CHAPTER 1 INTRODUCTION

1.1 Research background

Rice (*Oryza sativa* L.) is the most important cereal crop in the developed world and is a staple food for over one half of the world's population (Juliano, 1993). Drying is the process that reduces the grain moisture content to a safe level for storage. Drying is a particularly vital operation in the grain handling chain since moisture is the most important factor determining the extent to which grains are liable to deteriorate during storage (Soponronnarit, 1997). Proper drying will maintain the grain quality and minimize losses. Use of artificial dryers may cause non-uniform heating or overheating of paddy, causing cracking of paddy due to temperature fluctuations, in addition to incorporation of filth if drying is not carried out on a clean surface (Jocelyn et al., 1991).

Sun drying is the most common process in Timor Leste. It reduces the grain moisture content to 14%, a safe level, before storage. For drying of paddy in tropical areas, an air temperature of 33–40°C is normally used with sun drying, and the efficiency of these methods as well as the head rice recovery is improved by stirring the grain during drying (IRRI, 2004). This method is simple and easily managed. Farmers' usually dry paddy by sun drying due to its low cost compared to mechanical drying. However, this method is limited during rain or at night. High moisture content of paddy (18–19%) is always found in the rainy season and it is not safe for storage due to high respiration induced fungal growth and insect invasion. These causes reduce head rice yield, milling and cooking quality, and storability. Farmers in Timor Leste have problems with drying paddy by traditional sun drying. Thus, artificial drying methods may be possible to employ to maintain the rice yield and milling recovery.

Hot–air oven drying is applied to reduce the moisture content in many kinds of grains. The temperature of the hot air oven at 60°C was applied to reduce the moisture content of paddy down to 14% in 5 h. This method can obtain higher yields, with no kernels being cracked or broken during milling (Kaasova et al., 2002).

Storage induce changes in the physicochemical properties of rice may be both desirable and undesirable depending on storage conditions, variety, and user requirement. Storage after 4 and 6 months improves head rice yield, and causes harder grains, higher water absorption and volume expansion during cooking. The cooked rice is less tender or hard and sticky. There is an increase in the gel consistency of milled rice stored above 28–30°C. The cooked rice stickiness decreases during cooking. Aroma is also lost during storage because it is volatile, occurring within 4 and 6 months. The changes of rice quality also depend on cultivars (Jocelyn et al., 1991).

The eating quality of rice is also influenced by its storage history. Cooked stored rice is less tender and sticky. Another factor which affects the eating quality of milled rice is temperature during storage. It has been shown to affect the amylose content, gelatinization temperature and gel consistency of the rice grain. However, water absorption of rice during cooking in boiling water is primarily related to its surface area, which is a function of its grain size and shape (Jocelyn et al., 1991).

Commonly, the farmers in Timor Leste store rice for 4–6 months at the ambient air at (about 33°C). This can reduce the head rice yield, and the cooking and eating quality (FAO, 2010/MAP). Storage time for 6 months at 40°C influenced the texture of cooked aged rice which was harder and less sticky than freshly harvested rice (Zhou et al., 2002). According to Soponronarit et al. (1998) and Zhou et al. (2001), the advantages of proper storage time for 2–4 months include gaining a high percentage of head rice yield, improving overall quality, and maintaining a high selling price.

Consumers like the cooking quality of rice aged for some months. They prefer the cooked rice to remain separate and firm after cooking. The storage temperature is the main influence on the quality changes, as the milled rice is affected more than the paddy rice. The high amylose content variety apparently aged quicker than those with low amylose content (Wang et al., 2003). The storage temperature and duration can have significant effects on the quality of rice. During storage, a number of physicochemical and physiological changes occur, called “aging”, which affect the grain functionally and affect the eating quality (Zhou et al., 2003).Aged rice is preferred over freshly harvested rice by consumers in tropical Asia, but consumers dislike it in countries where Japonica rice is consumed (Faruq, et al., 2003). All varieties have poor cooking qualities immediately after harvest (Grist, 1983). Rice eaters, Asians in particular, have always known that the cooking-eating properties of rice change dramatically with its storage after harvest (Sowbhagya and Bhattacharya, 2001). Rice storage is required to change certain physicochemical properties of rice, such as stickiness, from a sticky to a relatively non-sticky product after cooking (Chrastil, 1994). As rice aged, the cooked rice texture becomes fluffier and harder (Zhou et al., 2002). The texture of cooked aged rice becomes looser and more expandable, which is desirable for cooking (Siwapornmrak, et al., 2004). Aged rice is achieved by a high temperature treatment. The physical properties of milled rice after being treated with the radio frequency heat treatment at 85°C for 5 min are equivalent to those from 6 months of storage (Vearasilp et al., 2011).

These research activities focused on the drying methods and storage conditions to improve rice quality. The results could be used to provide rice producers and end–users with information about these methods. These will also generate high quality rice to meet

the demand of local and global markets by incorporating technology findings and recommendations into national policy and regular practices of farmers.

1.2 Objectives

1. To study the effect of two drying methods and two moisture contents on rice quality.

2. To study the effect of storage times on two cultivars of rice quality.

3. To study the effect of high temperature treatments of two cultivars of rice quality.

1.3 Hypothesis

1. Differences in drying methods have effects on rice quality.

2. Differences in storage times have effects on rice quality.

3. High temperature treatments have effects on rice quality.

1.4 Scope of study

1. To study two drying methods: sun drying (38–40°C) and hot air drying (60°C) and two moisture contents (26% – 28%) on ‘Suphan Buri’ rice.

2. To study the effect of storage times (2, 4, and 6 months) on ‘Suphan Buri’ rice quality

3. To study the effect of high temperature treatment on ‘KDML 105’ and ‘Suphan Buri’ rice quality.

1.5 Benefits

1. The drying methods of rice would be clarified and would be applied to a basic knowledge to obtain high yield and quality of rice.

2. The knowledge gained by this research would educate farmers on methods to improve the quality of rice.

3. The optimum storage times and high temperature treatments could be employed by farmers and the Agriculture Institute to maintain rice quality.