Available online at www.sciencedirect.com
SCIENCE DIRECT®
Journal of Biotechnology 123 (2006) 413–433
Journal of BIOTECHNOLOGY
www.elsevier.com/locate/jbiotec

Review

The xylanolytic enzyme system from the genus *Penicillium*

Renato Chávez [a], Paulina Bull [b], Jaime Eyzaguirre [b,c,*]

[a] *Unidad de Biotecnología, Instituto de Investigaciones Agropecuarias (INIA), CRI-Carillanca, Temuco, Chile*
[b] *Laboratorio de Bioquímica, Departamento de Genética Molecular y Microbiología, Pontificia Universidad Católica de Chile, Santiago, Chile*
[c] *Departamento de Ciencias Biológicas, Universidad Andrés Bello, Santiago, Chile*

Received 23 July 2005; received in revised form 6 December 2005; accepted 23 December 2005

Abstract

In nature, there are numerous microorganisms that efficiently degrade xylan, a major component of lignocellulose. In particular, filamentous fungi have demonstrated a great capability for secreting a wide range of xylanases, being the genus *Aspergillus* and *Trichoderma* the most extensively studied and reviewed among the xylan-producing fungi. However, an important amount of information about the production and genetics of xylanases from fungi of the genus *Penicillium* has accumulated in recent years. A great number of *Penicillia* are active producers of xylanolytic enzymes, and the use of xylanases from these species has acquired growing importance in biotechnological applications. This review summarizes our current knowledge about the properties, genetics, expression and biotechnological potential of xylanases from the genus *Penicillium*.

Keywords: *Penicillium*; Xylanases; Gene expression; Biotechnological applications

Contents

* Corresponding author. Tel.: +56 2 6618070.
E-mail address: jeyzag@bio.puc.cl (J. Eyzaguirre).

0168-1656/$ – see front matter © 2006 Elsevier B.V. All rights reserved.
doi:10.1016/j.jbiotec.2005.12.036

1. Introduction

Xylan is the principal component of plant cell wall hemicelluloses. It is a heteroglycan composed of a linear chain of xylopyranose residues bound by $\beta\,(1 \rightarrow 4)$ linkages, with a variety of substituents linked to the main chain by glycosidic or ester linkages (Joseleau et al., 1992). These substituents are mainly acetate, methyl glucuronate and L-arabinofuranose residues, and the amount of each depends on the source of xylan: while rice bran xylan is rich in arabinose, birchwood xylan possesses a significant amount of glucuronate and low arabinose content (Kormelink and Voragen, 1993). Acetate groups are not present in softwood xylan (Gregory et al., 1998) (Fig. 1).

The biodegradation of xylan requires thus a set of esterases and glycanases. These enzymes are produced by a number of bacteria and fungi and are mostly

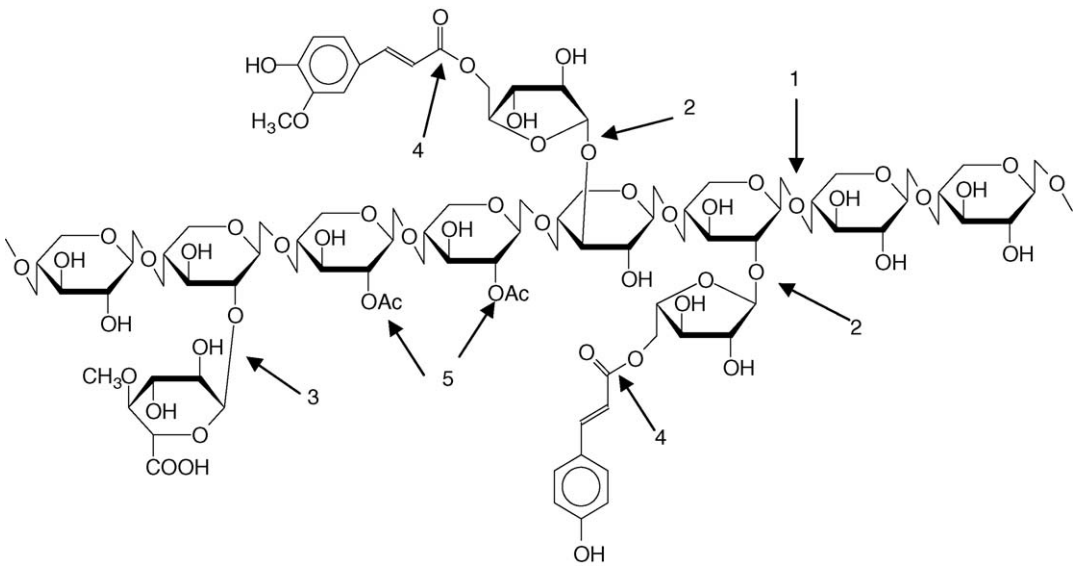

Fig. 1. The structure of xylan and site of action of the enzymes of the xylanase complex. 1: endoxylanases; 2: α-L-arabinofuranosidases; 3: glucuronidases; 4: feruloyl and coumaroyl esterases; 5: acetyl xylan esterases.