Enhancement of versatile extracellular cellulolytic and hemicellulolytic enzyme productions by Lactobacillus plantarum RI 11 isolated from Malaysian food using renewable natural polymers

Lactobacillus plantarum RI 11 was reported recently to be a potential lignocellulosic biomass degrader since it has the capability of producing versatile extracellular cellulolytic and hemicellulolytic enzymes. Thus, this study was conducted to evaluate further the effects of various renewable natural polymers on the growth and production of extracellular cellulolytic and hemicellulolytic enzymes by this novel isolate. Basal medium supplemented with molasses and yeast extract produced the highest cell biomass (log 10.51 CFU/mL) and extracellular endoglucanase (11.70 μg/min/mg), exoglucanase (9.99 μg/min/mg), β-glucosidase (10.43 nmol/min/mg), and mannanase (8.03 μg/min/mg), respectively. Subsequently, a statistical optimization approach was employed for the enhancement of cell biomass, and cellulolytic and hemicellulolytic enzyme productions. Basal medium that supplemented with glucose, molasses and soybean pulp (F5 medium) or with rice straw, yeast extract and soybean pulp (F6 medium) produced the highest cell population of log 11.76 CFU/mL, respectively. However, formulated F12 medium supplemented with glucose, molasses and palm kernel cake enhanced extracellular endoglucanase (4 folds), exoglucanase (2.6 folds) and mannanase (2.6 folds) specific activities significantly, indicating that the F12 medium could induce the highest production of extracellular cellulolytic and hemicellulolytic enzymes concomitantly. In conclusion, L. plantarum RI 11 is a promising and versatile bio-transformation agent for lignocellulolytic biomass.

Keyword: Lactic acid bacteria; Probiotic; Lactobacillus plantarum; Media enhancement; Cellulolytic enzyme; Hemicellulolytic enzyme; Lignocellulosic biomass