Response Surface Optimization of the Medium Components for the Production of Biosurfactant by Lactic Acid Bacteria

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Objectives

Cell growth and the accumulation of metabolic products are strongly influenced by medium composition. It is difficult to search for the major factors and to optimize them for biotechnological processes as several parameters are involved.

The aim of this study was the optimization of medium components for *Lactococcus lactis* and *Streptococcus thermophilus* growth using response surface methodology, in order to optimise the production of a growth associated biosurfactant.

For each lactic acid bacteria strain, six growth factors were analysed based on MRS medium for *Lactococcus lactis* (lactose, peptone, meat extract, yeast extract, ammonium citrate, potassium phosphate) or M17 medium for *Streptococcus thermophilus* (lactose, peptone, meat extract, yeast extract, soya peptone, natriumglycerophosphate).

Results

Fractional factorial designs (FFD) and the path of steepest ascent were effective in searching for the main factors and approaching the optimum region of response.

For *Lactococcus lactis*, by a 2^{6-2} FFD, peptone and lactose were found to be significant factors and had positive effects on cell growth and consequently on biosurfactant production.

For *Streptococcus thermophilus*, lactose and natriumglycerophosphate were found to be significant factors and had negative and positive effects, respectively.

The effects of the two main factors on *Lactoccocus lactis* growth were further investigated by a central composite design and the optimum composition was found to be 3.4% peptone, 1% meat extract, 0.5% yeast extract, 3.9% lactose, 0.2% ammonium citrate and 0.2% potassium phosphate.

The optimum medium composition for *Streptococcus thermophilus* growth was found to be 0.5% peptone, 0.5% meat extract, 0.25% yeast extract, 0.5% soya peptone, 1% lactose and 4.9% natriumglycerophosphate.

Conclusions

Response surface methodology proved to be a powerful tool in optimizing medium compositions for biosurfactant production by acid lactic bacteria.

The optimal medium composition allowed biosurfactant production to be 1.3 times faster compared to traditional medium.