Development of Whey Protein Concentrate-Pectin-Alginate Based Delivery System to Improve Survival of B. longum BL-05 in Simulated Gastrointestinal Conditions

Iqra Yasmin[1,2], Muhammad Saeed[3], Imran Pasha[3], Muhammad Anjum Zia[4]
Affiliations expand

- PMID: 29572754
- DOI: 10.1007/s12602-018-9407-x

Abstract

Bifidobacterium longum BL-05 encapsulated beads were developed by using whey protein concentrate (WPC) and pectin (PE) as encapsulating material through extrusion/ionic gelation technique with the objective to improve survival of probiotics in harsh gastrointestinal conditions. B. longum BL-05 was grown in MRS (de man rogosa and sharpe) broth, centrifuged and mixed with polymeric gel solution. Bead formulations E_4 (2.5% WPC + 1.5% PE) and E_5 (2% PE) showed the highest value for encapsulation efficiency, size, and textural properties (hardness, cohesiveness, springiness) due to increasing PE concentration. The survivability and viability of free and encapsulated B. longum BL-05 was assessed through their resistance to simulated gastric juice (SGJ), tolerance to bile salt, release profile in simulated intestinal fluid (SIF), and storage stability during 28 days at 4 °C. The microencapsulation provided protection to B. longum BL-05 and encapsulated cells were exhibited significant ($p < 0.05$) resistance to SGJ and SIF as compared to free cells. Bead formulations E_3 (5.0% WPC + 1.0% PE) and E_4 (2.5% WPC + 1.5% PE) exhibited more resistance to SGJ (at pH 2 for 2 h) and at 2% bile salt solution but comparatively slow release as compared to other bead formulations. Free cells lost their viability when stored at 4 °C after 28 days but microencapsulated cells demonstrated promising results during storage and viable cell count was > 10^7 CFU/g. This study revealed that extrusion using WPC and PE as encapsulating material could be considered as one of the novel technologies for protection and effective delivery of probiotics.

Keywords: B. Longum; Encapsulation; Pectin; Probiotics; Whey protein concentrate.