

A Review :

Potential applications of xylanase in paper and pulp

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The most important large-scale biotechnological applications of recent years is in the use of xylanase as bleaching agents in paper and pulp industry, to minimize use of chlorine the conventional bleaching agent. The applications of xylanases have offered a major step in the reduction of chlorine consumption in the bleaching process of kraft pulp, thus lowering environmental pollution by organic halogens. The pulp and paper technology is one of the fast growing industries and the use of xylanases seems attractive since they provide global environmental benefits. In this review, the 1. Source microorganisms and properties of xylanases produced by various microorganisms are discussed. 2. Applications of xylanase in hard and softwoods are also detailed.

Key words : Xylanase, Microorganisms, Paper and pulp industry; Properties of xylanase.

INTRODUCTION

Pulp bleaching technology is changing due to environmental public concerns (Yang *et al.*, 1992). Xylanases are being used, primarily for the removal of the lignin – carbohydrate complex (LCC) that is generated in the kraft process and acts a physical barriers to the entry of bleaching chemicals (Paice *et al.*, 1992). The use of the thermo stable and alkaline stable T6 Xylanase during a full scale mill trial using a TCF (Total Chlorine Free) sequence showed that this enzyme can be introduce into a mill at a low cost and results in a 2 ISO unit increase in the final brightness with an altered strength properties and successful implementation of enzymatic delignification in pulp production (Lundgren *et al.*, 1994). Viikari *et al.* (1986) first showed that treating pulps with hemicellulases can reduce the subsequent chlorine-bleaching requirements. Xylanases are believed to act mainly on reprecipitated xylan on the surface of the micro fibrils. The removal of this xylan renders the fibre structure more permeable for extraction of lignin in the subsequent chemical bleaching. Xylanase is applicable for pulp pretreatment at elevated temperatures in neutral and alkaline conditions (Ratto *et al.*, 1994). Organic chlorine compounds formed during the bleaching of chemical pulp house probably attracted most attention in recent years. These compounds arise mainly from the reactions between residual lignin present in wood fibres causing the brown colour of unbleached pulp and the chlorine used for bleaching (Viikari *et al.*, 1994). The use of xylanases in the pulp and paper industry has recently

become an alternative bleaching technology aimed at eliminating chlorine in bleaching and reducing chlorogenic compounds in bleach plant effluents. Bleaching with xylanases is considered as one of the most important applications of enzymes due to the positive environmental effects and economical feasibility of this method (Viikari *et al.*, 1994). Xylanase treatment enhanced peroxide bleaching of kraft pulps (Wong *et al.*, 1996). Enzyme treatment prior to chemical bleaching of eucalyptus kraft pulps allows a significant decrease in the consumption of both ClO_2 and H_2O_2 (Vicuna *et al.*, 1997). The capability for pulp bleaching by crude enzyme preparation is an interesting alternative choice for pulp biobleaching, because the cost for enzyme purification would be reduced; an important consideration for industry (Tenkanen *et al.*, 1997). The use of the enzymes for pulp bleaching could boost pulp brightness or alternatively decrease the amounts of bleaching chemicals consumed. The aim of the review deals with target applications of xylanase in biobleaching of pulps.

Xylanase :

Xylanase (endo β , 1-4 xylanase) are glycoside hydrolases that catalyze the hydrolysis of internal β -1, 4 bonds of xylan. Xylanases have been produced in either solid state fermentation or submerged state fermentation. They show a remarkable potential for practical utilization in many fields, including food additives, pharmaceuticals, feed formulations and agricultural applications.

Mechanism of action of the xylanases:

It has frequently been suggested that the catalytic

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