MagiZyme® HT 425L

Brewing Enzyme

MagiZyme® HT 425L is a thermostable bacterial alpha-amylase (EC 3.2.1.1) produced by the controlled fermentation of a non-genetically modified strain of *Bacillus licheniformis*.

Description

MagiZyme® HT 425L is an endo-amylase that randomly hydrolyzes (breaks) α-1,4-glycosidic bonds (linkages) in the interior of starch, glycogen, and their fractions; predominantly releasing dextrins of lower molecular weight and shorter chain length, oligosaccharides, and lesser quantities of glucose and maltose. The food grade liquid contains no chemical preservatives.

Performance Benefits

MagiZyme® HT 425L:

• Selectively and efficiently breaks down (hydrolyzes) starch and starch fractions; reducing their size, shape, and chain length.

• Breaks interior α-1,4-glycosidic bonds in starch and starch fragments (endo-action); predominantly releasing dextrin's and oligosaccharides (dextrinizing action).

• Initial hydrolysis rapidly reduces the viscosity of gelatinous starch slurries (liquefying, thinning action); yielding a soluble dextrin hydrolysate with a viscosity suitable for handling and further processing.

• Possesses exceptional thermal stability; permitting the efficient liquefaction of starch slurries in both batch and continuous industrial liquefaction systems.

• The properties of the α-amylase are compatible with both batch and continuous industrial liquefaction processes, and provide the opportunity for simplified design and operation of enzyme liquefaction systems.

• Is standardized to ensure process reproducibility and efficiencies, and cost/performance.

• Is a concentrated, economical liquid formulation that is convenient and easy to use.

• Complies FSANZ enzymes of microbial origin permitted for use Section 1.3.3. Clause 17.

Properties

Activity: ≥170 000U/ml
Form: Non-viscous, clear brown liquid
Solubility: Miscible with water
Specific Gravity: 1.10-1.25

Microbial Specifications

Total viable count (cfu/g): ≤ 50,000
Coliforms (MPN/g): ≤ 3,000
Salmonella species: absent in 25 g
E.coli: absent in 25g

Heavy Metal Specifications

Arsenic: ≤ 3mg/kg
Lead: ≤ 5 mg/kg

Cofactors and Inhibitors

MagiZyme® HT 425L α-amylase is a calcium metalloprotein which requires calcium ion as a cofactor for maximum stability. Calcium ion is not required for enzyme activity or starch hydrolysis. Rather, it stabilizes the structure of the protein molecule to maintain an active enzyme configuration. In the presence of calcium ions, **MagiZyme® HT 425L** tightly binds the calcium ions and is subsequently resistant to denaturation at pH and temperature extremes.

The addition of 50-75 mg/kg calcium ion to starch slurries is recommended to ensure that sufficient soluble calcium ion is available during starch liquefaction. Readily available calcium salts such as calcium sulfate, chloride, and oxide are acceptable.

Some whole cereal grains contain organic acids, phosphates and other calcium complexing compounds that can reduce the availability of soluble calcium ion below the concentration required for maximum enzyme stability and performance, e.g. barley malt, corn and rice, malt. When liquefying, whole cereal grains the addition of 100-200 mg/kg calcium ion is recommended.

To ensure enzyme stability in aqueous solutions (< 70°C) the addition of 5-10 mg/kg calcium ion is recommended.

Several metal ions inhibit **MagiZyme® HT 425L** activity. Copper, ferrous and cobalt ions are moderate inhibitors, while aluminum, lead and zinc are strong inhibitors. Alpha-amylase activity is also negatively affected by sequestering and strong oxidizing agents, e.g., EDTA, chlorine and sodium hypochlorite.

Dosage Guidelines

MagiZyme® HT 425L can be used to dextrinize and rapidly reduce the viscosity of gelatinous starch solutions in brewing, ethanol, food, textile, paper, and other applications, e.g., barley, barley malt, corn, potato, rice, sorghum, wheat, etc. The properties of the α-amylase are compatible with both batch and continuous industrial liquefaction processes, and provide the opportunity for simplified design and operation of enzyme liquefaction systems.

Enzyme requirements and performance are generally dictated by the type and quality of starch, the desired degree of hydrolysis, and the process and processing conditions (pH, temperature, time, etc.). In consideration of your process and processing conditions, conduct tests to establish and optimize use.

Initially evaluate **MagiZyme® HT 425L** at 0.05-0.1% (Brewing and Alcohol); (0.05-0.15% (Starch, monosodium glutamate) based on dry starch weight [dry solids basis (DSB); 0.2-0.60 kg/metric ton starch (DSB)]. Under optimal conditions, this dose will adequately liquefy a 30-35% DSB gelatinous starch slurry.

Prior to starch gelatinization, and with continuous agitation, directly add the enzyme to the starch slurry in batch liquefaction systems. Starch liquefaction will occur over the temperature range of starch gelatinization, and up to over 100°C. Depending on the starch type, maximum viscosity will occur between 60-80°C. If high viscosity impedes handling and processing, it will be necessary to hold at the point of peak viscosity until a viscosity break occurs (~ 15 minutes at a defined temperature).

Effect of pH and Temperature

Optimum Range: pH 5.8-7.8
Effective Range: pH 5.0 – 8.0
Solution Stability Range: pH 4.0 – 9.0

MagiZyme® HT 425L demonstrates optimum activity over the range of pH 5.8-7.8. In the presence of higher starch concentrations (10-50% DSB) and sufficient calcium ion (50-75 mg/kg), the enzyme demonstrates maximum starch hydrolysis over the range of pH 6.0-6.5 at 95°C. **MagiZyme® HT 425L** is stable in aqueous solution over the range of pH 4.0-9.0 at ambient temperatures.

Effect of Temperature
Optimum Range: 90-95°C
Effective Range: Up to 105°C

MagiZyme® HT 425L demonstrates optimum activity over the range 90-95°C at pH 5.8-7.8. In the presence of higher starch concentrations (10-50% DSB) and sufficient calcium ion (50-75 mg/kg), the enzyme demonstrates exceptional thermal stability and is compatible with continuous primary and secondary liquefaction systems employing a steam jet cooker (5 minute hold at 105°C and pH 6.5-7.0). Temperatures below 95°C extend enzyme activity and stability, whereas those above 95°C increase both the rate of hydrolysis and enzyme inactivation.

Packaging
MagiZyme® HT 425L is available in various 28 Kg pails.

Storage
The loss of activity is normally less than 10% over 6 months to a year when the enzyme is stored under cool, dry conditions in the original sealed containers. Product life can be extended by refrigeration 4- 10°C.

Safety and Enzyme Handling
Inhalation of enzyme dust and mists should be avoided. In case of contact with the skin or eyes, promptly rinse with water for at least 15 minutes.

For detailed handling information, please refer to the appropriate Material Safety Data Sheet, the Enzyme Technical Association (ETA) handbook, Working Safely with Enzymes, and the Association of Manufacturers and Formulators of Enzyme Products (Amfep) handbook Guide to the Safe Handling of Microbial Enzyme Preparations.

Technical Services BrewLab Adding Value

Zymus International Limited welcomes the opportunity to work with customers offering technical services with the use of our products in application development and optimisation.

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