CHAPTER I

INTRODUCTION

Soybean (*Glycine max* (L.) Merr) is popularly known as a healthy food in many Asian countries and mostly consumed as soymilk, tofu, and especially fermented products such as miso, tempeh, and natto.

The substances in soybean which shown the potential antioxidant activity are isoflavones. There are 2 major forms of isoflavone, glycoside form (daidzin+genistin) and aglycone form (daidzein+genistein). The antioxidative activity of isoflavones depends on their molecular structure and, surprisingly, is found considerably in fermented soybean (Hanasaki et al., 1994). The position of hydroxyl groups and other features in the chemical structure of isoflavones are important for their antioxidative and free radical scavenging activities (Thomas et al., 2001).

Isoflavones, have been found to have important secondary compounds with many chemical actions. Examples include antioxidative actions, and functions as anticancer agents (Kim et al., 2005). Soybean isoflavones have phenol hydroxyl groups which can scavenge free radicals in vivo and in vitro. Generally, the more hydroxyl groups, then the greater the antioxidant capacity (Cao et al., 1997), which suggests that these groups are the chemical basis for the antioxidant properties of isoflavones. The fermented soyfoods such as tempeh and miso contain greater amounts of aglycones because of enzymatic hydrolysis (β-glucosidase) which are produced from filamentous fungi during fermentation , while non-fermented soyfoods contain greater level of glucosides (Zheng et al., 1997). Furthermore, the use of diadzein and genistein during the fermentation of Japanese soybean has yielded o-hydroxyisoflavones, a potent antioxidant (Esaki, et al., 1999).

Dietary antioxidants from soybeans have gained much interest due to the preventive effects from free radicals that are known to be responsible for an oxidative damage to the living systems (Hanasaki et al., 1994). Considerable evidences for a variety of health benefits associated with consuming cultured soy products have been reported (Marinova et al., 2005; Lin and Yen, 1999). Consequently, the intake of fermented soybeans-derived antioxidants, with free radical-neutralizing ability, may be of importance in the prevention of various diseases, for examples, cancers, cardio and celebrovascular diseases and reduce oxidative damage and have a corresponding beneficial effect on human health.

Due to their broader nutrient profile and high bioavailability, the traditional fermented soy foods are considered to have more health promoting benefits. As a consequence of fermentation, soybeans are modified by microorganisms that not only grow and consume part of the substrate but also enrich them with the products of their metabolism. Fermentation with some GRAS microorganisms, especially filamentous fungi and bacilli, are known to produce antioxidative substances (Hayashi et al., 1995). In oriental countries, filamentous fungi such as *Aspergillus* and *Rhizopus*, are usually inoculated into the solid culture of steamed soybean, rice or barley in koji preparation and then used to prepare traditional fermented food products (Chia et al., 2006). It has been reported that besides containing abundance of hydrolytic enzymes, soybean fermented with filamentous fungi possess enhanced DPPH radical-scavenging effect, Fe^{2+} chelating ability, reducing power, and higher total phenolic and flavonoid contents. Therefore, the development of high antioxidative soy products might play an important role in overall disease prevention and enhancement of well-being.

The objectives of this study were as follows:

1. To screen and select the strain of *Aspergillus* displaying the highest β-glucosidase activity in fermented soybean.
2. To study potent antioxidative activities of the fermented soybean.
3. To study the formative mechanism and biotransformation of antioxidative substances in fermented soybean.