

CHAPTER 1

INTRODUCTION

1.1 Statement and significance of the problem

Thailand was the world number one to export rice. Currently, there is a high competition in the world market. In the year 2005, Vietnam succeeded in sharing the rice trade in many countries such as Japan, Iran, Malaysia and the Philippines. In the year 2006, Vietnam is one of the high potential rice exporters that exported more than 5 million tons. Most of the rice product exported from Thailand is the rice grain. Other products made from rice are not in high volume. Actually, the value of rice products per ton is about 22,460 Baht which is higher than rice grain itself which is about 13,270 Baht per ton (Pinthong *et al.*, 2004). Therefore, the rice product development such as red yeast rice is a value added product to be exported and traded oversea.

Red yeast rice is a product obtained by fermentation using *Monascus purpureus* (Li *et al.*, 2004). Solid culture of the fungus on rice grain produces intense red pigment as well as characteristic odor after drying by heating. The product is called differently according to the local language. Chinese calls “Ankak”, “Anka”, “Ang Khak” or “Hong Qu” while Japanese calls “Beni-Koji” or “Anka-Koji” (Li *et al.*, 2004; Hong *et al.*, 2008; Erdogru and Azirak, 2004; Pinthong *et al.*, 2004). Red yeast rice is widely used in food industry, especially, the red pigment is used as colorant in Sake, red soil bean curd, red pork, ham, sausage, Nham (fermented pork),

sour fish (fermented fish) and candy (Pinthong *et al.*, 2000). Pinthong *et al.* (2000) studied the application of red yeast rice in pork sausage as red color additive. The used of red pigment of *Monascus* instead of nitrite for the production of chicken ham was done successfully by Andrea *et al.* (2001).

Chinese red yeast rice is used in Thailand as food additive to make pleasant colored food such as red soybean curd, sausage, Nham, and sour fish. Sausage and Nham made from pork give stable product without dissociation of red color comparing to conventional product treated with E-249 (nitrite salt) and E-252 (potassium nitrate). The nitrogen compounds mentioned is one of the carcinogenic compounds causing cancer (Sabater *et al.*, 1999). Nham is one of the most popular foods that used to contain potassium nitrate as additive to give good appearance. The use of red yeast rice in place of potassium nitrate is a safer way. The glutinous rice abundantly grown in the northern part of Thailand is also interesting to be used as potential raw materials for making red yeast rice.

Beside being food colorant, red yeast rice is used for medical purpose. Chinese used it to improve blood circulation (Wu, 1966). It was found later that red yeast rice is a useful product for lowering cholesterol due to monacolin content. The main useful compound is monacolin K which is a cholesterol-lowering agent which can reduce risk of colon cancer cells (Hong *et al.*, 2008). Monacolin K decreases the amounts of cholesterol by inhibition of 3-hydroxy-3-methylglutaryl CoA reductase (HMG-CoA reductase), the key enzyme producing mevalonyl-CoA which is the important rate determining step to synthesize cholesterol (Hajjaj *et al.*, 2001; Su *et al.*, 2003). This, therefore, helps decrease blood pressure (Li *et al.*, 2004; Wang *et al.*, 1997). In the United States statin drugs with the same property as monacolin K were manufactured and used for lowering cholesterol with the trademark name of

lovastatin (the brand name is Mevacor) (Erdogru and Azirak, 2004). In China, it has been found that red yeast rice made from normal rice or non-glutinous rice gave the highest amount of monacolin K at 2.52 mg/g (Chen and Hu, 2005). Red yeast rice has been used in Chinese cuisine and functional food to promote blood circulation for centuries. In other Asian countries, red yeast rice is a dietary staple and is used to make rice wine, as a flavoring agent, and to preserve the flavor and color of fish and meat. The medicinal properties of red yeast rice favorably impact lipid profiles of hypercholesterolemia patients (Li *et al.*, 2005; Segura, 2003). Chinese red yeast rice is imported into Thailand to be used as a food colorant. The use of red yeast rice benefits Thai people, whose death is caused by hypertension and heart attacks. Apart from the production of monacolins, other useful compounds for health such as GABA, glucosamine, lecithin, flavonoids and dimerumic acid are also present. The difficulty of red yeast rice use is the presence of a mycotoxin, citrinin, which is a compound causing kidney failure.

In Thailand, there are 2 main varieties of rice grown and consumed by most people in different parts of the country. They are non-glutinous rice and glutinous rice. The amylopectin content in glutinous rice is higher (95 %) than in non-glutinous rice (70-90 %). The latter contains about 10-30% of amylose. Some varieties of glutinous rice have very small amounts of amylose or without amylose (Insomphun, 2003). The difference in their main composition may affect the content of useful fermentation metabolites.

More over, the glutinous rice is abundantly grown in the northern part of Thailand. The research work aims to study the amount of red pigment, monacolins, antioxidant activity, aroma compounds and citrinin found in red yeast rice made from glutinous rice is, therefore, of interest.

1.2 Research objectives

The objectives of this research were

1.2.1 To isolate *Monascus purpureus* from commercial Chinese red yeast rice and identify.

1.2.2 To investigate a good condition for preparing of red yeast rice.

1.2.3 To study the effect of rice varieties on the composition and qualities of red yeast rice.

1.2.4 To determine the presence of other useful compounds as well as some physical properties of fermented red yeast rice.

1.3 Potential applications

1.3.1 To use the product as food additives

1.3.2 To use the product for a medical purpose to treat hypertension or hypercholesterolemia

1.3.3 To have value added local rice products.