

Comparative studies of versatile extracellular proteolytic activities of lactic acid bacteria and their potential for extracellular amino acid productions as feed supplements

ABSTRACT

Background: Increasing understanding on the functions of amino acids (AA) has led to new commercial applications and expansion of the worldwide markets. However, the current technologies rely heavily on non-food grade microorganism and chemical synthesis for the production of AA. Several studies reported that lactic acid bacteria (LAB) have the capability of producing AA owing to their well-established proteolytic system and amino acid biosynthesis genes. Hence, the objectives of this study were to explore the extracellular proteolytic activity of LAB isolated from various Malaysian fermented foods and their potential to produce AA extracellularly as feed supplements.

Results: All the studied LAB isolates were versatile extracellular protease producers, whereby extracellular protease activities were detected from acidic to alkaline pH (pH 5, pH 6.5, pH 8) using qualitative and quantitative proteolytic assays. The highest proteolytic activity at pH 5 (15.76 U/mg) and pH 8 (19.42 U/mg) was achieved by *Lactobacillus plantarum* RG14, while *Lactobacillus plantarum* RS5 exhibited the highest proteolytic activity of 17.22 U/mg at pH 6.5. As for the results of AA production conducted in de Man, Rogosa and Sharpe medium and analysed by high pressure liquid chromatography system, all LAB isolates were capable of producing an array of AA. Generally, *Pediococcus* sp. showed greater ability for AA production as compared to *Lactobacillus* sp. Moreover, the studied LAB were able to produce a few major feed supplement AA such as methionine, lysine, threonine and tryptophan. *P. pentosaceus* TL-3 recorded the highest methionine and threonine productivity of 3.72 mg/L/h and 5.58 mg/L/h respectively. However, *L. plantarum* I-UL4 demonstrated a lysine productivity of 1.24 mg/L/h, while *P. acidilactici* TP-6 achieved up to 1.73 mg/L/h of tryptophan productivity.

Conclusion: All the 17 studied LAB isolates possessed versatile extracellular proteolytic system and have vast capability of producing various amino acids including a few major feed supplement AA such as methionine, lysine, threonine and tryptophan. Despite AA production was strain dependent, the studied LAB isolates possessed vast potential and can be exploited further as a bio-agent or an alternative amino acids and bioactive peptide producers.

Keyword: Amino acid; Bio-agent; Extracellular proteolytic activity; Feed supplement; Lactic acid bacteria; *Lactobacillus*; *Pediococcus*