New Product

Mannanase BGM "Amano"

Beta-mannanase is an enzyme widely used in various industries, including food and oil drilling detergents. Amano Enzyme has succeeded in commercializing a beta-mannanase preparation from ***Aspergillus niger*** that contains very few enzyme side-activities, thereby overcoming the shortcomings of beta-mannanase preparations already in the food market. This report summarizes Amano's new beta-mannanase product and its characteristics.

■Beta-mannanase and its industrial uses

Beta-mannanase is an endo-type enzyme that hydrolyzes beta-1,4 mannoside bonding in mannan (mannose polymer), which belongs to the group of hemicellulose, a complex polysaccharide, in plants. The cell walls of higher plants are composed of cellulose (approx. 40%), hemicellulose (approx. 30%) and lignin (approx. 30%). Hemicellulose is a collective term for straight or branched polymer chains composed of xylose, galactose, mannose, glucose, arabinose, etc. Beta-mannanase is the enzyme that breaks down galactomannan and glucomannan, whose main chains are of mannose. Well-known sources of beta-mannanase are filamentous fungi such as *Aspergillus niger* and *Trichoderma reesei*, as well as bacteria *Bacilli*.

Beta-mannanase is used in a wide range of industries. One such use in food processing is in the extraction of coffee. When coffee is extracted from roasted coffee beans, problems of low filterability and sediment formation after extraction can occur, due to the insoluble, highly viscous nature of galactomannan. To prevent these problems, beta-mannanase is applied during extraction, to break galactomannan down into low polymers. As another example, since beta-mannanase has some physiological effects, including enhanced bowel movement, it is used to manufacture guar bean-derived galactomannan hydrolysate, which is recognized as FOSHU (food for specified health uses) in Japan. Coffee bean-derived manno-oligosaccharide (mannobiose) is also given the same status. Other reported applications of beta-mannanase include the production of soluble konjac (devil's tongue starch cake) mannan, the decomposition of copra meal (residue after extraction of coconut oil), and the removal of viscous materials from aloe.

Technical applications include pulp bleaching, in which beta-mannanase is used as a type of hemicellulase, and oil-well drilling, during which galactomannan decomposed with beta-mannanase is used as a coagulant. Mannanase is also used in detergents to remove stains. Galactomannan, which is contained in a variety of foodstuffs, cosmetics and personal care products as a viscosity enhancer, is bound strongly with cotton and attracts particles of earth soil, which often stain clothing. Mannanase is therefore contained in detergents to remove such stains.

■Mannanase BGM "Amano" 10

Mannanase BGM "Amano" 10 has been developed as a beta-mannanase preparation for food use. The new product features much lower enzyme side-activities and higher purity than existing products. As shown in the table below, Amano's product demonstrates less activity in concomitant enzymes (xylanase, beta-mannosidase, alpha-galactosidase and acid protease) than the other two products already in the market.

Table. Comparison of concomitant enzyme activities in mannanase preparations

	Mannanase BGM "Amano"10	Existing product 1	Existing product 2
<Main activity> beta-galactomannanase	11,000	10,920	9,521
<Side-activity>			
Xylanase	0	9,733	3,654
Alpha-galactosidase	2	191	646
Beta-mannosidase	25	0	108
Acid protease	24	7242	109

■Applications of Mannanase BGM "Amano" 10

Fig. 1 indicates effects of Mannanase BGM "Amano" 10 on the coffee extraction application: filtration speed increased, while extracted liquid viscosity was lowered. Moreover, sediment formation was restrained during low-temperature storage of extracted liquid. In a taste evaluation, use of the Amano product was found to have improved the coffee taste, with intensified acidity, and a milder taste. This is attributed to a lower content of protease and other enzyme side-activities.

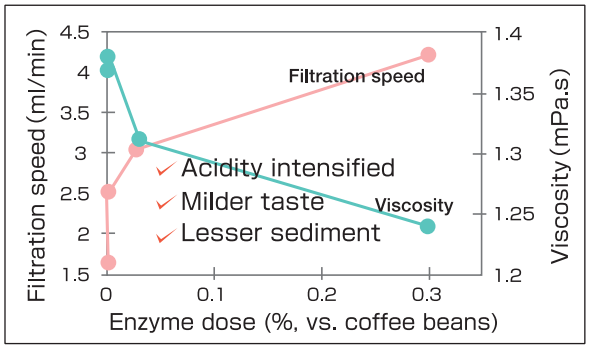

Fig. 1 Application to coffee extraction

Mannanase BGM "Amano" 10 was also tested in the hydrolysis of guar bean-derived galactomannan. The results of analysis of the oligosaccharide generated in galactomannan hydrolysis demonstrated that more low-polymer (hexa- or lower) manno-oligosaccharides were produced with the Amano product than when the other existing products were used. Fig. 2 compares the quantities of disaccharides (mainly mannobiose) produced. Moreover, the amount of monosaccharides produced also decreased with use of Mannanase BGM "Amano" 10. The presence of monosaccharides is not desirable in galactomannan hydrolysates or manno-oligosaccharide products for food use because monosaccharides cause osmotic pressure increase and browning. Use of Mannanase BGM "Amano" 10 reduces monosaccharide formation, presumably because of its lower content of exo-type enzymes releasing monosaccharides, such as alpha-galactosidase and beta-mannosidase. The taste of hydrolysate products obtained using Mannanase BGM "Amano" 10 was also improved.

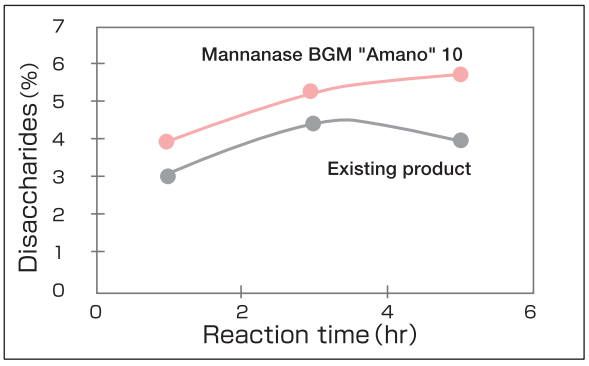

Fig. 2 Disaccharide formation from galactomannan

Mannanase BGM "Amano" 10 is expected to play a significant role in the manufacture of high value-added foods and food ingredients that are advantageously differentiated from other products because of its features, e.g., lower activity of various concomitant enzymes leading to lesser side reactions that can cause off-flavors, compared to conventional enzyme preparations.