

An optimized fermentation condition for acetic acid production by *Gluconobacter xylinus*

N. Pirahmadi*, M. Mobasher, N. Montazeri-Najafabady, S. Rasoul Amini, Y. Ghasemi

Department of Pharmaceutical Biotechnology, Faculty of Pharmacy, Shiraz University of Medical Science, Shiraz, Iran

Background and Aims: Acetic acid is one of the simplest carboxylic acids. It is an important chemical reagent with many industrial uses, specially in the production of cellulose acetate. The largest single use of acetic acid is in the production of vinyl acetate monomer, closely followed by acetic anhydride and ester production.

Methods: *Gluconobacter xylinus* is one of the best microorganisms for this purpose, since in *G. xylinus*, unlike other microorganisms, further oxidation of acetic acid to CO₂ and H₂O in the fermentation pathway does not happen. By using *G. xylinus* in a submerged fermentor with the help of box-behnken using the Minitab 15 software, 27 experiments were designed in three levels (-1, 0, 1). The effects of different concentrations of ethanol, peptone, D-glucose and different aeration conditions with constant concentrations of yeast extract, glycerol and temperature, on acetic acid production were evaluated in a 10 liter stirred tank fermentor connected to a computer for monitoring of pH, distilled O₂ (DO) and temperature.

Results: Medium contents were designed in three levels of concentrations (D-glucose: 0.5, 1, 3/ pepton: 0.2, 0.5, 1/ ethanol: 2, 4, 6/ oxygen:1, 2, 3) in 27 experiments of box-behnken. The lowest concentration of produced acetic acid was 1 g/ml and the highest concentration was 17.5 g/l measured with titration by 0.1 N NaOH.

Conclusions: The most yield of acetic acid was achieved by a medium composed of 2 g/l peptone, 40 ml/l ethanol, 15 ml/s air flow and D-glucose 10 g/l, in addition of constant concentrations of glycerol (10 g/l), yeast extract (3 g/l) and temperature (30°C).

Keywords: Acetic acid; *Gluconobacter xylinus*; Fermentation; Optimization