A CASE STUDY:

Fungal xylanases : Theie application and future propspects

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Microbial xylanases are a group of industrial enzymes with applications in the paper and pulp industries, food and feed industry; animal feed industry and textile industries. This application of the xylanase is ecofriendly and the enzyme applications within the pulp and paper industry seem to be nearly endless. Fungal xylanases can be produced using two main methods, solid-state cultivation systems and submerged liquid cultivation systems. Most research has used submerged culture, which allows control of the degree of aeration, pH and temperature of the medium and the control of other environmental factors required for the optimum growth of microorganisms. In this review, the source of different fungi and their properties of hydrolyzing the cheaper agricultural residues are disscused.

The biodegradation and bioconversion of lignocelluloses into useful products and biological alleviation of pollution from lignocelluloses wastes is an environmental challenge (Panagiotou *et al.*,2003). Lignocellulosic materials from forest, agriculture, set aside lands, industry or urban solid wastes, mainly made up of lignin; cellulose and hemicelluloses are potential feedstocks for chemical utilization. LCM are heterogenous and hemicelluloses polymers are xylans, made up of biopolymers for practical applications, accounting for 25-35% of the dry biomass of woody tissues of dicots and lignified tissues of monocots and occur up to 50% in some tissues of cereal grains. The most common xylans are made up of a main backbone of xylose linked by β-1-4 bonds, where structural units are often substituted at positions C_2 or C_3 with arabinofuranosyl,4-0-methylglucuronic acid acetyl or phenolic substituents.

The xylan backbone is hydrolysed by endo-1,4-β-D-xylan xylanohydrolase;EC.3.2.1.8 degrade the xylan polymer into small oligomeres.Many of the species of fungal genera are known, which produce xylanase like *Aspergillus,Disporotrichum,Penicillium, Neurospora, Fusarium, Neocallimastix, Trichoderma* and *Coniothyrium*.

These species were able to utilize the agricultural residues as substrates. About 30-40% of the production cost of many industrial enzymes is accounted by the cost of growth substrate. The use of low cost substrate for the production of industrial enzymes is one of the ways to greatly reduce production costs. Fungal enzymes are commonly used in industries due to various technical reasons, including the feasibility of obtaining enzymes (Mitchell and Lonsane,1992).

A few fungal strains produce alkalitolerant,cellulase-free xylanase when grown under alkaline conditions pH 8-10 (Bansod *et al.*,1993).Tolerance to high pH and temperature are the desirable properties of xylanase improved production of fungal xylanase in submerged culture (Haltrich and Steiner,1994).The role of enzymes in many processes has been known for a long time. Fungal xylanases have attracted considerable research interest because of their potential industrial applications in food and bread making, fruit juice clarification,beverage,animal feed, fibre seperation, paper and pulp industries (Beg *et al.*,2000; Bajpai ,1997; Kenealy and Jefries, 2003).

Enzymatic action on xylan in the agricultural residues:

Abundance of xylan on earth:

Xylan is the most abundant non-cellulosic polysaccharide present in both hard woods and annual plants and accounts for 20-35% of the total dry weight in tropical plant biomass. In temperate soft woods, xylans are less abundant and comprise about 8% of the total dry weight. Xylan is found mainly in the secondary cell wall and is considered to be forming an interphase between lignin and other polysaccharide.Xylans are linear homopolymers that contains D-xylose monomers linked through β-1,4-glycosyl bonds