

Survival of Micro-Encapsulated Probiotic Lactic Acid Bacteria in Mutton Nuggets and Their Assessments in Simulated Gastro-Intestinal Conditions

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Abstract : During recent years probiotic food products receive market interest as health-promoting, functional foods, which are believed to contribute health benefits. In order to deliver the health benefits by probiotic bacteria, it has been recommended that they must be present at a minimum level of 10⁶ CFU/g to 10⁷ CFU/g at point of delivery or be eaten in sufficient amounts to yield a daily intake of 10⁸ CFU. However a major challenge in relation to the application of probiotic cultures in food matrix is the maintenance of viability during processing which might lead to important losses in viability as probiotic cultures are very often thermally labile and sensitive to acidity, oxygen or other food constituents for example, salts. In this study *Lactobacillus plantarum* and *Lactobacillus casei* were encapsulated in calcium alginate beads with the objective of enhancing their survivability and preventing exposure to the adverse conditions of the gastrointestinal tract and where then inoculated in mutton nuggets. Micro encapsulated *Lactobacillus plantarum* and *Lactobacillus casei* were resistant to simulated gastric conditions (pH 2, 2h) and bile solution (3%, 2 h) resulting in significantly ($p \leq 0.05$) improved survivability when compared with free cell counterparts. A high encapsulation yield was found due to the encapsulation procedure. After incubation at low pH-values, micro encapsulation yielded higher survival rates compared to non-encapsulated probiotic cells. The viable cell numbers of encapsulated *Lactobacillus plantarum* and *Lactobacillus casei* were 10⁷-10⁸ CFU/g higher compared to free cells after 90 min incubation at pH 2.5. The viable encapsulated cells were inoculated into mutton nuggets at the rate of 10⁸ to 10¹⁰ CFU/g. The micro encapsulated *Lactobacillus plantarum* and *Lactobacillus casei* achieved higher survival counts (10⁵-10⁷ CFU/g) than the free cell counterparts (10²-10⁴ CFU/g). Thus micro encapsulation offers an effective means of delivery of viable probiotic bacterial cells to the colon and maintaining their survival during simulated gastric, intestinal juice and processing conditions during nugget preparation.

Keywords : survival, *Lactobacillus plantarum*, *Lactobacillus casei*, micro-encapsulation, nugget

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