

HEATWAVE 2018

How enzyme systems can compensate for deficits in this year's crop—Low amylase values, high falling numbers

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The long period of drought and hot weather in large parts of Europe and Russia has caused massive damage to the 2018 wheat crop. New enzyme systems make it possible to compensate for quality deficits in low-amylase flours and lower the falling numbers.

In numerous growing areas in Eastern and Western Europe, farmers experienced a state of emergency during the summer months. A drastic water shortage and extremely long periods of heat caused reduced grain set and poor grain filling in the wheat fields in many regions. At temperatures that sometimes exceeded 50°C, the grains ripened much too early and had to be threshed prematurely.

Whereas farmers face massive reductions in the quantity of the harvest, millers will have to cope with deficits in quality. Since the grains remained dormant for a long time because of the dry weather, they contain only a small proportion of the enzymes normally present in cereals.

A low enzyme content causes flours to bake dry

In particular, the level of alpha- and beta-amylases is an important criterion for assessing the quality of flour, since it is these enzymes that determine the conversion of starches. If the amylase content is low, too little sugar is formed – sugar that the yeast needs for fermentation. This deficit results in products with a low volume and poor leavening. Flours with low amylolytic activity also have a tendency towards inadequate browning and “baking dry”, and they become stale quickly.

The falling number: an indicator of amylase activity

As a rule, the amylase activity of a flour and its ability to break down starch is analysed by measuring the falling number. In this method, the viscosity of a heated suspension of flour or meal and

water is determined: the longer a pestle takes to penetrate the starch paste, the lower is the amylase content.

Although this laboratory value does not always correlate with the results of the baking process, many bakeries regard the falling number as a quality parameter with a bearing on the price. The bread industry usually prefers values between 250 and 350 s.

To ensure that mills can meet the relevant specifications even when processing the 2018 crop, Mühlenchemie offers a toolbox with different systems for regulating the falling number.

A diversity of options for lowering the falling number

The most innovative compound in the falling number range is Deltamalt FN-A. With this system solution, Mühlenchemie's Research & Development department has succeeded for the first time in combining two requirements, which were hitherto incompatible. With conventional amylolytic enzymes it was only possible to influence either the baking performance of a flour or its falling number. In order to balance the two parameters, mills had to add various active substances and enzymes to the flour – a complex procedure fraught in practice with numerous uncertainties.

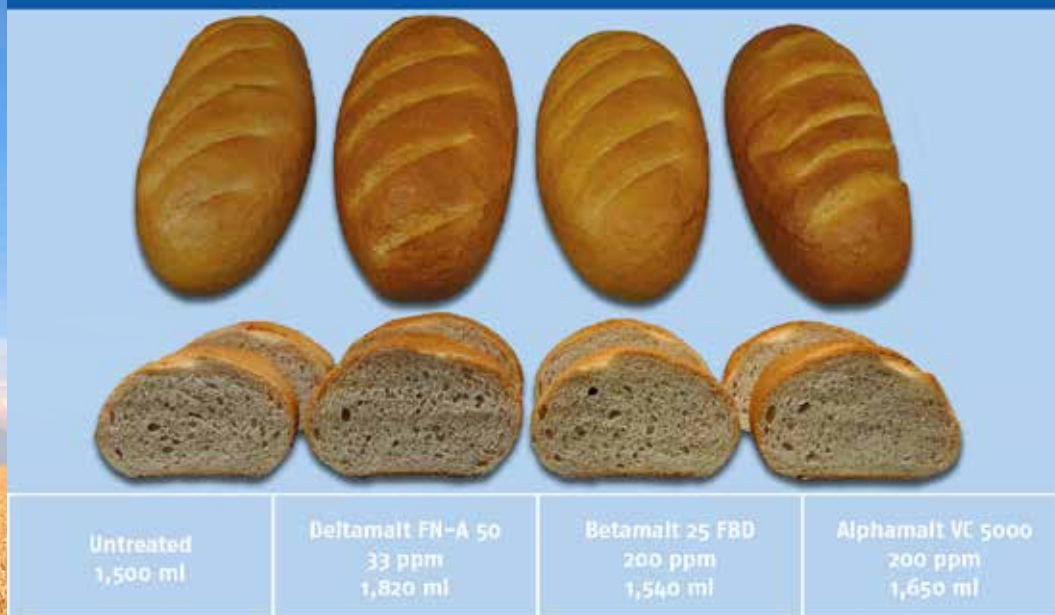
Deltamalt, a fungal amylase with enhanced handling characteristics, unites these two capabilities and is the first product to enable mills to optimize the relevant parameters “falling number” and “baking properties” simultaneously.

In comparative tests, Deltamalt FN-A 50 lowered the falling number of a Type 550 flour from 440 s to 270 s even at a usage level below 50 ppm and at the same time improved the volume, crispness and browning of a wheat loaf. (see Fig. 1). (Insert modified figure from the flyer, without Deltamalt FN-B).

Malt flour: a regulator with side effects

As an alternative to Deltamalt FN-A, the toolbox offers EMCEmalt. With this classic malt flour, too, it is no problem to adjust the falling number to any desired value. When using it,

Figure 1 - courtesy of ©Mühlenchemie



however, it must be remembered that germinated cereals contain dough-softening proteases as well as alpha- and beta-amylases, and that this may quickly result in wet doughs with poor stability.

If it is not felt necessary to increase the volume of the baked goods significantly, Betamalt 25 FBD is also suitable for lowering the falling number. This amylolytic barley malt concentrate shows little proteolytic side activity, and compared with traditional malt flour it offers greater product safety and reproducibility.

The fourth component of the Mühlenchemie toolbox is Alphamalt VC 5000 – an alpha-amylase derived from fungal cultures that greatly improves the baking properties of the flour and has a positive effect on oven rise and the volume of the baked goods. But since Alphamalt VC 5000 is heat-sensitive, its functionality cannot be proved by measuring the falling number.

Heterogeneous quality due to heat stress

Quite apart from the falling-number problem, mills will be faced with heterogeneous quality when processing the 2018 crop. Since heat stress affects the size of the grains, the structure of the starch and the composition of the gliadin and glutenin as well as enzymatic activity, lots of the same variety but with differing properties will be brought in for grinding.

The milling industry can respond even to this challenge with additional flour treatment measures. Mühlenchemie's portfolio includes special "on top" additives such as the anti-staling compound Alphamalt Fresh and the quality booster Alphamalt A 6003, with which flours can be standardized and optimized specifically and reliably even if their initial condition presented difficulties.

Influence on the prices of wheat, flour and flour additives

As a result of the drought, the protein content of the wheat crop

Severely reduced yields in the EU and CIS states

The consequences of the hot, dry summer of 2018 are already showing themselves in initial harvest forecasts. Whether in Poland, France, Romania, Kazakhstan or the Ukraine, in many major growing areas, farmers have had to contend with extreme drought and high temperatures. The German Raiffeisen Association (DRV), for example, forecasts a loss of 20 percent for German winter wheat. According to the industrial service AgriCensus, Russia is reckoning with a loss of about 25 percent of the wheat harvest. And because of the "driest summer for about 60 years", the Danish Agriculture and Food Council (DAFC) is expecting the reduction to be as much as 40 percent.

The consequences of this massive fall in the yield are also to be seen in the global harvest statement. In its recently published market reports, the International Grains Council (IGC) has lowered its forecasts for the 2018/19 harvest week after week. Whereas, for example, the estimated global wheat harvest was still 737 million tonnes at the beginning of July 2018, it fell to 721 million tonnes by the end of July.

will be slightly higher than in wet seasons, but because of the smaller grains and lower yield from the harvest the amount of vital wheat gluten and wheat starch produced will be less than usual. That means the currently high prices for wheat gluten will presumably continue to rise.

Although flour prices have practically no effect on the price of baked goods, the situation will make itself felt in applications in which vital wheat gluten is added in order to improve water absorption and the stability of the doughs. Recipes for sandwich loaves or hamburger buns often require the addition of 2 – 4 percent wheat gluten. This amount can be substituted with 0.2 – 0.4 percent of the enzyme compound EMCEgluten Enhancer 22. This substitution makes it possible to reduce logistics and warehousing costs as well as the cost of raw materials, since only one-tenth of the amount of wheat gluten is needed.

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