ONLINE ISSN : 1880-7291
PRINT ISSN : 1344-7882

Journal of Applied Glycoscience
Vol. 52 (2005) , No. 2 pp.115-120

Efficient Extraction of Ferulic Acid from Sugar Beet Pulp Using the Culture Supernatant of *Penicillium chrysogenum*

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(Received December 24, 2004)
(Accepted February 4, 2005)

We found a microorganism, *Penicillium chrysogenum* 31B, that has high ability to release ferulic acid from sugar beet pulp. Approximately 85% of alkaline-extractable ferulic acid in sugar beet pulp could be released using the culture supernatant of *P. chrysogenum* 31B. However, the culture supernatant did not efficiently extract ferulic acid from wheat bran, peel of corn seed, or sugar-cane bagasse. A ferulic acid esterase (FAE-1) was purified from the culture filtrate of *P. chrysogenum* 31B. The molecular mass of the enzyme was determined to be 62 kDa by SDS-PAGE. Optimum conditions for enzyme activity were 50°C and pH 6-7. The enzyme showed activity towards methyl esters of hydroxycinnamic acids including ferulic acid, *p*-coumaric acid, and caffeic acid, but was not active on methyl sinapinate or 3,4-dimethoxy cinnamate. The lack of activity of FAE-1 toward these substrates appears to be due to the presence of two methoxy groups on the benzene ring. The substrate specificity of FAE-1 seemed to be similar to that of ferulic acid esterase (CinnAE) of *Aspergillus niger*. However, there was a difference between FAE-1 and CinnAE in respect to activity towards methyl vanillate. It is remarkable that FAE-1 hydrolyzed methyl vanillate, which, to our knowledge, is the first report of a ferulic acid esterase hydrolyzing a hydroxybenzoic acid methyl ester.

Key words: ferulic acid, ferulic acid esterase, *Penicillium chrysogenum*, sugar beet pulp

To cite this article:

Tatsuji Sakamoto, Sayuri Nishimura, Tomoaki Kato, Yoichi Sunagawa, Moriyasu Tsuchiyama and Haruhiko Kawasaki: Efficient Extraction of Ferulic Acid from Sugar Beet Pulp Using the Culture Supernatant of *Penicillium chrysogenum* . *J. Appl. Glycosci.*, **52**, 115-120 (2005) .

JOI JST.JSTAGE/jag/52.115