CHAPTER 1

Introduction

1.1 Rationale

Consumers nowadays are increasingly turning to the better nutrition choices; thus, soybean is becoming one of the ingredients regarded by many nutritionists. This is because soybean provides consumers very high nutritional value while being inexpensive. Asian people have been recognizing the benefits of soybean and have learnt to consume soybean for a long time. Many reports state that soybean improve the food taste and when consuming soybean regularly it can also provide many health benefits (Roy *et al.*, 2009). Other profits of soybean include the prevention of breast cancer and prostate cancer (Jung *et al.*, 2006; Nishio *et al.*, 2007). The soybean has antimutagenic effect (Park *et al.*, 2003), antihypertensive effect (Okamoto *et al.*, 1995), and antidiabetic effect (Liu *et al.*, 2006). Thus, it reduces the risk of cardiovascular diseases (Bingham *et al.*, 1998; Park *et al.*, 2003; Potter *et al.*, 1998), and the risk of osteoporosis. Soybean plays an important role in improving bone health (Anderson and Garner, 1997; Ishimi *et al.*, 2002). Moreover, it can reduce hot flash during the menopause period in woman (Albertazzi *et al.*, 1998; Eden, 1998; Mackey and Eden, 1998). The functional properties of soybean come from a group of composition known as isoflavones. Isoflavones have a similar structure to an estrogen hormone; therefore, they are classified as a phytoestrogen. There are 2 main structures of isoflavones; aglycone and glucoside forms. Aglycone form has the structure that can be easily absorbed into small intestine. It has high estrogenicity and antioxidant activity. Nevertheless, the majority of isoflavones in soybean are in glucoside form and the amount of aglycone form can be increased by fermentation process. During this process, isoflavones in glucoside form are transformed to aglycone form by β-glucosidase from *Bacillus* spp. As a result, isoflavones from fermentation process can be absorbed into the body faster than isoflavones from nonfermentation process (Setchell *et al.*, 2002).

Sources of information reveal that traditional fermented soybean products in many countries such as, *Thua-nao* (Thailand), *Natto* (Japan), *Chungkookjang* (Korea), *Dawadawa* (Nigeria) and *Kinema* (Nepal) are full of isoflavone aglycones (Steinkraus, 1995).

Currently, the demand of food supplement has been expanded highly in the market. With the great property of isoflavone aglycones, employing it as a food supplement would be one of the most essential product in the health care market. However, the traditional process which is fermented by *Bacillus* spp. in environmental condition produces vulnerable quantity of isoflavone aglycones. Hence, the pure culture technology is used in order to produce isoflavone aglycones in higher amount.

The pure culture technology is a method that allows fermentation process to run efficiently. The products from this method have the same quality as the conventional fermentation process, because the key microorganism; *Bacillus* spp., can still be fully grown. In addition, the pure culture technology can reduce or eliminate other unwanted microorganisms. Consequently, starter culture is accepted as an efficient method for producing isoflavone aglycones and can be used to produce isoflavone aglycones in high volume. The resulting isoflavone aglycones can be extracted and purified in order to be further utilized in a health industry.

Consequently, this study aimed to select the most suitable microorganism that can produce a high level of isoflavone aglycones as the starter culture for isoflavone fermentation and to study the optimum fermentation process. The study also aimed to use the chosen microorganism and optimum fermentation process to scale up the isoflavone aglycone production from soybean and to study extraction and purification processes to produce pure isoflavone aglycone powder. Finally, the powder of the product would be observed and evaluated to measure its shelf-life.

1.2 Research objectives

1.2.1 To screen the *Bacillus* spp. that produce high level of isoflavone aglycones as the starter culture for soy isoflavone fermentation.

1.2.2 To determine the optimum fermentation condition for soy isoflavone aglycones production.

1.2.3 To produce isoflavone aglycones powder from soybean.