

## Comparative analyses on medium optimization using one-factor-at-a-time, response surface methodology, and artificial neural network for lysine–methionine biosynthesis by *Pediococcus pentosaceus* RF-1

### ABSTRACT

Optimization strategy that encompassed one-factor-at-a-time (OFAT), response surface methodology (RSM), and artificial neural network method was implemented during medium formulation with specific aim for lysine-methionine biosynthesis employing a newly isolated strain of *Pediococcus pentosaceus* RF-1. OFAT technique was used in the preliminary screening of factors (molasses, nitrogen sources, fish meal, glutamic acid and initial medium pH) before proceeded to optimization study. Implementation of central composite design of experiment subsequently generated 30 experimental runs based on four factors (molasses, fish meal, glutamic acid, and initial medium pH). From RSM analysis, a quadratic polynomial model can be devoted to describing the relationship between various medium components and responses. It also suggested that using molasses (9.86 g/L), fish meal (10.06 g/L), glutamic acid (0.91 g/L), and initial medium pH (5.30) would enhance the biosynthesis of lysine (15.77 g/L) and methionine (4.21 g/L). Alternatively, a three-layer neural network topography at 4-5-2 predicted a further improvement in the biosynthesis of lysine (16.52 g/L) and methionine (4.53 g/L) by using formulation composed of molasses (10.02 g/L), fish meal (18.00 g/L), and glutamic acid (1.17 g/L) with initial medium pH (4.26), respectively.

**Keyword:** *Pediococcus pentosaceus* RF-1; One-factor-at-a-time; Response surface methodology; Artificial neural network; Lysine; Methionine