CHAPTER 1

General introduction and thesis outline

1.1 Introduction

Rice is one of the main foods and sources of nutrition for most Thai people. Rice production in Thailand represents a significant portion of the Thai economy and labor force. Rice production has long played a vital role in Thailand's economic development, making the country the world's largest rice exporter (Titapiwatanakun, 2012). Rice can be processed into various products and divided into 2 groups, food products and by-products from rice.

In 2015, Thailand exported 9.79 million tonnes, down 10.8% from 10.97 million tonnes in 2014 (Arunmas, 2016). Export value also dropped by 15.2% to $4.61 billion from $5.43 billion, because of Vietnam, India and other countries in the region increased their export volume, selling at lower prices than Thai exports and the baht was weaker. However, exports of rice products such as cosmetics, healthcare goods and processed food have consistently increased. According to the association, the value of rice-product trading is currently $0.1 billion and estimated to grow by 10-15%. Rice products that have increased recognition among consumers are rice-bran oil and cosmetics (Pratruangkrai, 2012).

Thailand might no longer be able to export only rice grain, and it should focus more on product development. The development of rice into processed rice and other products would be a way for the industry to survive and continued drop in exports during an era of intense competition

Red mold rice is an innovative product with high commercial value compared with non-processed rice. Red mold rice is a product of rice fermented by the fungus

Monascus purpureus, (Chen and Hu, 2005) which has an important role in the food industry. It can be used as food coloring for example in red soy bean curd, sake, wine and meat products (Ma *et al.,* 2000). In addition, red mold rice contains medicinal substances that have been used for a long time in Asia, especially monacolin K (Ma *et al.,* 2000; Lin *et al.,* 2008). Monacolin K was found in red mold rice that can inhibit cholesterol biosynthesis, decrease blood cholesterol and reduce the risk of hypertension (Lee *et al.,* 2006; Wu *et al.,* 2009).

Unfortunately, citrinin (mycotoxin) may occur naturally in fermentation process and it reported to be hepatotoxic and nephrotoxic in mammals (Betina, 1989). Citrinin had a negative impact on the acceptability of *Monascus* fermented product and many countries concerned about consumer safety such as Japan and Taiwan (Shi and Pan, 2011). Therefore, improvement in the process of rice yields to red mold rice with high monacolin K and low citrinin would be important for consumer health.

1.2 Objectives

1. To isolate and screen the strain of *M. purpureus* (both wild type and mutant strains) that can produce high monacolin K and low citrinin
2. To study the effect of rice substrates on the monacolin K, and citrinin production
3. To optimize the conditions for solid state fermentation of red mold rice
4. To investigate the effect of RMR supplementation and drug on Japanese quail

1.3 Usefulness of thesis

1. To use the red mold rice to treat the hypercholesterolemia
2. To enhance the value of local rice
3. To manufacture the Japanese quail eggs with low cholesterol

1.4 Plan of the thesis

This thesis is divided into 7 chapters and is organized as follows.

Chapter 1 writes introduction.

Chapter 2 collects the data to write the literature review.

Chapter 3 describes the optimization of monacolin K production under solid state fermentation.

Chapter 4 describes the red mold rice production from purple rice.

Chapter 5 describes the optimization of monacolin K production by *Monascus purpureus* using purple glutinous rice powder.

Chapter 6 describes the effect of red mold rice on egg production and cholesterol level in Japanese quail.

Chapter 7 describes the general discussion and conclusion.