

UNIVERSITI TEKNOLOGI MARA

**OPTIMUM COMPOSITION OF
Aloe vera AND ALGINATE
ENCAPSULATING MATRICES FOR
IMPROVEMENT OF *Lactobacillus*
plantarum NBRC 3070 VIABILITY**

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ABSTRACT

Encapsulation of cells together with prebiotic source is one of the promising methods to be considered to overcome the issues in delivering probiotic cells to the gut. To date, the used *Aloe vera* gel as prebiotic source with probiotic cells within alginate beads is unreported elsewhere. Optimization of the composition of *Aloe vera gel* and alginate to be used as co-encapsulating matrix for maximum encapsulation yields *Lactobacillus plantarum* NBRC 3070 was carried out using Face Centered Composite Design-Response Surface Methodology (FCCD-RSM). The result showed that the optimum composition of *Aloe vera* gel is at 1.99 % (v/v) and alginate is at 1.38% (w/v) for the maximum of encapsulation yield (EY) at 89% (up to 1×10^8 CFU/mL) with no significant difference ($p < 0.05$) in the verification process. The survivability of encapsulated *Lactobacillus plantarum* NBRC 3070 within optimized *Aloe vera* gel and alginate coated chitosan was further determined in simulated gastric fluid (SGF) for 2 hours and simulated intestinal fluid (SIF) for 4 hours. Results shows that the optimized co-encapsulated matrix was able to protect the entrapped cells during passage in SGF (pH2.5) after 2 hours of incubation with only 1 \log_{10} reduction from initial inoculum dose (1.11×10^8 to 1.18×10^7 CFU/mL) and all the cells were then totally released within first hour in SIF (pH 6.5). These beads also has been able to control the release activity of the probiotic cells without changing the physicochemical characteristics of the pineapple juice during the 14 days storage at 4°C. As a conclusion, the optimized *Aloe vera gel* and alginate co-encapsulated matrix was able to protect and improve the survivability of *Lactobacillus plantarum* NBRC 3070 during delivery process to the target area in gastrointestinal system as well as during fruit juice storage medium.

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CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND OF THE STUDIES

The beneficial effects of probiotic foods for human health and nutrition are increasingly recognized by health professionals. Many researchers who conducted a study on the properties and function of living microorganism in food had suggested that the intake of probiotics gave many positive impacts to the host especially in preventing diseases (such as lactose intolerance, hypertension, inflammatory bowel disease, anti-inflammatory as well as anticancer (Goldin, 2011). In addition, probiotic also was reported to play an important role in immunological, digestive and respiratory functions (Kailasapathy & Chin, 2000; Blum & Schiffrin, 2003; Gill & Guarner, 2004; Isolauri, Salminen, & Ouwehand, 2004). Therefore, the demand of probiotic as a food supplement has increased drastically. In conjunction with high demand, the invention of new probiotic products has increased tremendously. Most probiotic are traditionally supplied in dairy products (fermented milk and yoghurts) but recently it has been used in varieties of functional foods such as ice cream, cereal and cheese (Saarela, Mogensen, Fonden, Matto, & Mattila-Sandholm, 2000; Stanton et al., 2001).

Probiotics are defined as “live microorganisms, which when administrated in adequate amounts confer a health on the host” (FAO & WHO, 2001; Sanders, 2008). Most commonly probiotic are from *Lactobacillus* spp. and *Bifidobacterium* spp. and for that they are known as beneficial bacteria.

Due to many advantages in improving the digestive health, probiotic has become attention besides prebiotics. Prebiotics is known as a carbohydrates substance or generally classified as soluble fiber. Prebiotics play an important role in maintaining the survivability of probiotic (Vieira, Teixeira, & Martins, 2013). Prebiotics were discovered in 1995 and since that they have been a part of human diet. However, prebiotic detail function remains dim and unclear. Currently, the interest of prebiotic study increased and has gained attention of many researchers from all over the world. Some researchers had concluded that prebiotics have