A Review

Microbial xylanase : Its important role in various industries

S. GNANA SOUNDARI AND V. SASHI

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See end of the article for authors' affiliations

Correspondence to :
V. SASHI
Department of Plant Biology and Plant Biotechnology, P.S.G.R. Krishnammal College for Women, Peelamedu, COIMBATORE (T.N.) INDIA

Summary

Xylanase enzymes, hydrolyze xylan subtrates and play a major role in industries.Xylanases are most distributed enzymes in bacteria, fungi and plants. For commercial applications,xylanases should ideally be produced quickly and in large quantities from simple and inexpensive substrates. Natural xylan sources such as agricultural and forestry wastes, paper industry wastes and various fruit wastes are potential raw materials for xylanase production. Among these, food industry wastes contain high amount of xylan,as its one of the main polymers in the plant cell wall. These wastes are potential raw material for xylanase production and as xylanases have a wide range of application, in fruit juice extraction, separation of oil and grease by crude xylanase paper and pulp industry, bread making, degumming of plant fibers and also acts as detergents, nutrition for pigs and chickens and recycling of waste cotton. The present review mainly sates the xylan structure, biodegradation of xylan,xylanase and applications of xylanase in various industries.

Key words : Xylanase, Structure of xylan, Xylanase applications.

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Xylan is hemicellulose and the second most abundant natural polysaccharide (Collins *et al.*, 2005). It is present in the cell wall and in the middle lamella of plant cells. (Polizeli *et al.*, 2005). This term covers a range of non-cellulose polysaccharides composed in various proportions of monosaccharide units such as D-xylose, D-mannose, D-glucose, L-arabinose, D-galactose, D-glucuronic acid and D-galactouronic acid. In nature, wood hemi celluloses hardly ever consist of just one type of sugar. Usually they are complex structure made of more than one polymer, the most common being glucuronoxylans, arabino glucuronoxylans, glucomannans, arabinogalactans and galacto glucomannans (Haltrich *et al.*, 1996; Kulkarni *et al.*,1999; Sunna and Antrainckian, 1997). It is a polymer therefore the complete degradation of natural xylan requires a concerted action of several enzymes. Endo- 1,4-β-Xylanases (EC-3.2.1.8) are glyloside hydrolases that cataly 2C a random hydrolysis of the internal β-1,4-glycosidic linkages of xylan (Collins *et al.*, 2005). Xylanases produced from various microorganisms, such as bacteria, fungi, protozoans and germinating seeds. This focuses the application of xylanase in paper and pulp industry, juice processing, bread making, detergent and in recycling of waste cotton.

Enzymatic action on xylanin the agricultural residues:

Xylan:

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 contain D-xylose monomers linked through β-1,4-glycosyl bonds (Srinivasan and Rele, 1999).

Structure of xylan:

In nature, the xylans are partially substituted by acetyl 4-0-methyl –D-glucoenosyl and 1-arabinofuranosyl residues forming complex heterogeneous and polydispersed, polymers. The structure of xylan found in cell walls of plants can differ greatly depending on their origin but they always contain a β-1,4-linked D-xylose back bone (Ebringerova and Heinze,2000).

Arabinose is connected to the backbone of xylan via an ∝-1,2 or 1,3 linkage either as single residue or as short side chains.Glucuronic acid and its 4-0-methyl ether are attached to the xylan backbone via an µ-1,2-linkage whereas aromatic feruloyl and P-coumaryl