

Wanticha Lapsiri 2012: Production of Spray-Dried Probiotic Lactic Acid Bacteria Grown in Cereal Extracts and Storage Stability.

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The objective of this study was to develop spray-dried cereal extract powders containing probiotic lactic acid bacteria. A total of 82 strains were isolated from fermented vegetables to screen for potential probiotics to be used in cereal extract fermentation. Thirteen strains of *Lactobacillus plantarum* were selected for their ability to produce high acid level and subsequently evaluated for their probiotic properties. Of 13 strains, *L. plantarum* TISTR 2075 was found to meet probiotic criteria including autoaggregation, coaggregation, cell surface hydrophobicity, antibiotic resistance, gastrointestinal tract tolerance, antimicrobial activity against *Escherichia coli* O157:H7 DMST 12743 and *Salmonella* Typhimurium ATCC 13311 and heat resistance considered as potential probiotic. Additionally, results showed that cereal flour (soybean, sesame and Job's Tears) exhibited the ability to protect *L. plantarum* during exposure to simulated gastrointestinal tract conditions. Soybean was found to improve the gastric tolerance of strains, while Job's Tears flour enhanced the small intestinal juice tolerance. Also, the viability of *L. plantarum* strains under simulated small intestinal juice after sequential of simulated gastric juice was quite stable with relatively high survival rate (>84%). Furthermore, the extract of these cereals supplemented with sesame could provide for good growth of *L. plantarum* TISTR 2075 with the viable cell count of >8.3 log CFU/mL and the significant increase in calcium solubility was also observed after 24 h fermentation. Spray drying of *L. plantarum* TISTR 2075 in maltodextrin with various protectants (protein, trehalose, fibersol, isomalt, ascorbic acid, palatinose and acacia gum) was also investigated. Protein and trehalose were considered as the most efficient protective media providing high survival rate of 97.4 and 93.3%, respectively. Also, probiotic properties including gastrointestinal tract tolerance and antimicrobial activity was not affected by spray drying process. Survival of the spray-dried strain was monitored over a period of 12-month storage at 4 and 25 °C. During storage at 4 °C, the strain retained its viability of 10^4 – 10^8 CFU/g over 12 months depending on protectant types. At an elevated storage temperature of 25 °C, a significant ($P<0.05$) loss of viability was observed in all protectants until reaching a total death at 4 months of storage. Moreover, the storage temperature and relative humidity were found to influence the viability of spray-dried *L. plantarum* TISTR 2075 and physical property of the powders. Increasing the relative humidity and temperatures resulted in higher loss of viability. A temperature dependent prediction model based on Arrhenius theory was developed to determine the viability of the spray-dried *L. plantarum* TISTR 2075 in different protectants for long-term storage.

Student's signature

Thesis Advisor's signature