Ca-alginate liquid core capsule for lactobacili fermentation

Abstract

Lactic acid bacteria (LAB) have been used for food fermented products since ancient time, which not limited to dairy products. Some Asian traditional food is produced through LAB fermentation. LAB consist of the Gram-positive genera including lactobacillus, which produce lactic acid as the end product of a carbohydrate fermentation. Lactobacillus is one of the important LAB that have been widely applied in food fermentation because of their fermentative ability to enhance food safety, nutrition and to improve health related benefits (as probiotics bacteria). Lactobacillus also received much attention for lactic acid production. This is because lactic acid is highly demanded for the production of poly-l-lactate biodegradable plastics in recent days. The viability and microbial growth of Lactobacilli have been known to be inhibited by its end product (i.e. lactic acid). One of the common solutions to overcome the inhibition issue is by using encapsulation technology. Encapsulation offers several advantages for lactobacilli fermentation which included protection to the bacterial from harsh environments (e.g. pH, temperature, shear stress), retaining cells in continuous process, and allowing reuse of the bacteria. Encapsulation can be achieved in two forms; beads or capsules. Apart from beads, the capsules consisted of a defined inner core which surrounded by a semi permeable membrane. The content of the inner core could be in the form of liquid or solid. Liquid core capsules provide plenty of space for microbial growth (in inner core), eliminate cell release to fermentation medium and minimize mass transfer resistance of solutes. The main focus of this review was on the liquid core capsules produced by Ca-alginate bio-gel. In general, Ca-alginate liquid core capsules can be produced using single step methods or multiple steps methods. The details of the method used to produce the liquid core capsules were described and discussed. The use of the capsules for lactobacilli fermentation is limited because they are easily destabilized by chelating agents and eventually dissolved. The counter measures to strengthen the stability of the capsules were discussed. The previous studies showed that the viability, microbial growth and productivity of the encapsulated

lactobacilli (in liquid core capsule) were better than those of either free cell and entrapped lactobacilli (in beads). Lastly, the authors give several recommendations to expand the potential of using the liquid core capsules to improve Lactobacilli fermentation.