THE MANY USES OF XYLANASE: INDUSTRIAL APPLICATIONS

Xylanases are enzymes commonly found in micro-organisms, marine algae, protozoans, snails, crustaceans, insects, seeds, plants, and other natural sources. Their major function is to break down a type of fibre known as hemicellulose by converting one of its components, (beta 1, 4) xylan, into a simple sugar called xylose. Xylan, also known as “wood gum”, is a gummy polysaccharide found in plant cell walls. Recently, there has been much industrial interest in xylanases for wood pulp biobleaching, papermaking, the manufacture of food and beverages, animal nutrition, and bioethanol production. Because of their biotechnological characteristics, xylanases are most often produced from microorganisms for commercial applications. Let’s look briefly at some promising industrial uses of xylanases.

Xylanases are used in the biobleaching of wood pulp and in the bioprocessing of textiles. In fact, treating cellulosic pulps with xylanases selectively removes residual xylan when dissolving pulp. Xylanases are able to degrade the hemicellulose present in the pulp without affecting the cellulose. Enzymatic treatment has been shown to enhance various physical properties of paper, including viscosity, tensile strength, breaking length, and tear factor. In addition, biobleaching with xylanases softens the fibres, allowing them to undergo further chemical bleaching.

Another industrial use of xylanases is the bioconversion of xylan into higher value added products. As the enzymatic hydrolysis of xylan leads to xylose, different fermentations may occur and a variety of compounds can result from these reactions. One of the most important such products is xylitol, which is used to sweeten food products such as chewing gum, candy, soft drinks and ice cream. Xylitol can also be used as a natural sweetener in toothpaste and various pharmaceutical products.

Furthermore, xylanases are used in manufacturing animal feed. Animal Science researchers have proven that the pre-treatment of agricultural silage and grain feed with xylanases improves nutritional value and facilitates digestion in ruminants. It has also been reported that xylanases reduce viscosity and increase absorption by breaking down the starch polysaccharides in high-fibre rye- and barley-based feeds. Supplementing broiler diets with a combination of xylanases increases growth performance indicators like weight gain.

Finally, in the bioenergy industry, there is a type of xylanase, called “Xtreme” xylanase, which has great potential to revolutionize biorefining. Xtreme xylanase is the most thermal- and acid-stable xylanase ever discovered, meaning that it can tolerate a very wide range of processing conditions. Scientists report that Xtreme xylanase can be used to improve biomass pre-treatment economics by removing or reducing the need for steam and pH neutralization during the biorefining process. Beyond these benefits, Xtreme xylanase is also able to boost fermentation efficiency and, more generally, make bioprocessing more economical.

In summary, xylanase enzymes have a wide range of industrial applications. Beyond those already mentioned, xylanases can also be combined with others enzymes, such as amylases, for enhancing the quality and volume of bread; pectinase, for clarifying juice and liquefying fruits; or cellulases, for deinking (removing the ink from) recycled fibres.

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With biotechnology, there are many ways to use xylanases!

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