

Enzyme information

Termamyl®

Description: Termamyl® is a liquid enzyme containing outstanding heat-stable alpha amylase, expressed and produced by a genetically modified laboratory strain of *Bacillus licheniformis*. It is an enzyme that hydrolyses 1,4 alpha glucosidic linkages in amylose and amylopectin. Starch is rapidly broken down to soluble dextrans and oligosaccharide,

Specification: Termamyl® is a clear brown liquid

Activity: One Kilo alpha-amylase Unit is the amount of enzyme which breaks down 5.26g starch per hour. Novozymes standard method for determination of alpha-amylase is based on the following standard conditions:

Substrate soluble starch
Reaction time 7-20 minutes
Temperature 37°C
pH 5.6

The presence of Ca ions and pHs of 5.5 - 6.5 can have a stabilizing effect on the enzyme even at temperatures close to or a little above 100°C.

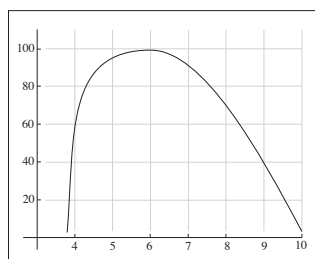
Applications: Termamyl® is used in the following industries:

Starch industry - the enzyme is used for continuous liquefaction of starch in steam jet cookers or similar equipment operating at temperatures up to 110°C and thereby taking advantage of the extreme heat stability of this enzyme.

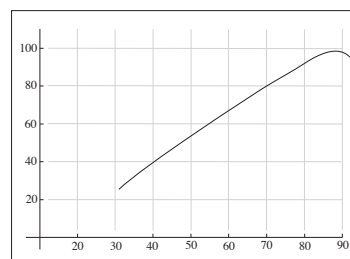
Alcohol industry - the enzyme is used for thinning of starch in distilling mashes. The heat stable of the enzyme is important advantage in the thinning of mashes .

Brewing industry - Termamyl® is used for adjunct liquidification (unmalted grains such as corn, rice, rye, oats, barley, and wheat used in brewing beer which supplement the main mash ingredient - malted barley). Due to the heat stability of the enzyme, the cooking programme can be simplified, it also means more of the adjunct can be used.

Sugar industry - Termamyl® is used to break down starch present in cane sugar. The starch content in the raw sugar is reduced which improves refinery filtering.



The influence of pH on the activity of Termamyl®



The influence of temperature on the activity of Termamyl®

Safety: The product is non-flammable. In the case of spillage or accidental contact with skin or eyes, rinse by flushing with water. Any spillage of the enzyme should be wiped up immediately with a paper towel and disposed of in a waste bin. Do not allow spillages of the enzyme or diluted enzyme to dry to a powder.

Enzyme information

AMG

Description: AMG - Amyloglucosidase is a liquid enzyme obtained from a selected strain of the fungus *Aspergillus niger*. The enzyme hydrolyses (breaks down) both the 1,4 and the 1,6 alpha linkages in starch. During hydrolysis, glucose units are removed in a step wise manner from the end of the substrate molecule. The rate of hydrolysis depends on the type of linkages and the chain length. The 1,4 alpha linkages are more readily broken than the 1,6 alpha linkages

Specification: The liquid enzyme is a clear brown preparation.

Activity: One Novozymes Amyloglucosidase unit is defined as the amount of enzyme which hydrolysis 1 micromole maltose per minute under the following standard condition:

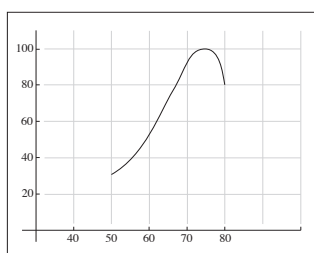
Substrate maltose
Temperature 25°C
pH 4.3 acetate buffer
Reaction time 30 minutes

The activity can be destroyed by heating the liquid to 80°C for about 5 minutes or 75°C for about 40 minutes

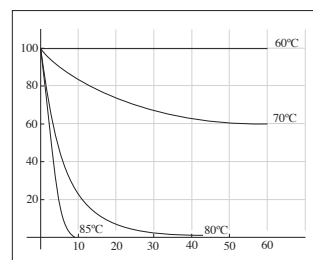
Applications: The enzyme is widely used in the following industries

AMG helps industrial bakers to overcome the challenge of crust separation and moisture loss in pre and part-baked goods. The enzyme enhances crust colour by generating glucose to enable the maillard reaction responsible for crust formation. Major benefits are reduced baking time, achieves desired crust colour and crispness and has limited impact on dough properties, even at high dosages.

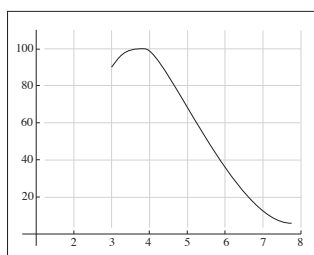
AMG is also used in the production of alcohol and spirits. It is used to degrade starch and dextrans efficiently and quickly into fermentable sugars.



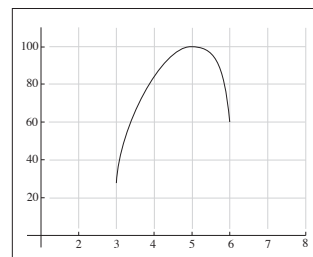
The effect of temperature on activity of AMG



The effect of temperature on stability of AMG



The effect of pH on activity



The effect of pH on stability

Safety: The product is non-flammable. In the case of spillage or accidental contact with skin or eyes, rinse by flushing with water. Any spillage of the enzyme should be wiped up immediately with a paper towel and disposed of in a waste bin. Do not allow spillages of the enzyme or diluted enzyme to dry to a powder.

Enzyme information

Celluclast®

Description: Celluclast® is a liquid enzyme preparation made from a selected strain of fungus called *Trichoderma resei*. The enzyme breaks down cellulose to glucose, cellobiose and larger polymers of glucose. The relative amounts of the products formed depends on the reaction conditions. Celluclast® has a pronounced viscosity-reducing (thinning) effect on soluble cellulosic substrates.

Specification: Celluclast® is a brown liquid.

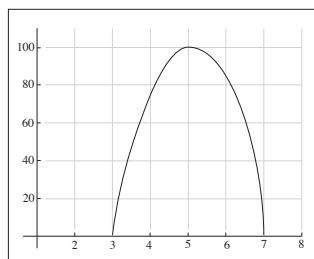
Activity: Novozymes define activity as NCU (Novo Cellulose Unit) which is the amount of enzyme which under standard conditions, degrades CMC to reducing carbohydrates with a reducing power corresponding to 1µmol glucose per minute.

Standard conditions used to determine the activity of the enzyme.

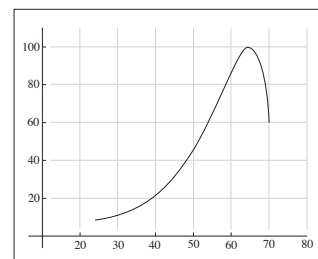
Substrate CMC	Temperature 40°C
pH 4.8	Reaction time 20 minutes

Applications: The enzyme can be used when the aim is to breakdown cellulosic material for production of fermentable sugars or the reduction of viscosity. The main products of cellulose hydrolysis with the enzyme are cellobiose and glucose. Cellobiose is not a fermentable sugar. To ensure maximum production of fermentable sugars Celluclast® is often used in combination with another enzyme. The ratio of the Celluclast® with another enzyme will depend on the reaction conditions, such as pH, temperature and substrate concentration.

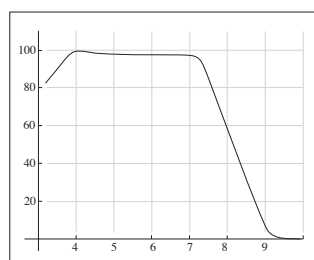
Since substrates can vary greatly trials will need to be done to find out the optimum dose rate of the Celluclast and complimentary enzyme. Where the reduction of viscosity is needed to increase the yield of plant products Celluclast® is recommended. Because of the enzymes action on beta-glucans and other non-starch polysaccharides it is often used to reduce viscosity in industries that process a range of grains such as wheat, barley and sorghum.



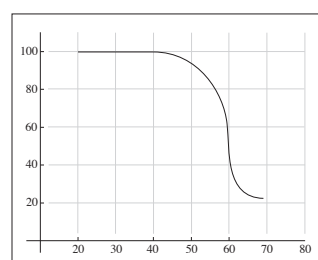
Influence of pH on the activity of Celluclast®



Influence of temperature on the activity of Celluclast®



Influence of pH on the stability of Celluclast®



Influence of temperature on the stability of Celluclast®

Safety: The product is non-flammable. In the case of spillage or accidental contact with skin or eyes, rinse by flushing with water. Any spillage of the enzyme should be wiped up immediately with a paper towel and disposed of in a waste bin. Do not allow spillages of the enzyme or diluted enzyme to dry to a powder.

Enzyme Information sheet is based on information provided by Novozymes

Enzyme information

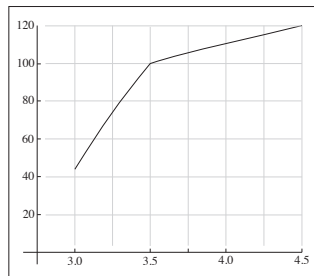
Pectinex[®] Ultra

Description: Pectinex[®] Ultra is a liquid enzyme preparation produced by a selected fungal strain of *Aspergillus aculeatus*. The enzyme preparation contains a collection of pectolytic and hemicellulolytic enzymes. The preparation has the ability to disintegrate plant cell walls.

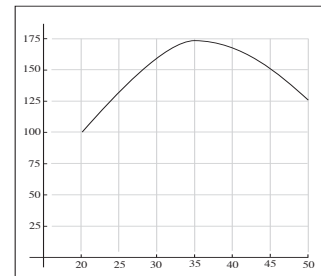
Specification: The Pectinex[®] Ultra preparation is a brownish liquid with a pH of approximately 4.5. The preparation is sterile filtered and bottled under aseptic conditions to ensure that the enzyme preparation that is supplied to commercial customers is virtually free of any microorganisms. Pectinex[®] Ultra complies with world wide specifications for food-grade enzymes.

Activity: Pectinex[®] has a standard activity of 26,000 PG/ml (pH 3.5). The standard activity is determined by the measurement of the viscosity reduction of a solution of pectic acid at pH 3.5 and a temperature of 20°C

Applications: The preparation is especially designed for the treatment of fruit and vegetable mashes and the maceration of plant material. The use of the enzyme preparation on fruit and vegetables mashes leads to increased capacities in the separation of solids and liquids and higher yields of juice.



Influence of pH on pectinase activity



Influence of temperature on pectinase activity

Safety: The product is non-flammable. In the case of spillage or accidental contact with skin or eyes, rinse by flushing with water. Any spillage of the enzyme should be wiped up immediately with a paper towel and disposed of in a waste bin. Do not allow spillages of the enzyme or diluted enzyme to dry to a powder.

Enzyme information

Viscozyme®

Description: Viscozyme® is a multienzyme product containing a wide range of carbohydrases, including: arabanase, cellulase B- glucanase, hemicellulase and xylanase. The enzyme mixture is produced from a selected strain of the *Aspergillus* group.

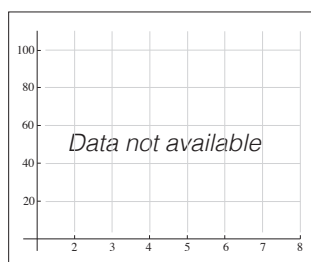
Specification: The preparation is a clear brown liquid with an activity of 100FBG/g. The optimum conditions for the activity of this enzyme complex is pH 3.3 - 3.5 and a temperature of 40°C - 50°C.

Storage: When Viscozyme® is stored at 25°C the activity of the product is maintained for at least three months. When stored at 5°C, the product will maintain its activity for at least one year.

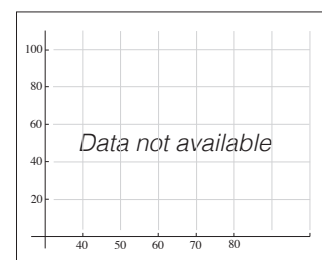
Applications: Viscozyme® is a special enzyme used in the breakdown of cell walls for the extraction of useful components from plant tissues and in the processing of cereals and vegetable materials.

The ability of the enzyme preparation to function at low temperatures means there is a reduction in the energy required to obtain products and also a reduction in the degradation of the desired products.

The multi-enzyme nature of Viscozyme® is important in the processing of plant material in the alcohol, brewing, starch and related industries. The ability of the preparation to degrade non starch polysaccharides can be used to improve starch availability in fermentations and to generally reduce viscosity and hence improve yields.



Influence of pH on the activity of Viscozyme®



Influence of temperature on the activity of Viscozyme®

Safety: The product is non-flammable. In the case of spillage or accidental contact with skin or eyes, rinse by flushing with water. Any spillage of the enzyme should be wiped up immediately with a paper towel and disposed of in a waste bin. Do not allow spillages of the enzyme or diluted enzyme to dry to a powder.

Enzyme information

Dextranase

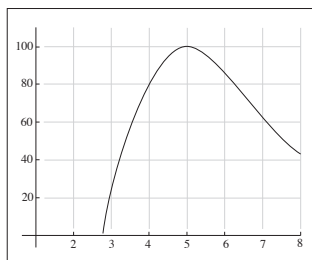
Description: Dextranase is a fungal dextranase produced from a submerged fermentation of a selected strain of *Chaetomium erraticum*. The enzyme hydrolyses the 1-6 alpha glucosidic linkages in dextran. The break down products are mainly isomaltose and isomaltotriose.

Specification: Dextranase is an amber coloured liquid.

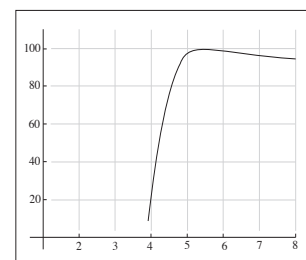
Activity: Enzyme activity is measured in KDU. One Kilo Novo Dextranase Unit (1KDU) is the amount of enzyme which breaks down dextran to give 1g maltose per hour using the following standard conditions:

Substrate	Dextran 500
Reaction time	20mins
Temperature	40°C
pH	5.4

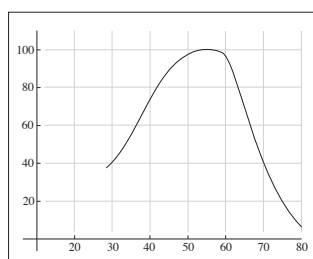
Applications: The enzyme is used in the sugar industry to break down dextran in raw sugar juices or syrups. Dextran forming bacteria can be a problem during harvesting of sugar cane and beet. The dextran producing bacteria interferes with clarification and sucrose crystallization, reducing factory capacity and yield. The use of the enzyme improves yields. The sugar industry often prefer operating conditions of pH 5 - 6 and a temperature between 50 - 60°C



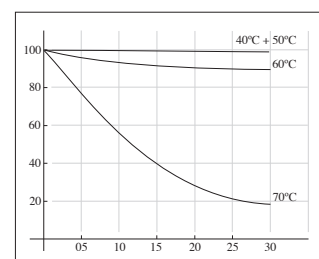
Influence of pH on the activity of Dextranase



Influence of pH on the stability of Dextranase



Influence of temperature on the activity of Dextranase



Influence of temperature on the stability of Dextranase

Safety: The product is non-flammable. In the case of spillage or accidental contact with skin or eyes, rinse by flushing with water. Any spillage of the enzyme should be wiped up immediately with a paper towel and disposed of in a waste bin. Do not allow spillages of the enzyme or diluted enzyme to dry to a powder.

Enzyme information

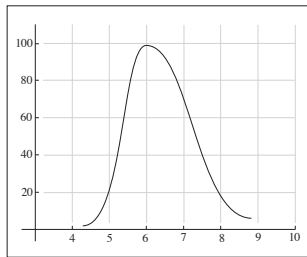
Neutrase®

Description: Neutrase® is an endoprotease which can be used in many applications where proteins have to be broken down to polypeptides or peptides. The enzyme is a bacterial protease produced from a selected strain of *Bacillus amyloliquefaciens*. Neutrase® contains only the neutral protease from *Bacillus amyloliquefaciens* where as other commercial preparations contain alkaline protease

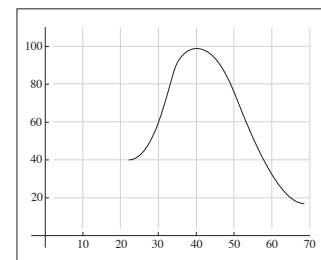
Specification: Neutrase® is a clear brown liquid. The product complies with numerous recommended specifications for use in the food industry.

Activity: Neutrase® activity as standardized in Anson units (AU). The analytical method is based on denatured haemoglobin in a 0.02M Ca²⁺ buffer. When stored at 5°C the product will maintain the declared activity for at least 1 year if stored at 25°C it will maintain the declared activity for at least 3 months. The enzyme can be inactivated by heat treatment e.g. 2 minutes at 85°C.

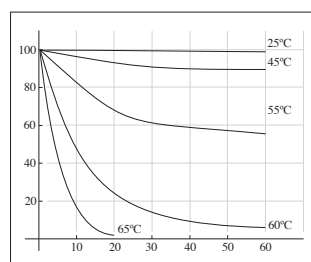
Applications: Neutrase® is used to breakdown a wide range of proteins of vegetable and animal origin.



The influence of pH on the activity of Neutrase® at 45°C



The influence of temperature on the activity of Neutrase® at pH 6.



The stability at pH 6.0 of Neutrase® at various temperatures

Safety: The product is non-flammable. In the case of spillage or accidental contact with skin or eyes, rinse by flushing with water. Any spillage of the enzyme should be wiped up immediately with a paper towel and disposed of in a waste bin. Do not allow spillages of the enzyme or diluted enzyme to dry to a powder.