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FILAMENTOUS FUNGI FROM CHILEAN EXTREME ENVIRONMENTS SCREENED FOR COLD ACTIVE XYLANASE

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Abstract

Extreme environments, especially those which undergo low temperatures, are sources of microorganisms displaying enzymatic activities which can be of interest for several industrial, agricultural and medical applications. In particular cold active enzymes display a higher catalytic efficiency over a temperature range of roughly 0-30ºC and a higher thermosensitivity compared with their mesophilic counterparts. Cold active xylanases received increasing attention during the past two decades because they are exploited for various applications, such as cold washing, food processes, leather softening, environmental bioremediation and molecular biology applications. Although these enzymes are quite widespread in nature, only few researches on the cold active xylanase produced by fungi were carried out up to now. The aim of this study was to screen for xylanase activity different filamentous fungi collected by one of the coauthors in the Atacama desert (4000-4700 m a.s.l.), Chile, which is the driest cold desert of the world.

The enzymes were produced from fungal isolates grown in 24-well plates on solid medium for 10 d at 15°C. The temperature profiles (10-90°C) of xylanase activity were obtained performing the assay in 96-well micro-plates in a temperature-gradient PCR cycler (activity assayed on oat spelt xylan 1%, pH 6, 30 min). Xylose released in the solution was quantified by a spectrophotometric assay using DNS at 540 nm. Most of the psychro-tolerant isolates showed an optimal temperature of xylanase activity of 42°C, downshifted by 10-35°C if compared with 3 different commercial enzymes obtained by mesophilic/thermophilic microorganisms. Two isolates still maintaining 30% of activity at 20°C were observed. These findings indicate that the low-temperature environment of origin had strongly selected organisms producing xylanase with optimal temperatures colder than those of commercial ones. This study confirms that the exploration of extreme environments can provide fungal strains interesting for industrial applications.