Pretreatment strategies to improve crude glycerol utilisation and metabolite production by Aspergillus terreus

ABSTRACT

Crude glycerol (CG) can be used as a substrate for microbial bioconversion. However, due to presence of many impurities, many microorganisms are unable to utilise this substrate efficiently. The present study is trying to improve CG using as the feedstock of Aspergillus terreus for the production of lovastatin, (+)-geodin, and sulochrin. The CG was pretreated chemically (solvents) and physically (activated carbon (AC) and water softener (WS)) to separate most of the impurities from the CG. For solvent pretreatments, petroleum ether (PE) produced the largest increase of lovastatin (92.8%) when compared to positive control and pure glycerol (PG) and up to 820% when compared to negative control (CG). In contrast, diethyl ether (DE) produced the largest increase in (+)-geodin at 80.81% (versus CG) and 176.23% (versus PG). The largest increase in toluene (Tol) was observed in sulochrin production, at 67.22% (versus CG) and 183.85% (versus PG). For physical pretreatments, the pattern of metabolite production in AC (lovastatin: 20.65 mg/L, (+)-geodin: 7.42 mg/L, sulochrin: 11.74 mg/L) resembled PG (lovastatin: 21.8 mg/L, (+)-geodin: 8.60 mg/L, sulochrin: 8.18 mg/L), while WS (lovastatin: 11.25 mg/L, (+)-geodin: 15.38 mg/L, sulochrin: 16.85 mg/L) resembled CG (lovastatin: 7.1 mg/L, (+)-geodin: 17.10 mg/L, sulochrin: 14.78 mg/L) at day 6 of fermentation. These results indicate that solvent pretreatments on CG are excellent for metabolites production in A. terreus, depending on the solvents used. In contrast, physical pretreatments are only feasible for (+)-geodin and sulochrin production. Therefore, different strategies can be employed to manipulate the A. terreus bioconversion using improved CG by using a few simple pretreatment strategies.