Screening of keto reductases expressed in conidial fungi from the Brazilian semi-arid region

Serly Santiago Machado[1], Enesio Rodriguez Nascimento Neto[1], Elisa Teshima[1], Osmar Calderon Sanchez[2], Heiddy Marquez Alvarez[1], Ivan Sergio Colás Gonzáles[1] Luis Fernando Pascholati Gusmão[1], Angélica Maria Lucchese[1]

1 Universidade Estadual de Feira de Santana, Av Transnordestina SN, Feira de Santana, Bahia, Brazil 2

Universidad de la Habana. Zapata y G. CP 10400. Ciudad Habana. Cuba

*angelica.lucchese@gmail.com

Keywords: biocatalysis, acetophenone, fungi

INTRODUCTION

Chiral alcohols are key building blocks for many industrial products, such as pharmaceuticals and other high value compounds[1]. Although several synthetic methods for the production of chiral alcohols from ketones are known, biocatalysis is one of the most important tools because of its high chemo-, regio- and stereoselectivity, as well as mild and environmentally friendly reaction conditions[1,2]. Isolated keto reductases or whole-cell biological systems can be used as catalysts to this conversion, and studies seeking new sources of these enzymes have been carried out[2]. It is well established that the screening of a wide variety of microorganisms, which are living in our environment, is one of the methods to obtain new biocatalysts[1,2]. In this work some conidial fungi from the semi-arid region as biocatalysts in the reduction process of acetophenone to identified potential producers of keto reductases were evaluated.

RESULTS AND DISCUSSION

The screening for the identification of microorganisms with reductase activity was performed with 56 conidial fungi, isolated from dead plant material in Brazilian semi-arid region. Acetophenone in presence of ethanol as co-solvent was used as substrate (0,1% v/v), and after 5 days of incubation the products were analysed by gas chromatography coupled to mass spectrometry (GC/MS). From these fungi, 34 catalysed the bioreduction of acetophenone with conversion rates from 1% up to 55%. The Prelog's rule was followed in 24 bioreduction process yielding the S enantiomer preferentially, of which nine of them with a high stereoselectivity (>99%). Ten fungi catalysed the bioreduction to the anti-Prelog *R* product but with lower stereoselections (55% up to 94% ee). In table 1 the results of bioreduction with conversion rates higher than 5% are summarized.

Table 1. Assymetric reduction of acetophenone with conidia fungi

Code	Microorganisms	C (%)	*ee* (%)
04/06	*Sarcopodium circinatrum*	5	94 (R)
05/06	*Curvularia inaequalis*	11	83(S)
07/06	*Cladosporium* sp	32	86 (R)
21/06	*Stachybotrys* sp	16	76(R)
27/06	*Aspergillus* sp	34	55(R)
30/06	*Stachybotrys* sp	35	67(R)
35/06	*Beltrania* sp	10	87(S)
38/06	*Cladosporium* sp	7	79(S)
53/06	*Dictyosporium* sp	18	>99(S)
73/06	*Curvularia* sp	15	88(S)
82/06	*Periconia* sp	43	>99(S)
87/06	*Dictyosporium sp*	9	>99(S)
98/06	*Idriella* sp	55	95(S)
101/06	*Dictyochaeta* sp	44	90(S)
01/07	*Stachybotrys sp*	9	83(S)
03/07	*Curvularia* sp	11	>99(S)
12/07	*Myrothecium sp*	30	>99(S)
16/07	*Pestalotiopsis* sp	7	>99(S)
26/07	*Stachybotrys* sp	44	96(S)
35/07	*Stachybotrys sp*	37	87(S)
36/07	*Pithomyces chartarum*	15	55(R)
42/07	*Periconia hispidula*	43	95(S)
114/07	*Cladosporium* sp	12	82(S)

*c = conversion rates (CG/MS), ee = enantiomeric excess (chiral CG), absolute configuration is in parenthesis.

CONCLUSION

New sources of keto reductases were identified. The *Periconia* sp 82/06 and *Myrothecium* sp 12/07 were the most efficient producers of keto reductases with high enantioselectivity and moderate conversions in the conditions used in this screening.

ACKNOWLEDGEMENTS

Fapesb, CNPq, MCT/PPBio

REFERENCES

[1]Carvalho, C.C.C.R. *Biotechnology Advances*, **2011**, *29*, 75.
[2]Matsuda, T.; Yamanaka, R.; Nakamura, K. *Tetrahedron: Asymmetry*, **2009**, *20*, 513