Biotransformation of Gallic Acid by Beauveris sulfurescens ATCC 7159

Hsu FL;Yang LMChang SF;Wang LH;Hsu CY;Liu PC;Lin SJ

Abstract

Preparative-scale fermentation of gallic acid (3,4,5-trihydroxybenzoic acid) (1) with Beauveria sulfurescens ATCC 7159 gave two new glucosidated compounds, 4-(3,4-dihydroxy-6-hydroxymethyl-5-methoxy-tetrahydro-pyran-2-yloxy)-3-hydroxy-5-methoxy-benzoic acid (4), 3-hydroxy-4,5-dimethoxy-benzoic acid 3,4-dihydroxy-6-hydroxymethyl-5-methoxy-tetrahydro-pyran-2-yl ester (7), along with four known compounds, 3-O-methylgallic acid (2), 4-O-methylgallic acid (3), 3,4-O-dimethylgallic acid (5), and 3,5-O-dimethylgallic acid (6). The new metabolite genistein 7-O-beta-D-4''-O-methyl-glucopyranoside (8) was also obtained as a byproduct due to the use of soybean meal in the fermentation medium. The structural elucidation of the metabolites was based primarily on 1D-, 2D-NMR, and HRFABMS analyses. Among these compounds, 2, 3, and 5 are metabolites of gallic acid in mammals. This result demonstrated that microbial culture parallels mammalian metabolism; therefore, B. sulfurescens might be a useful tool for generating mammalian metabolites of related analogs of gallic acid (1) for complete structural identification and for further use in investigating pharmacological and toxicological properties in this series of compounds. In addition, a GRE (glucocorticoid response element)-mediated luciferase reporter gene assay was used to initially screen for the biological activity of the 6 compounds, 2-6 and 8, along with 1 and its chemical O-methylated derivatives 9-13. Among the 12 compounds tested, 11-13 were found to be significant, but less active than the reference compounds of methylprednisolone and dexamethasone.