ABSTRACT

In order to obtain a better preservation method for commercial purpose, this research investigated the feasibility of preserving Bifidobacterium longum CCRC 11847, a probiotic bacterium in human gastrointestinal tract, with spray-drying process. Initially, the effect of each factor, such as time course, outlet temperature of spray-drying, feed velocity and types and concentration of emulsifiers and antioxidants, on the survival ratio of the bacterium was investigated by changing one factor at a time. Then the most suitable conditions of each factor were combined for spray-drying process to obtain the best survival ratio of the bacteria. The bacterium was cultured anaerobically at 37 ℃ in the MRS broth and spray-dried at different time interval to obtain the best time course for preservation. After 36 hours, the total viable plate count was 3*10^8 CFU/mL and the growth of the bacteria was optimum. The effect was the best when the outlet and inlet temperature of the spray dryer were set at 90 ℃ and 37 ℃, respectively. When different kinds of emulsifiers such as glycerol monostearate, sorbitan monostearate, and stearic acid were used as the protective agent in the spray-drying process, it was found that glycerol monostearate had the best protective effect on Bifidobacterium longum. The total viable plate count after spray-drying was 9*10^5 CFU/g. As for the concentration of the emulsifiers, three different concentrations (1%, 2%, 3%) were used and the results indicated that the protective effect increased with increasing concentration of the emulsifiers. When different kinds of antioxidants, such as butyl hydroxyanisol (BHA), dibutyl hydroxytoluene (BHT), and ascorbic acid (Vitamin C) were used as the protective agent in the spray-drying process, it was found that BHA had the best protective effect on the bacterium among the three. When the survival ratio test of the bacteria was conducted at antioxidant concentrations of 1000 ppm, 2000 ppm, and 3000 ppm, it was found that higher antioxidant concentrations had better protective effect than lower concentrations. When the optimal conditions of each factor in the spray-drying process were combined, the survival ratios of Bifidobacterium longum right after spray-drying and after 30 days storage at room temperature were higher than those of basal set. With an initial cell concentration of 3*10^8 CFU/mL, the survival count right after spray-drying with basal set conditions was 420 CFU/g, and none survived after 30 days of storage. However, the survival count right after spray-drying reached 9*10^5 CFU/g when the optimal set of conditions was employed, and the survival count of Bifidobacterium longum after 30 days storage at room temperature was 4.4*10^5 CFU/g, representing a survival ratio of 49%.

Keywords : Bifidobacterium longum ; spray-drying ; emulsifiers ; antioxidants
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