

Optimization of nutrient medium composition for lactic acid microbiological synthesis by bacteria *Lactobacillus paracasei*

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Abstract

Changes in growth characteristics of *Lactobacillus paracasei* and synthesis of lactic acid in media with various contents of the different sources of growth factors were investigated during this study to find an alternative to yeast extract as source of growth factors.

It was found that the most promising alternative to yeast extract is the hydrolysate of textured soy flour. Lactic acid yield was 85.5% as compared to using yeast extract (97.5%), productivity – 0.75g/l·h while lactic acid concentration rose to 17.1 g/l. Having similar characteristics soy protein concentrate hydrolysate provided lactic acid yield 80.5% and lactic acid concentration 16.1 g/l. However in the latter case the productivity was significantly less and achieved 0.46 g/l·h. Viable bacterial cells at the end of stationary growth phase was $7.9 \cdot 10^{11}$ CFU/ml and $7 \cdot 10^{11}$ CFU/ml, respectively. These results correspond to that derived using yeast extract as a source of growth factors and equal $8 \cdot 10^{11}$ CFU/ml.

Optimization of nutrient medium composition was carried out using the methodology of complete factor experiment. Obtained the regression equation reflected substrate conversion degree dependence of the concentration of the constituents of the nutrient medium:

$$\hat{Y}_{\text{opt}} = 80.86 - 4.64X_1 + 8.6X_2 + 5.95X_3 - 1.3X_4 + X_5 + 4.55X_1X_3 - 1.02X_1X_4 - 1.8X_2X_4 - 1.18X_2X_5 - 1.74X_3X_5 - 1.3X_1X_2X_3 + 0.97X_2X_3X_5 + 1.53X_1X_2X_3X_5$$

Optimum of the components of nutrient medium was determined. At the background glucose concentration 20 g/l the optimal concentration of a source of growth factors was 10 g/l, K_2HPO_4 – 2 g/l, $MgSO_4$ – 0.1 g/l, $MnSO_4$ – 0.075 g/l.

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