Betamalt 25 FBD

Mühlenchemie
Understanding Flour

Amylolytic vegetable concentrate for improving the baking properties of rye and wheat flours and reducing their Falling Numbers

Enzymes and malt flour – background information

In all living materials, enzymes serve to maintain vitality. That also applies to cereals, although these do not produce large amounts of enzymes until they germinate. Enzyme-active malt flour is therefore made from germinated cereals such as barley, wheat or rye. The function of all three malt flours is much the same.

Malt flour contains large amounts of α and β amylases and also protease, glucanase and numerous other enzymes. Some of them (amylases and glucanases) have a positive effect on the baking process; others (proteases) tend to be damaging since they break down the gluten.

α-amylase splits the linear, unbranched parts of the starch molecule into smaller molecules. Like most other enzymes, amylase only attacks dissolved or hydrated substrates, i.e. the starch which has swollen in the dough.

The short-chain dextrins that come about through α-amylase activity serve as a substrate for β-amylase, which splits off maltose from them. This sugar is then utilized by the yeast.

This chain of different reactions has a number of effects:

- Reduced viscosity of the dough
- Greater fermentation power and thus oven rise
- Larger volume of the baked goods
- Enhanced flavour and browning
- Longer shelf-life (the crumb stays soft).

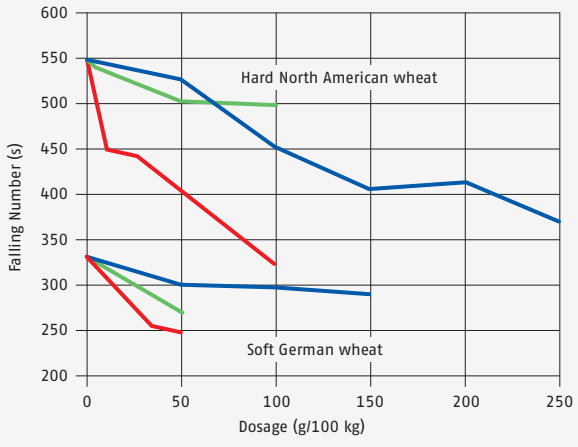
Malt flour amylases versus fungal alpha-amylases

Like all amylases naturally present in cereals, the amylase in malt flour has a considerable influence on the Falling Number. In this respect it differs from fungal amylase, which has no effect on the Falling Number if it is used in reasonable amounts. Amylase from malt has greater heat stability than fungal amylase and can therefore withstand the rising temperatures during standard determination of the Falling Number longer than fungal amylase. That means it is still active when the starch is partially pasted and therefore open to attack by the amylase. The viscosity of the flour-and-water mixture is thus reduced, and this is reflected in the Falling Number.

If the Falling Number is very high – i.e. the flour's own enzymatic activity is very low – malt flour has to be added in amounts of 150 g or more per 100 kg of flour in order to achieve a Falling Number of 250 to 300 s. If the Falling Number is around 300 s, no more than 50 g should be added or the dough will become too sticky.

Figure 1 shows a comparison of the Falling Numbers of flours from the USA and Germany that have been treated with fungal and cereal amylase respectively. Although the fungal α-amylase used in this case was from *Aspergillus niger* and therefore more heat-stable than the usual fungal α-amylase from *Aspergillus oryzae*, it had less effect on the Falling Number than the cereal amylases.

Fig. 1: Effect of fungal amylase and cereal amylases on the Falling Number of wheat flour

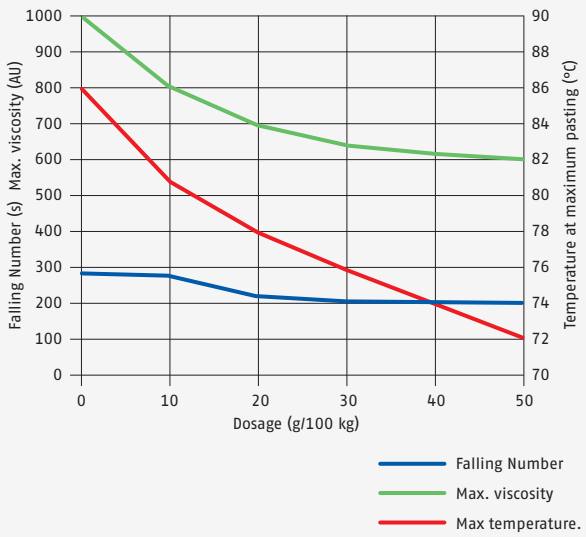


The effect of **Betamalt 25 FBD** on the Falling Number

It was a new amylolytic concentrate, **Betamalt 25 FBD**, that had the greatest effect on the Falling Number. Its activity is three to five times that of wheat malt flour. That is evident from the lower dosage needed to reduce the Falling Number of hard wheat flour (Fig. 1). Its efficacy is confirmed by photometric determination of the activity.

Figure 2 shows the effect of **Betamalt 25 FBD** on the Falling Number and Amylogram values of German rye flour Type 997 (approx. 1 % ash). The addition of 50 g of **Betamalt 25 FBD** per 100 kg of flour reduced the Falling Number by 100 s, the maximum viscosity by about 400 AU and the maximum pasting temperature by about 15 °C.

Fig. 2: Effect of Betamalt 25 FBD on the Falling Number and Amylogram values of German rye flour Type 997



The effect of **Betamalt 25 FBD** on baking properties

Betamalt 25 FBD is an amylolytic product derived from barley, with 1200 DU. It offers the advantage of standardized amylolytic activity free of fluctuations in conjunction with greatly reduced proteolytic activity.

This results in much better reproducibility of the dough properties than when malt flour is used.

- Better oven rise
- Greater volume yield
- Enhanced browning of the baked goods
- Glossy bread crust
- Delayed staling of the bread

Applications

Betamalt 25 FBD s used for standardizing the rheological properties of wheat and rye flours; this is reflected in a reduction of the Falling Number, maximum pasting temperature and maximum viscosity in the Amylograph test.

Betamalt 25 FBD is also used for other applications outside baking, for example in brewing and the production of non-alcoholic beverages made from cereals.

In this case Betamalt 25 FBD has important additional functions:

- Reduces the viscosity of the cereal mash
- Improves fermentation by increasing the amount of free sugar molecules
- Intensifies the sweetness without the addition of sugar.

How activity is determined

The activity of malt flour is often expressed as DP (diastatic power) or in DU (diastatic units); as a rule the DP is around 400. This indicates the number of reduction equivalents released from the soluble starch. Titration with iodine solution yields information on the formation of maltose and thus the presence of β-amylase.

Alternatively, the amylolytic activity of the malt is sometimes stated in SKB/g. The abbreviation stands for Sandstedt, Kneen and Blish, who developed the method in 1939. The values are in the range of 80 to 120. In this procedure the destruction of the iodine/starch complex by α-amylase in the presence of an excess of β-amylase is measured. Furthermore, the maltose released can be determined by various methods.

The following graphs (Figures 3 and 4) show the effect of temperature and pH on the activity of **Betamalt 25 FBD** and thus on the formation of maltose. The dextrin is broken down by the α and β amylases contained in Betamalt.

The shape of the curves for pH and temperature is typical of an amylolytic cereal product. The optimum temperature is around 60 °C, the optimum pH in the mildly acid range. If the laboratory does not have a photometer, it is possible to determine the activity of the amylolytic products with the aid of viscometers such as the Amylograph or the Rapid Visco Analyzer. To do this, soluble starch is used as a substrate at a constant temperature setting. Although the method is less accurate than photometric determination (about ± 15 % as opposed to ± 5 %) it is still adequate for numerous quality assurance purposes.

Fig. 3: Effects of temperature on the activity of Betamalt (15 % maltodextrin DU10, pH 5.2, 60 min.)

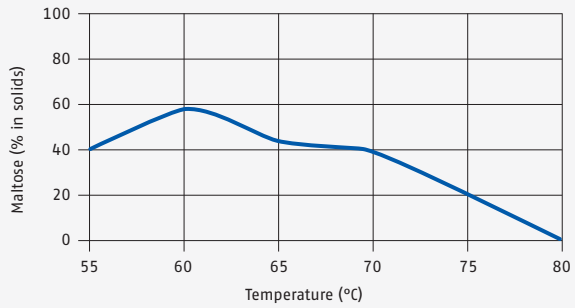
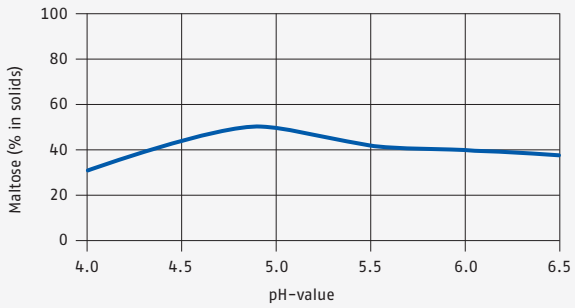
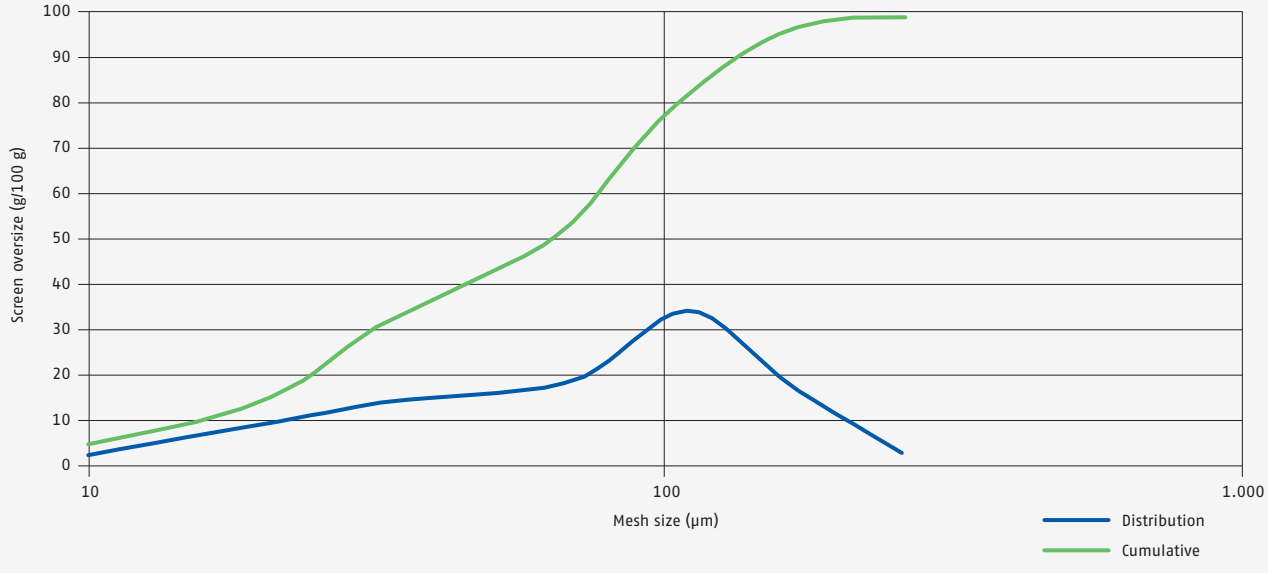


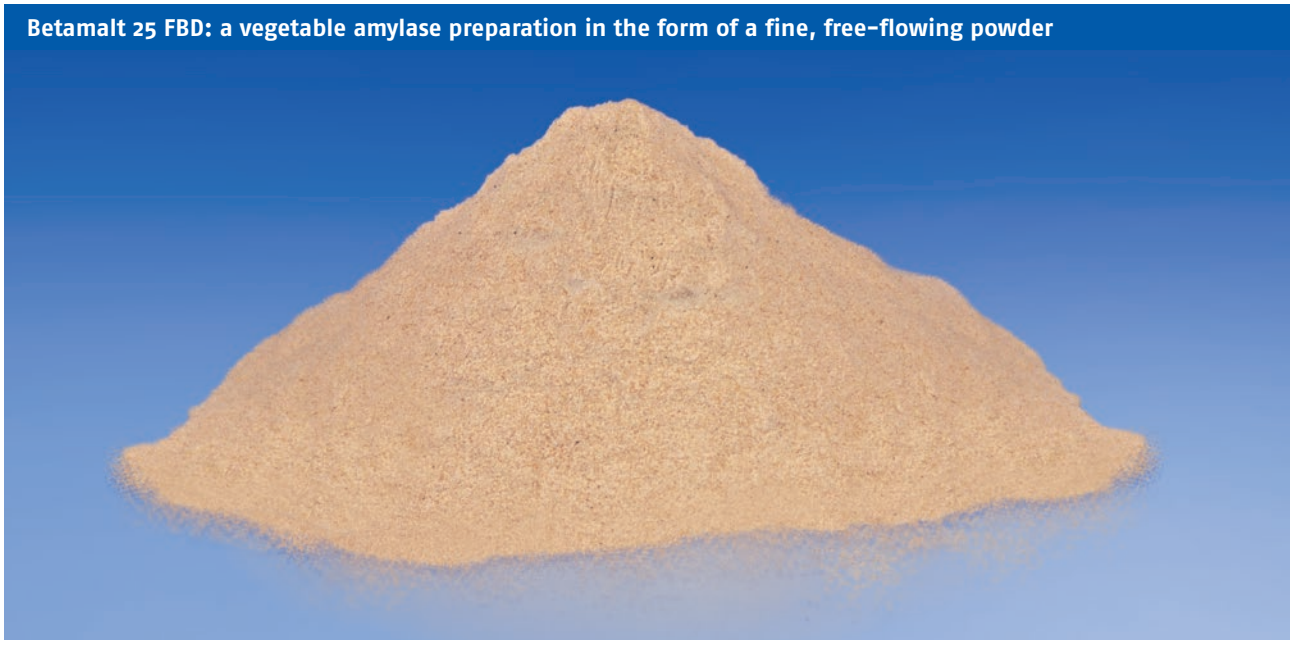
Fig. 4: Effect of the pH on the activity of Betamalt (15% maltodextrin DU10, 62 °C, 60 min.)



Particle size distribution of **Betamalt 25 FBD** in the Particle Sizer



Betamalt 25 FBD: a vegetable amylase preparation in the form of a fine, free-flowing powder



Usage levels

The typical dosage of **Betamalt 25 FBD** is 10–50 g per 100 kg of flour, depending on the desired reduction of the Falling Number and the initial values of the flour to be treated.

Ingredient statement

Betamalt 25 FBD is produced from barley and standardized with wheat flour. The ingredient statement on the retail pack could therefore be "Barley malt extract; wheat flour".

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