

CLEAR ADVANTAGES

WITH NEW-GENERATION

PECTINEX[®] MASH



Apple juice is naturally cloudy but clear apple juice concentrate is usually sold on the world market. Therefore all the solid particles have to be removed from the juice during processing.

New Pectinex Mash is the next generation of mashing enzymes for the first mash. It improves juice yields while preparing the way for a smooth clarification and filtration. This unique enzyme blend is one of the first achievements from joint work following the integration of Biocon's enzyme business into Novozymes.

To produce apple juice, the first step is a mashing process in which the aim is to press the fruit to extract juice. During this process, enzymes can provide a real advantage by optimizing juice yields. Based on pectinases, a first mashing product such as Pectinex Mash degrades soluble pectin to improve the release of juice from the fruit matrix.

The enzymes are added to the apples during milling and then the mash is held in a tank for about an hour where the enzymatic process takes place before pressing. Pectinases can therefore facilitate the extraction of juice with the focus on maximizing juice yield. However, due to their varying modes of action, not all pectinases are able to resolve the challenges posed in downstream processing such as clarification and filtration.

That's why a new generation of Pectinex Mash is being launched by Novozymes in August 2008. It not only increases yields, but also reduces the difficulties encountered in downstream processing. It works for all kinds of raw materials and juice production processes.

The difference is clear

The difference between the old Pectinex Mash and the new-generation Pectinex Mash are shown clearly by the results of lab trials at Novozymes. Among other parameters, a haze meter was used to measure the cloudiness of the juice extracted during a first mash treatment.

The clarity of the juice after the solid/liquid separation (pressing and centrifugation) was significantly better. The new enzyme preparation gave a cloudiness reading (known as turbidity) of 108 EBC units (known as standard turbidity units) whereas old Pectinex Mash gave a reading of 210 EBC. This effect is also reflected in the lower serum viscosity achieved with the new enzyme preparation.

"The clearer the juice, the better the mash enzyme. Here we observed a very significant difference in the ability to clarify the juice," says Dr Kurt Dörreich, commenting on the trial. He is based at Novozymes in Switzerland where he heads the global Center of Excellence and the Customer Solutions department for Juice and Wine. "The new Pectinex Mash gives high juice yields without attacking the cell walls and dissolving the structure of the fruit. It is advantageous for a first mash enzyme not to be too aggressive against the cell walls," he adds.

Clear apple juice is sold on the world market and therefore all the solid particles have to be removed from the juice during processing.

"The juice from the new-generation Pectinex Mash is easier to depectinize and filter," adds Kurt Dörreich. "You can achieve very good flow rates during ultrafiltration. With a lower turbidity in the mashing stage, you have fewer problems to fix later in the clarification and filtration stages. The whole efficiency of the plant increases."

Yields and profits

The total juice yield when using the new blend of Pectinex Mash also increased in the trials – by 1% compared to the old Pectinex Mash. This may sound like a small amount, but higher juice yields can be converted into higher profits. For example, a 1% increase in yields at today's market prices gives an increased profit of approximately USD 2.5 per ton of apples processed into juice.

"In the apple juice industry, the juice yield is in the range of 91–96% with first mash enzymes, whereas a manufacturer will reach a yield of only 75% without mashing enzymes. When you do a second mashing with enzymes, the yield can even increase to 99%! Enzymes are important contributors to the profits of customers. Any yield increase adds up to more profits," says Frédéric Issenhuth, the Global Marketing Manager for Juice and Wine at Novozymes in Switzerland.

The price of apples on the world market almost doubled in 2007 due to shortages of apples. As supplies become scarcer, juice producers look for ways to get more juice out of every apple. Apple orchards around the world have a limited output for juice production of 12.5 million tons of apples, while world demand is increasing. Novozymes estimates that this new-generation enzyme with a 1% higher juice yield gives the potential to create more than 100,000 tons of extra apple juice for the juice industry.

The new Pectinex Mash works well with all the existing equipment, whether belt press, hydraulic ▶▶

▶▶ press, or decanter. Enzyme solutions help juice producers to become more efficient by maximizing press capacity and shortening processing times. This is especially important during the months that apples are harvested when juice producers only have a short time in which to process a large quantity of fresh fruit. Enzymes help to ease their workload.

Like the existing Pectinex Mash, the new generation of Pectinex Mash is not derived from a genetically modified microorganism. Unlike the existing Pectinex Mash, it has a

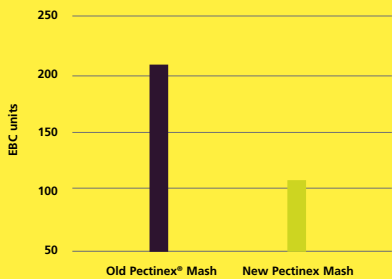
better balance of enzyme activities that act on specific soluble pectins in the fruit mash, leaving the insoluble pectin almost untouched. With the promise of improved yield and better downstream processing, enzyme customers will be conducting mashing trials with the new-generation Pectinex Mash to see the benefits for themselves. "Customers who are willing to run trials can be assured of the best technical support from Novozymes; we will demonstrate clear benefits," says Vincent Gass, the launch captain. ■

BENEFITS OF IMPROVED PECTINEX® MASH

- Fast mashing and juice viscosity reduction
- Juice yield increased by approximately 1%
- Faster throughput for increased production capacity
- Smoother clarification and filtration

Enzyme technology is used extensively during the first mashing of apples. To avoid problems later on, a first mash enzyme should not aggressively attack the cell walls and release too many solid particles into the juice. After pressing and centrifugation, the turbidity was 210 EBC in the case of old Pectinex® Mash (the tube on the left) and 108 EBC in the case of new Pectinex Mash (the tube on the right). The black strip is less visible through the tube on the left because there are more solid particles left in the apple juice treated with the old Pectinex Mash. EBC is a standard turbidity unit. Source: Lab trials at Novozymes, 2008.

TURBIDITY OF APPLE JUICE AFTER SOLID/LIQUID SEPARATION



A UNIQUE COMBINATION FROM NOVOZYMES

Novozymes is the only enzyme manufacturer using two different fermentation technologies and able to offer the best of both in one blended pectinase product.

Pectinases can be manufactured from either submerged or solid-state fermentation technology. Both technologies offer advantages and disadvantages – and both technologies are being used today by Novozymes to produce pectinases for the fruit juice industry.

With submerged fermentation technology, the enzymes produced have certain specific activities. In contrast, solid-state fermentation technology produces a broad spectrum of enzymes, which can cover needs that cannot be met by the range of enzymes produced by traditional submerged fermentation. Pectinases are being produced by solid-state technology by Novozymes in India following the acquisition of the enzyme business of Biocon Ltd in Bangalore in 2007.

"It is a real challenge to have several enzymes working together in one blend, all the more if they come from different production technologies. They have to be able to work under specific conditions and parameters," underlines Aindrila Dasgupta, Senior Manager for Customer Solutions at Novozymes in Bangalore.

The new-generation Pectinex® Mash is a blend of pectinases produced by both technologies using only naturally occurring microorganisms that have not been genetically modified.

Novozymes also has plans to test market a new improved enzyme blend for second mashing whereby the pomace left after pressing the apples is treated to extract even more juice. ■

FOR MORE INFORMATION
 Frédéric Issenhuth
 frei@novozymes.com
 Vincent Gass
 vgss@novozymes.com

