

Improvement of phytase biosynthesis by new bacterial isolate, *Pediococcus pentosaceus* C4/1a via continuous cultivation

ABSTRACT

Phytase producer was selected from five different lactic acid bacteria isolates obtained from the animal faeces sources from laboratory culture collection. From the five isolates, C4/1A showed the highest phytase activity (21.25 U/mL) as compared to others and was identified as *Pediococcus pentosaceus* C4/1A by 16S rRNA gene sequencing. Optimization of medium formulation and culture conditions was conducted by a conventional method (one-factor-at-one-time) using response surface methodology (RSM). Effects of four parameters were studied on the bacterial growth, reducing sugar and phytase productions. The phytase biosynthesis increased from 21.2 U/mL to 42.3 U/mL using the optimized medium formulation and culture conditions. The RSM suggested that yeast extract, glucose, sodium phytate and inoculum size significantly improved by 99.2% production of phytase. Continuous cultivation was carried out at dilution rate ranging from 0.1 h⁻¹ to 0.4 h⁻¹ and the steady-state of *P. pentosaceus* C4/1A was achieved after five generations and three residence times. The cultivation was carried out for 48 h and the highest productivity of phytase and cell concentration was obtained at dilution rate 0.3 h⁻¹ which resulted in 8.65 U/mL/h and 0.894 g/L/h, respectively. Throughout the cultivation process, production of phytase was improved by 89.3% from shake-flask experiment to 2L bioreactor.

Keywords: High productivity; Lactic acid bacteria; Optimization; Response surface methodology