,000U/ML

★ Food and dairy

Catalase works as an antioxidant by neutralizing hydrogen peroxide. It is recommended to deactivate hydrogen peroxide when it is used as a bleacher or as a disinfectant.

Recommended dosage: 50 to 150 ml/ton fresh raw material at 30 to 45°C for 10 to 30 minutes. Based on 50,000 u/L. No pH adjustment is required.

★ Beer and Gluconate industries

In beer storage and sodium gluconate, the recommended dosage is 20-100 ml/ton at room

temperature. In dry matter with 30-35% concentration, the recommended dosage is 2,000 to 6,000 ml/ton at a pH of 5.0 at 30 to 55°C for 30 hours. Based on 50,000 u/ML.

In sodium gluconate production, catalase is used for the de-lignification of corn cob residue from which sodium gluconate can be obtained, a product with multiple applications in different industries. As a concrete retarder in construction; in bleaching, cleaning, and degreasing fibers in textiles; and as a water corrosion inhibitor in water systems.

★ **Pulp and papermaking industries**

In these industries, the main use is the degradation of residual bleaching, and the recommended dosage is 100 to 300 ml/ton of dry pulp at 40 to 60°C for 30 minutes. Based on 50,000 u/ML. No pH adjustment is required.ML

Packaging, Storage & Handling

- ▶ Liquid: Plastic drums of 22; 200; 840 and 1,000 L.
- ▶ Powder: 20 kg cartons; 25 kg bags and 25 kg drums.
- ▶ Storage & handling: Avoid exposure to direct sunlight; keep in clean, cool, and dry place.

Acid Xylanase

Description:

Acid Xylanase is obtained by submerged fermentation of *Trichoderma reesei*; it is widely used in the manufacturing of baked goods, brewing and alcoholic beverages, feed, and wheat products.

Technical information:

- ◉ Available in liquid form (black/brown; 50,000 and 100,000 iu/ml.) and also in powder form (white to gray; 50,000; 100,000 iu/gr). Food grade quality 290,000 iu/gr.
- ◉ Temp range: 30 to 65°C (Optimum temp: 40-60°C).
- ◉ pH range: 3.0-7.0 (Optimum pH: 4.8-5.5)
- ◉ Unit definition: One unit will release 1 μmol of reducing sugar measured as xylose equivalents from oats xylan 10 mg/ml per min at a of pH 4.8 at 50°C.

Mode of Action:

Acid Xylanases are hydrolases that breakdown xylan, the second most abundant polysaccharide, into Xylo-oligosaccharide and xylose. Acid Xylanases are used in animal feed, for the manufacturing of bread, food and alcoholic drinks, textiles, bleaching of cellulose pulp, and xylitol production.

Uses:

★ Baking

Acid Xylanases are often used to improve cereal processing to improve product quality. In wheat, Acid Xylanase helps in separating wheat gluten from starch thus, increasing gluten and starch yield and purity. In combination with Fungal- α -Amylase or refined α -Amylase, Acid Xylanase, will have a synergistic effect.

Recommended dosage: 0.02 to 0.15 kg/t based on 290,000 iu/gr.

★ Feed

In poultry, improves feed conversion ratio (FCR) as a result of a better digestibility. In corn and soy diets, it has a synergistic effect when used in combination with glucanase.

Recommended dosage: 0.01-0.05 kg/ton raw material. Based on 10,000 iu/g.

★ Beer, sake, wine

Acid Xylanase will breakdown starches into sugar through saccharification in wheat beer and during the squeezing process in the manufacturing of fermented beverages such as sake and wine.

A synergistic effect occurs when used with β -glucanase or neutral protease.

Recommended dosage: 0.1 to 0.5 L/ton.

★ Fruit juice

Acid Xylanase diminishes the turbidity caused by polysaccharides normally present resulting in the clarification of the juice. Best results are obtained when used in conjunction with pectinase and α -Amylase.

Recommended dosage: 0.1 to 0.2 L/ton based on 5,000 iu/ml.

★ Xylo-oligosaccharides (XOS)

Acid Xylanase can be used in the production of XOS, a prebiotic known as the "Super Bifidus Factor" which is obtained from the hydrolysis of corncobs.

Recommended dosage: 0.2 to 0.4 L/ton on dry basis at 50,000 iu/ml

Packaging, Storage & Handling

- ▶ Liquid: Plastic drums of 22; 200; 840 and 1,000 L.
- ▶ Powder: 20 kg cartons; 25 kg bags and 25 kg drums.
- ▶ Storage & handling: Due to its organic nature, high temperature, strong acid & strong alkaline conditions will inactivate the enzyme.
- ▶ Avoid exposure to sunlight, keep in clean, cool, and dry place

Mid-temperature α -Amylase

Description:

Mid-Temperature α -Amylase is the result of the deep fermentation of *Bacillus subtilis*. This enzyme is

commonly used in the manufacturing of sugar from starch and alcohol production, including beer. Industries such as textiles, dyeing, printing, papermills and feed also use it.

Technical information:

- Available in liquid (light brown) at 2,000; 3,000 & 5,000 u/ml. it is also available in powder form (yellow) at 2,000; 3,000; 4,000 and 5,000 u/g. Food grade (white color) can be custom made at concentrations of 1,000 to 10,000 u/g.
- Temperature range: 30 to 90°C (Optimum temperature: 60-70°C).
- pH range: 4.5-8.0 (Optimum pH: 5.2-6.2)
- Unit definition: The amount of enzyme required to hydrolyze 1 mg of starch in 1 hour at pH 6.0 at 60°C
- Standard GB/T 24401-2009

Mode of Action:

Mid-Temperature α -Amylase randomly hydrolyzes α -1-4 glucosidic linkages of gelatinized starch transforming them into dextrin molecules reducing the viscosity of the starch slurry.

Uses:

★ Beer and alcohol

Mid- Temp- α -Amylase is a major mash enzyme in the production of fermentable wort by digesting starch into smaller units. Better results can be obtained by adding β -amylase. Higher levels of Mid-Temp- α -Amylase help produce a thick, rich beer.

Recommended dosage: 6.0 L/ton of raw material based on 2,000 u/ml. Keep at 80-90°C for 30 minutes.

★ Fermentation industry

In the production of starch sugar, monosodium glutamate and industries that use liquefaction fermentation industry. Starch slurry is 16-18Be'; adjust pH to 6.2-6.4; add 0.2% calcium chloride (calculate on weight of raw material) add α -amylase at a rate of 6.0-8.0 L/t raw material (based on 2000u/ml) Blend well and heat to 85-90°C for 30 minutes.

★ Textile industry

Mid-Temp- α -Amylase hydrolyzes starch from the fabric, known as desizing, by breaking it into smaller molecules that can be easily washed away from the fabric or dissolved in hot water.

Recommended dosage: Add Mid-Temperature α -Amylase at a rate of 0.2% On Weight of Fabric (owf) based on 2000 u/ml. at 50-80 °C for 20-40 minutes.

★ Feed industry

Mid-Temp- α -Amylase in diets for broilers facilitate the digestibility of the starch present in the diet. Best results are obtained when used in combination with pectinase, β -glucanase and xylanase.

Recommended dosage: 0.02 to 0.04 kg/ton of raw material

★ Juice Processing

In juice processing, Mid-Temp- α -Amylase degrades starch into smaller units preventing post bottling haze formation. Since apples contain considerable amounts of starch, particularly at the beginning of

the harvest season, Mid-Temp- α -Amylase will improve the yield and clarification of apple juice. Mid-Temp- α -Amylase also helps in the elaboration of kiwi juice.

Recommended dosage: 0.02-0.1 L/t of the original juice slurry based on 2000 u/ml) at 45°C for 60-120 minutes

Packaging, Storage & Handling

- ▶ Liquid: Plastic drums of 22; 200; 840 and 1,000 L.
- ▶ Powder: 20 kg cartons; 25 kg bags and 25 kg drums.
- ▶ Storage & handling:
- ▶ Avoid exposure to direct sunlight; keep in clean, cool, and dry place

Cellulase

Description:

Cellulase is obtained through submerged fermentation of *Trichoderma reesei*, it is available in liquid and powder and has the ability to degrade cellulose into cello-oligosaccharide, cellobiose and glucose. It is widely used in the feed, distilling and textile industries.

Technical information:

- ◉ Available in liquid (brown) 100,000-200,000 u/ml and powder form (off white) 40,000; 100,000; 200,000 u/g. Food grade 400,000 u/g.
- ◉ Temperature range: 30 to 75°C (Optimum temperature: 55 to 60°C).
- ◉ pH range: 4.3-6.0 (Optimum pH: 4.5-5.0)
- ◉ Unit definition: (CMCA ENZYME): The amount of enzyme needed to hydrolyze cellulose in one hour at a pH 4.8 at 50°C, producing the equivalent to 1 mg of glucose (Standard: QB 2583-2003)

Mode of Action:

Cellulase is a linear polysaccharide of glucose residues connected by β -1.4 linkages. Cellulases are a multicomponent enzymatic system with endoglucanases (EG) that randomly hydrolyze cellulase chains into cellobiohydrolases (CBH) that hydrolyze cellobiose from the polymer ends and cellobiases that hydrolyze cellobiose into glucose and β -glucanases.

Uses:

★ Feed

Because of its cellulolytic properties, Cellulase improves the digestibility and utilization of fibrous

nutrients, and it is commonly used in monogastric and ruminant diets.

Recommended dosage: 0.03-0.1 kg/ton of raw material based on 100,000 u/ml.

★ **Textiles**

In textiles, Cellulase is used for stonewashing by reducing the tear strength and dye uptake and to soften the texture of fabrics.

Recommended dosage: 0.5-2.0 (owf) at pH 4.5-5.5 at 45-55°C. Bath ratio: 1:10-25 for 30 to 60 minutes.

★ **Alcohol**

Because of its high starch content, cassava is an attractive feedstock for ethanol production. The use of Cellulase, in solid fermentation, will enhance alcohol production by converting unused glucan components into glucose and then into ethanol. A similar effect occurs when Cellulase is used in the elaboration of rice wine.

Recommended dosage: 0.15-0.25 kg/ton of raw material.

★ **Juice production**

Cellulase helps to eliminate haziness in apple juice by hydrolyzing the cellulose naturally present in apples.

Recommended dosage: 0.05-0.4 L/ton of pulp based on 100,000 u/ml for 1 to 5 hrs. at a of pH 4.5-5.5, and at 45-60°C

Packaging, Storage & Handling

- ▶ Liquid: Plastic drums of 22; 200; 840 and 1,000 L.
- ▶ Powder: 20 kg cartons; 25 kg bags and 25 kg drums.
- ▶ Storage & handling: Due to its organic nature, high temperature, strong acid & strong alkaline conditions will inactivate the enzyme.
- ▶ Avoid exposure to sunlight, keep in clean, cool, and dry place

Acid Pectinase

Description:

This product is obtained by deep fermentation from *Aspergillus niger*, and it is widely used in the manufacturing of fruit and vegetable juice as well as wine. It also can be used in the feed diets and wood preservation.

Technical information:

- ◉ Available in liquid (light brown) 30,000 to 60,000 u/ml. and powder form (yellow) 30,000 to 60,000 u/g. Food grade: 300,000 u/g.
- ◉ Temperature range: 25 to 65°C (Optimum temperature: 50 to 60°C).
- ◉ pH range: 2.5-4.5 (Optimum pH: 3.3 -4.0)

- Unit definition: The amount of enzyme needed to hydrolyze 1 mg of galacturonic acid from 1 mg of pectin in one hour at 50°C and at a pH of 3.5 (Standard: QB 1502-1992)

Mode of Action:

Pectinase is a biocatalyst with multiple components, mainly PMGL; PG; PGL; PE. Pectinase will degrade pectin molecules.

Uses:

★ Fruit and vegetable juice

Helps in the clarification and stabilization of fruit and vegetable juice and reduces the viscosity of puree and vegetable sauces.

Recommended dosage: 0.05-3.0 L/ton of fruit or vegetable slurry based on 30,000 u/ml at a pH of 3.4-4.0 at 45°C for 1 to 5 hrs.

★ Wine

As in juices, it helps in its clarification and color stabilization.

Recommended dosage: 0.05-2.0 L/ton of slurry based on 30,000 u/ml. Pectinase can be added in the slurry or after the dilution.

★ Feed

It improves the digestibility of the diet by hydrolyzing complex fibers and making nutrients readily available which will reflect in a better food conversion.

Recommended dosage: 0.03-0.06 g/ton of complete feed based on 30,000 u/g.

Packaging, Storage & Handling

- ▶ Liquid: Plastic drums of 22; 200; 840 and 1,000 L.
- ▶ Powder: 20 kg cartons; 25 kg bags and 25 kg drums.
- ▶ Storage & handling: Avoid exposure to direct sunlight; keep in clean, cool, and dry place.

Acid Protease

Description:

Acid Protease is obtained through submerged fermentation of *Aspergillus niger*. It is a proteolytic enzyme that, under acid conditions, breaks down polypeptides into short chain peptides and amino acids. It is widely used in the production of ethanol, white spirits (vodka, gin, tequila), leather processing, feed additives and single cell protein feed and food.

Technical information:

- Available in liquid (brown) and powder form (light brown)
- Temperature range: 30 to 65°C (Optimum temperature: 55 to 65°C).
- pH range: 2.0-6.0 (Optimum pH: 2.5-3.5)
- Unit definition: One unit is the amount of enzyme needed to liberate 1 mg of tyrosine per minute of casein at pH 3.0; at 40 +/- 0.2 °C

Mode of Action:

The aspartic protease present has a proteolytic effect that hydrolyzes polypeptides into smaller peptide molecules and amino acids.

Uses:

★ Alcohol

In the manufacturing of fermented grain spirits such as whisky or rye helps to increase production of ethanol.

Recommended dosage: 0.05-0.15 L/ton of raw material based on 100,000 u/ml.

★ Other Fermented products

In the manufacturing of vinegar, soy sauce, yellow rice, millet wine, white spirits.

Recommended dosage: 0.15-0.2L (kg)/ton of raw material based on 100,00 u/ml.

★ Wool slenderizing

Acid Protease will have a shrink proof effect in the wool fiber and will improve its tenacity and extension.

Recommended dosage for a small lot: 0.6-2.0% (owf) at a pH 3.0-3.5 and a temperature of 40 to 50°C

Bath ratio: 1:20-40; keep it for 60 to 90 minutes.

Deweying rate: 1-4%

★ Feed

Acid Proteases reduce undigested protein in the GI tract, thus increasing energy values of the feed rations, and reducing protein fermentation in the large intestine resulting in better GI health.

Protease widens the range protein sources that can lower the cost of the ration without sacrificing performance.

Recommended dosage: 0.01-0.05 kg/ton of complete feed

★ Single Cell Protein

Acid Proteases work very well in the manufacturing of SCP. Due to the nutritional value of its biomass (protein content 40%), SCP is used as supplements in human food and animal feed.

Recommended dosage: 0.01-0.02 kg/ton complete feed

SCP is a protein source for human food supplements and animal feeds.

Recommended dosage: 0.1 -0.2 L(kg)/ton of raw material.

Packaging, Storage & Handling

- ▶ Liquid: Plastic drums of 22; 200; 840 and 1,000 L.
 - ▶ Powder: 20 kg cartons; 25 kg bags and 25 kg drums.
 - ▶ Storage & handling: Avoid exposure to sunlight, keep in clean, cool, and dry place.
-

β -Glucanase

Description:

It is an enzyme obtained through submerged fermentation of *Trichoderma reesei* and recovered by Modern Back Extraction Technique. Commonly used in the manufacturing of beer, feed, paper production and as an antifungal compound in plants.

Technical information:

- ◉ Available in liquid form (brown; 20,000 u/ml.) or in powder form (white; 30,000 u/gr). Food grade quality 90,000 u/ml.
- ◉ Temperature range: 30 to 70°C (Optimum temperature: 50-60°C). Higher activity can be obtained at 60 to 70°C for 30 min.
- ◉ pH range: 3.5-5.5 (Optimum pH: 4.8-5.5)
- ◉ Unit definition: One unit (U) of β-glucanase activity is defined as the amount of enzyme which liberates 1 μmol reducing sugar per min at 50°C and a of pH 5.5 (Standard: LDZJ03. 03-2010)

Mode of Action:

The main function of glucanase is to break down large polysaccharides (glycosidic bonds) via hydrolysis to diminish its hydrophilic activity and viscosity in the substrate.

Uses:

★ Beer

Glucanase breaks down the β-glucans located in the cell walls of the endosperm of the barley, this is important because glucans can be a problem during wort production and beer filtration. Glucanase should be added at the beginning of the saccharification stage. Glucanase can have an effect in the color, texture, clarification, and flavor of the beer.

Recommended dosage: 0.5 to 0.25 L/ton of malt based on 20,000 u/ml.

★ Feed

Poultry: In diets rich in barley, β-glucanase improves the digestibility of the ingesta thus increasing weight gain and improving feed conversion.

Recommended dosage: 0.02 to 0.1 kg/ton based on 20,000 u/ml.

Packaging, Storage & Handling

- ▶ Packaging. Liquid: Plastic drums of 22; 200; 840 and 1,000 L..
- ▶ Powder: 20 kg cartons; 25 kg bags and 25 kg drums.
- ▶ Storage & handling: Due to its organic nature, high temperature, strong acid & strong alkaline conditions will inactivate the enzyme.
- ▶ Avoid exposure to sunlight, keep in clean, cool, and dry place

Pullulanase

Description:

This product is obtained by deep fermentation of *Bacillus licheniformis*, and it is widely used in the manufacturing of starch sugar, beer saccharification, organic acid (salt), monosodium glutamate and alcohol production.

Technical information:

- ◉ Available in liquid (brown) 1,000 and 2,000 u/ml.
- ◉ Temperature range: 40-65°C (Optimum temperature: 60—65°C).
- ◉ pH range: 4.0-7.0 (Optimum pH: 4.2-4.8)
- ◉ Unit definition: The amount of enzyme needed to liberate 1 mg of reducing sugar (calculated as glucose) from pullulan in one minute. (Standard: LDZJ 03.02-2009)

Mode of Action:

Pullulanase is a debranching isoamylase that hydrolyzes pullulan, amylopectin and α -1.6 glucosidic linkages and during saccharification converts them in fermentable sugars. Works very well in conjunction with glucoamylase and fungal- α -amylase.

Uses:

★ Crystalline dextrose

In the manufacturing of crystalline dextrose or organic acid (salt) with glucose as a substrate, glucoamylase will continue the saccharification of partially processed starch and dextrin into glucose. If the maltose content exceeds 55%, the use of Pullulanase and β -amylase will be required.

★ Beer

In beer manufacturing, Pullulanase will reduce the content of amylopectin to produce a dry beer. It also

reduces the use of Glucoamylase and shortens the fermentation process by reducing the saccharification time.

Recommended dosage: 10-50 ml/ton of wort, based on 1,000 u/ml.

★ **Modified starch**

In the manufacturing of modified starch, Pullulanase can increase the amylose content transforming the film-forming ability and solubility of anti-peptic products.

Recommended dosage: 0.6 to 2.0 L/ton of raw material based on 1,000 u/ml as initial dose for a 6 to 12 hr.

★ **Other applications**

Pullulanase can be used in the manufacturing of monosodium glutamate, alcohol, vinegar, soy sauce, and yellow rice wine during the saccharification phase reducing residual dextrans and improving the use of the substrate.

Packaging, Storage & Handling

- ▶ Liquid: Plastic drums of 22; 200; 840 and 1,000 L.
- ▶ Powder: 20 kg cartons; 25 kg bags and 25 kg drums.
- ▶ Storage & handling: Avoid exposure to direct sunlight; keep in clean, cool, and dry place.

Glucoamylase

Description:

This enzyme is obtained by controlled fermentation of *Aspergillus niger*, and it is widely used in the brewing industry, manufacturing of starch sugars, alcohol monosodium glutamate and antibiotics

Technical information:

- 📍 Available in liquid (brown) 100,000; 150,000; 200,000 and 300,000 u/ml. In powder form: 100,000 u/ml.
- 📍 Temperature range: 40-70°C (Optimum temperature: 60—65°C).
- 📍 pH range: 3.0-5.5 (Optimum pH: 4.2-4.6)
- 📍 Unit definition: The amount of enzyme needed to liberate 1 mg of starch in one hour at a pH of 4.6 at 40°C

Mode of Action:

Glucoamylase will hydrolyze terminal 1,4 linked α -D-glucose residues successively from non-reducing ends of amylose chains to release free glucose. This fermentation also can hydrolyze α 1, 6 glucosidic

linkages into isomaltose and dextrans.

Uses:

★ Alcohol

Due to its high debranching activity and its ability to digest starch, glucoamylase can be used for alcohol production.

Recommended dosage: 1.0 to 1.6 L/ton of raw marl at 60 to 65°C.

★ Starch sugar

Recommended dosage: 1.0 to 3.0 L/ton of raw material.

★ Dry beer

Recommended dosage: 0.2 to 0.5 L/ton of dry malt.

★ Liquor brewing and vinegar

Recommended dosage: 1.0 to 1.5 L/ton of raw material.

★ Monosodium glutamate, antibiotics, and citric acid

Recommended dosage: 1.0 to 3.0 L/ton of raw material

Packaging, Storage & Handling

- Liquid: Plastic drums of 22; 200; 840 and 1,000 L.
- Powder: 20 kg cartons; 25 kg bags and 25 kg drums.
- Storage & handling: Avoid exposure to direct sunlight; keep in clean, cool, and dry place.

Compound Glucoamylase

Description:

Compound Glucoamylase is the combination of Glucoamylase and Pullulanase. While Glucoamylase is obtained from controlled fermentation of *Aspergillus niger*, Pullulanase is the result of a deep fermentation of *Bacillus licheniformis*. Compound Glucoamylase is widely used in the manufacturing of beer, monosodium glutamate, starch sugar, and antibiotics.

Technical information:

- 📍 Available in liquid (brown) 100,000 u/ml based on starch as substrate.
- 📍 Temperature range: 40-65°C (Optimum temperature: 55-60°C).
- 📍 pH range: 4.0-5.5 (Optimum pH: 4.2-4.6)
- 📍 Unit definition: The amount of enzyme needed to liberate 1 mg of starch in one hour at a pH of 4.6 at 40°C (Standard: GB 8276-2006)

Mode of Action:

Glucoamylase will hydrolyze terminal 1,4 linked α -D-glucose residues successively from non-reducing ends of amylose chains to release free glucose. This fermentation also can hydrolyze α -1, 6 glucosidic linkages in isomaltose and dextrans. Pullulanase is a heat stable debranching enzyme that works at a low pH and hydrolyzes α -1,6 glucosidic linkages in starch.

Uses:

★ Glucose production

After liquefying the raw material, adjust pH to 4.2 to 4.5, cool the material to 60°C and add Compound Glucoamylase at a rate of 0.4 to 0.9 L/ton of dry starch. Saccharification time should be between 30 to 60 hours.

★ Beer manufacturing

In the elaboration of beer, the recommended dosage is 0.15 to 0.35 L/ton of dry starch.

Packaging, Storage & Handling

- ▶ Liquid: Plastic drums of 22; 200; 840 and 1,000 L.
- ▶ Powder: 20 kg cartons; 25 kg bags and 25 kg drums.
- ▶ Storage & handling: Avoid exposure to direct sunlight; keep in clean, cool, and dry place.

High-Temperature α - Amylase

Description:

This is a bacterial amylase that derives from *Bacillus licheniformis*. Because of its tolerance for high temperatures, it is widely used in the production of starch sugars such as: glucose, fructose, maltose and dextrin. It is also used in the manufacturing of monosodium glutamate, organic acids, and gluconic acid salts.

Technical information:

- ◉ Available in liquid (brown) 20,000; 30,000; 40,000 u/ml. based on starch as substrate.
- ◉ Effective temperature : 55-100°C (Optimum temperature: 80-97°C).
- ◉ On steam injection liquefaction, the momentary temperature can be up to 105-112°C
- ◉ pH range: 4.3-8.0 (Optimum pH: 5.2-6.0)

Mode of Action:

This is an endo-enzyme that will randomly hydrolyzes α -1,4 glucosidic linkages of gelatinized starch into soluble dextrans, thus reducing high viscosity of the starch slurry.

Uses:

★ Starch as raw material

Slurry density: 10-20 Bé scale; pH: 5.6-5.8; steam injection temperature: 108-110°C; laminar flow: 90 minutes; make DE value 5-20% liquefied solution.

Recommended dosage: 150-500 ml/ton on dry basis, based on 40,000 u/ml.

★ Dry smash starch as raw material

Slurry density: 10-20 Bé scale; pH 5.8-6.2; injection temperature: 95-110°C; laminar flow: 90 minutes; make DE value 5-20% liquefied solution.

Recommended dosage: 600-900 ml/ton on dry basis, based on 40,000 u/ml.

★ Other applications

High-Temperature α -Amylase shows excellent low pH properties in alcohol and brewery manufacturing, textile, dye, and printing fermentation industries. The lowest pH value up to 4.6, especially, in the alcohol industry. The dosage refers to the introduction of high temperature α -amylase.

Packaging, Storage & Handling

- ▶ Liquid: Plastic drums of 22; 200; 840 and 1,000 L.
- ▶ Powder: 20 kg cartons; 25 kg bags and 25 kg drums.
- ▶ Storage & handling: Avoid exposure to direct sunlight; keep in clean, cool, and dry place

β -Amylase

Description:

β -Amylase is a high efficiency enzyme obtained from plants through Lonct Enzyme proprietary methods and characterized by good tolerance to high temperatures. This enzyme acts on starch, glycogen and related polysaccharides and oligosaccharides producing β -maltose by an inversion. β -Amylase cleaves two bound glucose molecules (maltose) from the reducing end of the chain. It is widely used in the manufacturing of beer, vinegar, high maltose syrup, and crystalline maltitol.

Technical information:

- 📍 Available in liquid (dark brown) 700,000 u/ml.

- Temperature range: Stable below 65°C (Optimum temperature: 55-60°C).
- pH range: 3.0-6.5 (Optimum pH: 5.0-5.6)

Unit definition: The amount enzyme required by hydrolysis of 1.10% starch solution to produce 1 mg of maltose per hour at pH 5.5 and 60°C. (Standard: LDZJ 03 04-2010)

Mode of Action:

β amylase is an exoamylase enzyme, which starts from the non-reductive end of liquefied starch and hydrolyzes α -1.4-glucosidic linkages in polysaccharides resulting in the successive liberation of maltose units from the non-reducing ends of the chain and simultaneously undergoing a Walden Inversion Reaction by transforming α -maltose into β -maltose.

The optimum saccharification conditions depend on saccharification time, pH, temperature, substrate concentration, and enzyme dosage. So, it is up to the plant to decide which are the optimum conditions for each particular case.

Uses:

★ Maltose syrup and beer brewing

Recommended dosage: 0.1 to 0.3 L/ton of dry material.

Optimum saccharification time for maltose syrup: 12 to 30 hours.

Optimum saccharification time for beer brewing: 0.5 to 1 hour.

★ High maltose syrup

For the production of high maltose syrup, (>70%) The saccharification stage will require the addition of Pullulanase.

Recommended dosage: β -Amylase 0.5 to 1.0 L/ton of dry material and Pullulanase 0.5 to 1.0 L/ton of dry material based on 1,000 u/ml. Saccharification time: 24 hrs.

★ Super high maltose syrup

For the production of super high maltose syrup, (>90%) The saccharification stage will require the addition of Pullulanase.

Recommended dosage: β -Amylase 1.5 to 2.0 L/ton of dry material and Pullulanase 1.5 to 2.8 L/ton of dry material based on 1,000 u/ml. Saccharification time: 24 hrs. Adding maltogenic amylase 0.015 L/ton of dry basis (enzyme activity based on 2000 u/ml).

Packaging, Storage & Handling

- ▶ Liquid: Plastic drums of 22; 200; 840 and 1,000 L.
- ▶ Powder: 20 kg cartons; 25 kg bags and 25 kg drums.
- ▶ Storage & handling: Avoid exposure to direct sunlight; keep in clean, cool, and dry place.

Wide Temperature Desizing Enzyme

Description:

This is the combination of High-Temperature α -Amylase obtained from *Bacillus licheniformis* and Mid-Temperature α -Amylase obtained from *Bacillus subtilis*. It is used in textiles for desizing purposes.

Technical information:

- Available in liquid (brown) 25,000 u/ml.
- Specific gravity: 1.10-1.25 g/ml.
- Temperature range: 40 to 110°C (Optimum temperature: 75 to 95°C).
- pH range: 6.0-7.5 (Optimum pH: 6.5-7.0)
- Metal ions such as: Ca²⁺; Mn²⁺ and Mg²⁺ will enhance the enzyme's activity, while Hg²⁺; Pb²⁺; Zn²⁺ will have a negative effect on its performance
- Unit definition: The amount of enzyme needed to hydrolyze 1 mg of starch in one minute at a pH of 5.0 at 70°C (Standard: QB 8275-2009)

Mode of Action:

This enzyme randomly hydrolyzes α -1.4 links of gelatinized starch and convert them in dextrans and soluble oligosaccharides thus, facilitating its removal.

Uses:

★ Textiles

High-Temperature α -Amylase is used in textile finishing for desizing, which is the random hydrolyzation of starch molecules into dextrans and oligosaccharides from the fabric to facilitate its removal or to dissolve them in hot water.

Recommended dosage: Bath ratio 1:10-20; enzyme concentration: 1.0-3.0 ml/L at a pH of 6.0-7.0 for 30 to 60 minutes.

Packaging, Storage & Handling

- ▶ Liquid: Plastic drums of 22; 200; 840 and 1,000 L.
- ▶ Storage & handling: Due to its organic nature, high temperature, strong acid & strong alkaline conditions will inactivate the enzyme.

Phytase

Description:

Thermostable phytase produced by Shandong Lonct Enzymes Co.,Ltd. with the latest scientific research achievements of strains refined by liquid deep fermentation and post-treatment technology. High temperatures, acid, and protease will not have a negative effect.

Technical information:

- Available in liquid: 10,000 u/ml to 50,000 u/ml. Solid type: 10000 u/g to 200,000 u/g
- Adjustment temperature range: 30-95°C (Optimum temperature 80°C).
- pH range: 3.0-6.0 (Optimum pH: 4.5)
- Unit definition: The amount of enzyme, needed to liberate 1 μmol inorganic phosphorus per minute from 5.0 $\mu\text{mol/l}$ sodium phytate at pH5.5, at 37°C.

Mode of Action:

Thermostable Phytase effectively hydrolyzes the phytic acid (Phytate) present in grains and seeds, releasing the phosphorus that is bound (orthophosphate), an essential nutrient for reproduction, ATP formation, and bone formation in diets, primarily, of monogastrics (swine and poultry). However, thermostable Phytase can also be used in high producing dairy cattle.

Since phytate is an antinutrient, as it travels through the GI tract, the oxygen present will increase its negative charge and will chelate with proteins, amino acids and minerals (P; Ca; Fe; Zn) making them unavailable to the animal. Phytase will neutralize this negative effect.

By liberating the phosphorus present in the phytate, the need of additional inorganic phosphorus in the diet will be less, thus, lowering the cost of the diet and reducing the environmental footprint.

Uses:

★ Recommended dosage by specie

Swine: 80-100 g/ton of complete feed. In concentrate and premixes, adjust proportionately.

Poultry: 50-80 g/ton of complete feed. In concentrate and premixes, adjust proportionately.

Dairy: 90-120 g/ton of complete feed. In concentrate and premixes, adjust proportionately.

Packaging, Storage & Handling

- ▶ Packaging. Liquid: Plastic drums of 22; 200; 840 and 1,000 L.
- ▶ Powder: 25 kg bags
- ▶ Storage & handling: Avoid exposure to direct sunlight; keep in clean, cool, and dry place. Recommended storage temperature: below 25°C



Contact Us

Thank you for your attention to Seebio Biotech (Shanghai) Co., Ltd.. If you' ve got any questions or comment, please contact us by phone, fax or email, as well as in letter.

Seebio Biotech (Shanghai) Co., Ltd.

Building 5, No. 508 Chuanhong Road, Pudong, Shanghai 201202, P.R.China

Phone: +86 21 58183719

Fax: +86 21 50272982

Foreign Trade Department

Extension

E-Mail

Alisa Goo

6521

sales@seebio.cn

Gloria Yang

6515

foodadd@seebio.cn

Leopard Jiang

6522

finechem@seebio.cn

