

## Product Description

Distizym<sup>®</sup> BA-N is a special enzyme applied in alcohol production for the liquefaction of starch-containing mashes. The enzyme is produced from a specially selected strain of *Bacillus subtilis*. The main activity of the enzyme is based on an  $\alpha$ -amylase (1,4- $\alpha$ -D-glucan-glucanohydrolase: EC.3.2.1.1).

Distizym<sup>®</sup> BA-N is tested by specialized laboratories for purity and quality.

## Aim of Treatment

Liquefaction and dextrinisation of the gelatinised, digested starch in distilling mashes in a temperature range of 30-90 °C.

## Product and Effect

As an endo enzyme Distizym<sup>®</sup> BA-N hydrolyses 1,4- $\alpha$ -D-glycosidic bonds within the starch molecule. Products formed hereby are  $\alpha$ -limit dextrans and oligosaccharides.

## Dosage

The following standard dosages are recommended:

120 mL Distizym<sup>®</sup> BA-N/ tonne grain starch,  
250 mL Distizym<sup>®</sup> BA-N/ tonne potato starch or starch from other farinaceous raw materials.

In case of a deviation from standard conditions a higher or lower dosage might be required.

## Application

### Traditional digestion of starch without pressure

Distizym<sup>®</sup> BA-N is dosed into the mash tank before doughing or milling in the raw material or it is added during or after this process – in the latter case before or at the start of the heating phase. Before addition the enzyme is diluted with cold water in the ratio of 1:1. Dependent on the raw material Distizym<sup>®</sup> BA-N shows a good liquefaction effect already at temperatures as of 30 °C and a strong liquefaction effect as of 50 °C. Dependent on the heating rate, a more or less long liquefaction rest is kept at a mash temperature of 70-80 °C before reaching the final temperature. It is recommended to add calcium (in form of Ca(OH)<sub>2</sub>, CaCl<sub>2</sub>, etc.) in amounts of 75-150 ppm related to pure calcium. This, at first, activates the enzyme and, at temperatures above 60 °C, has an additionally stabilizing effect. In case of mashes with a pH-value below 5.0 an adjustment to pH 6.0 is recommended. When calcium hydroxide is applied to raise the pH-value, then, at the same time, higher calcium concentrations result.

### Special pressure/thermo processes (High-Pressure Cooking Process according to Michurin etc.)

Distizym<sup>®</sup> BA-N can be applied in High Pressure Cooking Methods when there is no necessity or possibility to keep a liquefaction rest at high temperatures (90-95 °C). This is for instance the case in High Pressure Cooking Processes (at 5-6 bar, respectively 150-160 °C), when, after pressure release in the steam separator, the mash is continuously cooled down to temperatures below 70 °C and is transferred into the saccharification vat. In case of other High Pressure Cooking Processes with continuous cooling of the mash, e.g. the Jet-Cooker method, Distizym<sup>®</sup> BA-N reduces the amount of thermostable amylase (Distizym<sup>®</sup> BA-TS), always necessary at the start, by an addition as of 80 °C for further liquefaction. In both cases it is recommended to add calcium (in form of Ca(OH)<sub>2</sub>, CaCl<sub>2</sub>, etc.) in amounts of 75-150 ppm related to pure calcium to stabilize and protect the enzyme from inactivation through the, at the start, still high temperatures.

## Storage

Optimum storage conditions at 0-10 °C. Higher storage temperatures result in a shorter shelf life. Temperatures above 25 °C must be avoided. Reseal opened packagings tightly and use up as soon as possible.

## General Characteristics

Enzyme characteristics: the activity range of the enzyme is between pH 4.0 and 8.0, the optimum is at pH 5.8-6.0 in the presence of substrate and calcium. The temperature range is between 30 °C and 90 °C, the temperature optimum is at 70-80 °C in the presence of substrate, calcium and at an optimal pH-value.

The diagrammes 1 and 2 show the influence of temperature and pH-value on the enzyme activity of Distizym<sup>®</sup> BA-N.

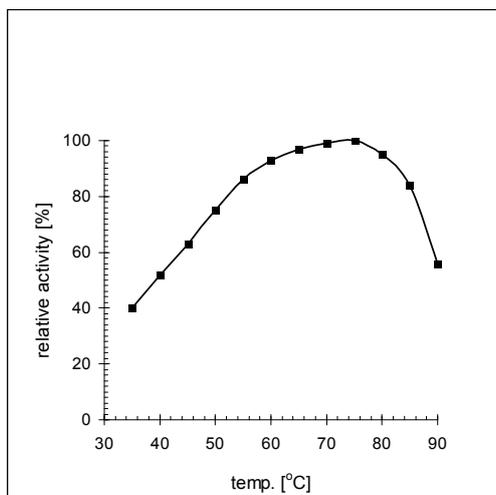


Fig 1: Influence of temperature on activity  
(16 % starch; pH 6.0).

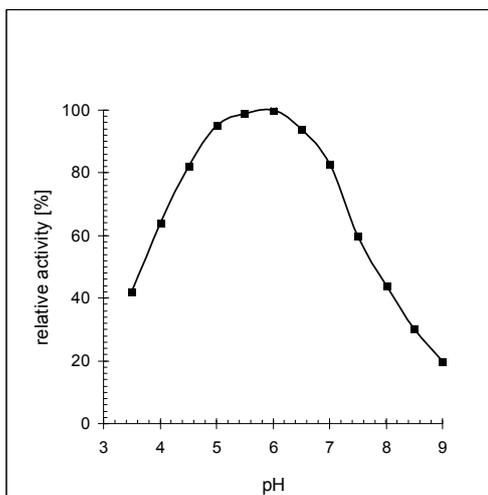


Fig 2: Influence of pH-value on activity  
(16 % starch; 70 °C).