Application of Lactic Acid Bacteria on the Functional Fish Protein and Soybean Peptides

乳酸菌在水產蛋白及大豆胜肽保健產品之應用

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This review will focus on the developments of lactic acid bacteria (LAB) fermented functional foods using fish and soybean proteins as substrates. On part I, mackerel minces were fermented with lactic acid bacteria (LAB) ~ *Lactobacillus plantarum* CCRC10069, *Lactococcus lactis* subsp. *lactis* CCRC 12315, *Lactobacillus helveticus* CCRC 14092, or their combination at 37^{o}C. Rapid growth of LAB, decline in pH, suppress of main microflora, increases in whiteness, Hunter L, nonproteinous nitrogen, sensory quality and free amino acids related to taste were observed. However, VBN of samples fermented with LAB were still ≤25 mg/100 g after 36 h fermentation. SDS-PAGE indicated the obvious degradation of water- and salt-soluble muscle proteins after 12 h fermentation. Animal test demonstrated the LAB fermented mince has the functionality on reduction of blood pressure, glucose, and total cholesterol of SHR. To further develop a new processing technique, mackerel mince was firstly homogenized with equal volume of 5% NaCl solution and then dilute with various amounts of 2.5% NaCl solution to obtain different media with protein concentration of 90, 45, 22.5 mg/mL, respectively. To the media, lactic acid bacteria (LAB) ~ *Lactobacillus plantarum* CCRC10069, *Lactococcus lactis* subsp. *lactis* CCRC 12315, *Lactobacillus helveticus* CCRC 14092, *Pediococcus pentosaceus* L or *P. pentosaceus* S were inoculated. During 48 h fermentation at 37^{o}C, rapid growth of LAB, decline in pH, suppress of main microflora and increases in whiteness, Hunter L and sensory quality were observed and the VBN of all fermented samples was still below 25 mg/100g. After 24 and 48 h fermentation, the sensory evaluation and photographic records indicated the high acceptability of the fermented products. According to the results obtained from this study, various LAB fermented fish products such as fish butter, fish pudding or fish custard can be produced by only adjusting the protein concentration of substrates and this technique has very high commercial potential. Similar technology was also developed using soybean as substrate. On Part II, the study was to investigate the optimal media for *Bacillus subtilis* YJ1 to produce proteases and to evaluate the functionally of those hydrolysates of soy bean after lactic acid bacteria fermentation. According to the data obtained, the modified medium containing 1% skim milk, 1% soy meal, 0.5% glucose, 0.5% NaCl, 0.25% K_2HPO_4 had highest neutral (599.8 U/mL.min) and alkaline proteases (522.8 U/mL.min) activities after 4 days incubation at 37 ^{o}C. SDS-PAGE and change in nonproteinous nitrogen indicated high degradation of soy bean proteins after 1 h hydrolysis with *Bacillus subtilis* YJ1 proteases at 50 ^{o}C. The soluble proteins, peptides and total free amino acid increased significantly ($p<0.05$) after 24 h LAB fermentation of soy bean hydrolysate, compared with those before hydrolysis or without LAB fermentation. The DPPH scavenging ability and TEAC of soy bean significantly increased after hydrolysis and further increased after 24 h LAB fermentation. The peptides of the hydrolysates after 24 h LAB fermentation with MW lower than 1000 Da could inhibit 69% of Angiotensin I Converting Enzyme (ACE), while those between 1000 and 5000 Da inhibited 47% of ACE based on the hydrolysis of hippuryl-L-Histidyl- L-Leucine (HHL). However, those with MW higher than 5 kDa could only inhibit 13% of ACE. According the data obtained in this study, the digestibility, antioxidant ability and inhibition of ACE activity of soy bean hydrolysates after 24 h LAB fermentation could be significantly improved.