CHAPTER I

INTRODUCTION

1.1 Background

Nowadays, more people are currently aiming for a healthier lifestyle. This causes a change in the philosophy of food in which food is not only to give energy and fulfil nutrition need but also to maintain and enhance health. The combination of high prevalence of overweight, obesity and other diseases such as cardiovascular diseases with the increase of food awareness and consumer health concern, spike the interest for functional food. Functional food, as is defined by the Indonesian Institute of Science (LIPI), National Standardization Agency of Indonesia (BSN) and Indonesia National Agency of Drug and Food Control (BPOM), is a fresh or processed food that is already scientifically proven to improve physiological function and/or reduce disease risks as it contains certain components (Amaliah *et al*., 2019; Pielak *et al*., 2019).

There are varying functional food available in the market. Some examples of functional food are foods containing prebiotics and probiotics (Al-Sheraji *et al*., 2013). Probiotics are viable non-pathogenic microorganisms that gives health benefit to the host when consumed in sufficient amount such as *Lactobacillus*, *Bifidobacterium,* and others (Pandey *et al*., 2015). It is predicted by Zion Market Research Inc. that the

global market value of probiotic food would increase to 65.87 billion USD by 2024 from 40.09 billion USD in 2017. The global probiotic dietary supplement market is predicted to reach 7 billion USD by 2025. This increase may be due to consumers' interest in the health benefits that probiotics may offer including intestinal pathogen growth inhibition, improved immune system, and preventing or treating diseases. The health benefit is conferred if a sufficient probiotic amount of 6-8 log CFU/gram or CFU/mL with a minimum of 6 log CFU/gram or CFU/mL reach the gut (Terpou *et al.*, 2019; Yilmaz-Ersan *et al*., 2020). According to Attri *et al*. (2021), it is recommended to consume probiotic at an estimated daily dose of 8-9 log CFU.

In general, the health benefit of consuming probiotic is balancing the growth and bioactivity of gut microflora and decreasing those that are adverse. Other health benefits that consuming probiotic may offer is strain specific. The health benefit of consuming probiotic is highly dependent on the maintenance and delivery of sufficient number of viable probiotics through different food production stages, storage, and during gastrointestinal tract. Maintaining sufficient viability is challenging due several factors that affects the probiotics survivability such as pH, oxygen, water activity, presence of compounds such as salt and sugar, bacteriocins, artificial flavoring, coloring agent, and processing parameters such as fermentation condition, heat treatment, cooling and storage condition (Attri *et al*., 2021).

Currently, probiotic encapsulation, as one of the methods to immobilize microbial cells, is done to improve the survival and viability of probiotics during

storage and delivery by increasing the stability, facilitate handling and storage of probiotic culture, protecting against production stage, storage and gastrointestinal transit or digestion. The encapsulation process commonly uses spray drying, freeze drying and other methods. These drying methods are applied to maintain viable probiotic cultures and are commonly practiced by the food industry for preservation purposes. These drying processes have several setbacks such as significant viable cell loss and increases the production cost. Despite of the mentioned setbacks, the viability of probiotics can be maintained and further improved with the addition of growth promoters or protectant such as prebiotics (Terpou *et al*., 2019). Hence, this research aims to review the incorporation of probiotics in food with the addition of prebiotic to deliver sufficient viability.

1.2 Problem

Commercial probiotic products are commonly found in the form of food-based, or lyophilized powders in capsules, liquids, powder beads and tablets (Terpou *et al*., 2019). The production process of commercial probiotic products uses technologies such as spray drying and freeze drying that may significantly reduce probiotic viability and also contributes to the production cost resulting in an increase in the market price. Aside from the processing condition, the incorporation of probiotics in food, followed by storage and gastrointestinal digestion, also affect the viability of probiotic. The health benefit of consuming probiotics is dependent in the probiotic viability amount, hence delivering sufficient viability into the colon is crucial. Previous studies have

investigated the role of prebiotic as protectant and growth promoter to maintain probiotic viability and ensure the delivery of sufficient viable probiotic into the colon. Varying potential source of prebiotic have also been studied using ingredients that are more available and economical. Hence, this research is made as a literature review of the incorporation of probiotics in food with the addition of prebiotic to deliver sufficient viability.

1.3 Objective

1.3.1 General Objective

This review aims to explore and give clear overview on the incorporation of probiotics in foods and the use of prebiotic to maintain high viability, hence enabling the delivery of sufficient viability in the colon.

1.3.2 Specific Objective

The specific objective of this review is to discuss and analyze the incorporation of probiotics in food, the methods used to preserve and deliver sufficient probiotic for consumption, the effect of prebiotics and its alternative sources as protectant and growth promoter to the viability of probiotics in foods.