Biochemical and catalytic properties of two intracellular beta-glucosidases from the fungus Penicillium decumbens active on flavonoid glucosides

In the presence of rutin as sole carbon source, Penicillium decumbens produces two intracellular beta-glucosidases named G(I) and G(II), with molecular masses of 56,000 and 460,000 Da, respectively. The two proteins have been purified to homogeneity. G(I) and G(II) composed of two and four equal sub-units, respectively and displayed optimal activity at pH 7.0 and temperature 65-75 degreesC. Both beta-glucosidases were competitively inhibited by glucose and glucono-delta-lactone. G(I) and G(II) exhibited broad substrate specificity, since they hydrolyzed a range of (1,3)-, (1,4)- and (1,6)-beta-glucosides as well as aryl beta-glucosides. Determination of k(cat)/K-m revealed that G(II) hydrolyzed 3-8 times more efficiently the above-mentioned substrates. The ability of G(I) and G(II) to deglycosylate various flavonoid glycosides was also investigated. Both enzymes were active against flavonoids glycosylated at the 7 position but G(II) hydrolyzed them 5 times more efficiently than G(I). Of the flavanols tested, both enzymes were incapable of hydrolyzing quercetin and kaempferol-3-glucoside. The main difference between G(I) and G(II) as far as the hydrolysis of flavanols is concerned, was the ability of G(II) to hydrolyze the quercetin-3-glucoside.
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