

Influence of culture conditions and medium compositions on the production of bacteriocin-like inhibitory substances by *Lactococcus lactis* Gh1

ABSTRACT

Antibacterial peptides or bacteriocins produced by many strains of lactic acid bacteria have been used as food preservatives for many years without any known adverse effects. Bacteriocin titres can be modified by altering the physiological and nutritional factors of the producing bacterium to improve the production in terms of yield and productivity. The effects of culture conditions (initial pH, inoculum age and inoculum size) and medium compositions (organic and inorganic nitrogen sources; carbon sources) were assessed for the production of bacteriocin-like inhibitory substances (BLIS) by *Lactococcus lactis* Gh1 in shake flask cultures. An inoculum of the mid-exponential phase culture at 1% (v/v) was the optimal age and size, while initial pH of culture media at alkaline and acidic state did not show a significant impact on BLIS secretion. Organic nitrogen sources were more favourable for BLIS production compared to inorganic sources. Production of BLIS by *L. lactis* Gh1 in soytone was 1.28-times higher as compared to that of organic nitrogen sources ((NH₄)₂SO₄). The highest cell concentration ($X_{mX} = 0.69 \pm 0.026 \text{ g}\cdot\text{L}^{-1}$) and specific growth rate ($\mu_{\max} = 0.14 \text{ h}^{-1}$) were also observed in cultivation using soytone. By replacing carbon sources with fructose, BLIS production was increased up to 34.94% compared to BHI medium, which gave the biomass cell concentration and specific growth rate of $0.66 \pm 0.002 \text{ g}\cdot\text{L}^{-1}$ and 0.11 h^{-1} , respectively. It can be concluded that the fermentation factors have pronounced influences on the growth of *L. lactis* Gh1 and BLIS production. Results from this study could be used for subsequent application in process design and optimisation for improving BLIS production by *L. lactis* Gh1 at larger scale.

Keyword: Fermentation; *Lactococcus lactis*; Bacteriocin; Culture conditions; Medium compositions