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Short Communication

Application of oven drying method on moisture content of ungrounded and grounded (long and short) rice for storage

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This study was conducted on ungrounded, grounded, long and short rice grains to determine the moisture content for storage. The rice samples were dried in an oven at 105°C; in this regard, every sample was divided in 6 parts with equal volume. The moisture contents were measured in six different ways, such as 1st part with 1 h interval, 2nd with 2 h, 3rd with 4 h, 4th with 6 h, 5th with 12 h and 6th part after 24 h. It is observed that an ungrounded grain sample with weight of 28.9 g showed in 1, 2, 4, 6, 12, and 24 h moisture release 5.81, 7.82, 9.10, 9.62, 10.48, and 11.11%, respectively. However, long grains weighing 44.86 g released moisture in 1, 2, 4, 6, 12, 24 h as 4.41, 6.87, 8.76, 9.59, 10.63 and 11.39%, respectively. While the short grains with weight of 45.68 g showed moisture release in the interval of 1, 2, 4, 6, 12 and 24 h as 3.96, 6.17, 7.99, 8.76, 9.68 and 10.29% respectively. It is evident from the study that ungrounded grains may be stored for long time as the moisture is easily released from them and they may retain the quality as compared to grounded short grains.

Key words: Ungrounded, grounded, moisture content.

INTRODUCTION

The moisture content plays an important role in the storage of rice for long period in terms of maintaining of its quality. There are several practical air-oven procedures that have been standardized to determine moisture content of grains (Hart et al., 1959; United states Department of Agriculture (USDA), 1971; Association of Official Analytical Chemists (AOAC), 1980; American Society of Agricultural Engineers, 1982; Jindal and Siebenmorgen, 1987; De Datta Surajit (1981) These methods are based on drying whole or ground grains in an oven over a fixed period of time. The cleaning, drying, and storage of grains are postharvest operations required to maintain their product quality (Bakker-Arkema et al., 1999). The drying temperature and time are usually specified for a particular type of grain on the basis of moisture content comparison with the reference method.

Moisture content determinations made with different oven methods and different grains may not be the same due to the empirical nature of the methods. Oven exposure time depends upon the type of grain and the method used (Hart and Neustadt, 1957; Warner and Browne, 1963; Young et al., 1982; Bowden, 1984).

Mechanical systems, especially those using hot air for rapid drying of high moisture grain are becoming increasingly popular throughout the region (Soponronnarit et al., 1996; Wiset et al., 2001; Huang-Nguyen et al., 1999; Nguyen et al., 1999). Fluidised and spouted bed dryers are examples of high temperature dryers. Due to the high air temperatures used, residence time of grain in the dryer must be short to prevent heat damage.

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Table 1. Shows the trend/regression trends.

S/N	Type of grain	Formulae (Logarithmic)	R^2 value
1	Ungrounded Grains	y = 1.6185Ln(x) + 6.4189	0.9496
2	Grounded Long Grains	y = 2.1714Ln(x) + 5.1579	0.9496
3	Grounded Short Grains	y = 1.9809Ln(x) + 4.6602	0.9429

Experiment was expressed by the aforestated equations.

Though air-oven procedures have been standardized for moisture determination of several common whole grains, there exists no such standard for rough rice. Noomhorm and Verma (1982) have compared rough rice moisture content determinations using the l30DC-16 h whole-grain method based on the work of Matthews (1962). They used the AOAC (1980) method as a standard, incorporating two-stage drying over the moisture content range of approximately 10 to 19% w.b. They concluded that the whole-grain oven method gave significantly higher moisture contents compared to the AOAC method. Thus, there is a need to develop a standard oven procedure for whole-grain rough rice moisture content determination that would be accurate, rapid and easy to use.

Grains are among the major commodities for feeding mankind. The cleaning, drying and storage of grains are post harvest operations required to maintain their product quality. Grain drying is a process of simultaneous heat and moisture transfer. When air is moved through grain two things happen, first of all, the grain will cool/warm until at equilibrium with the air being blown through. Secondly, the grain will dry/moisten until at equilibrium with the air being blown through.

The medium of drying is air. The major physical properties of air that affect the drying rate of grains are the relative humidity or humidity ratio, the dry bulb temperature, the specific volume, and the enthalpy. The current study is based on the assessment of moisture content in ungrounded and grounded (long and short) rice, to determine the effects of oven drying temperature with different times on its moisture content.

MATERIALS AND METHODS

This study was carried as a laboratory exercise to explore the overall effects of oven drying temperature in different timings, to determining the moisture content of ungrounded, long and short rough rice grain. A preliminary study on moisture content of three samples was taken in account by using oven drying box model DHG-101. The temperature of drying box was kept constant at 105°C. The fresh harvested rice (T-259) was purchased in 2009 for experiments. The packet of the ungrounded rice sample and were grounded with machine and long grains were obtained. After that, an ungrounded long sample was cut into two pieces to get the short grain. The three samples with equal volume of each sample were kept in the sampler with the weight of, Ungrounded Grain 28.9 g, Long Grain 44.8 g, and Short Grain 45.6 g, six different ways and time intervals (Table 1).

Measurement of moisture drying

The weight of empty samplers (pots) was measured by electronic weight balance model G&G. The same volume of grains of ungrounded, long and short rice samples were kept separately in each sampler (pots) and were measured again; it was placed in the drying box on fixed temperature on the timings that is, 1, 2, 4, 6, and 24 h; after the given time interval its weight was again measured. The results of the study revealed a trend that indicated a possible relationship between the moisture contents attained with the various drying temperature/time combinations.

RESULTS AND DISCUSSION

The experiment was conducted to analyze the moisture content variations in three different samples in order to see the ability for long time storage. The perceived data showed that Ungrounded Grain sample (weight 28.9 g) showed 5.81% moisture release in 1 h, 7.82% moisture release in 2 h, 9.10% moisture release in 4 h, 9.62% moisture release in 6 h, 10.48% moisture release in 12 h, and 11.11% moisture release in 24 h (Figure 1) However long grains (weight 44.86 g) showed 4.41% moisture release in 1 h, 6.87% moisture release in 2 h, 8.76% moisture release in 4 h, 9.59% moisture release in 6 h, 10.63% moisture release in 12 h, and 11.39% moisture release in 24 h (Figure 1). While the short grains (weight 45.68 g) showed 3.96%, moisture release in 1 h, 6.17% moisture release in 2 h, 7.99% moisture release in 4 h, 8.76% moisture release in 6 h, 9.68% moisture release in 12 h and 10.29% in 24 h (Figure 1). It is observed from the data that ungrounded grains released more moisture as compared to grounded grains because of voids. By measuring the equal volume of ungrounded and grounded grains, it was found that 40.1% more space is required to store ungrounded grains as compared to grounded long grains and 41.16% more than short grains of same volume. However, it is found that the trend of moisture releases in all samples is nearly the same (Table 1).

Conclusion

It is concluded from the perceived data that the moisture release of all grain samples decreased with deferent time intervals. However, moisture release in long grains is higher than smaller grains. Trend of moisture releases in

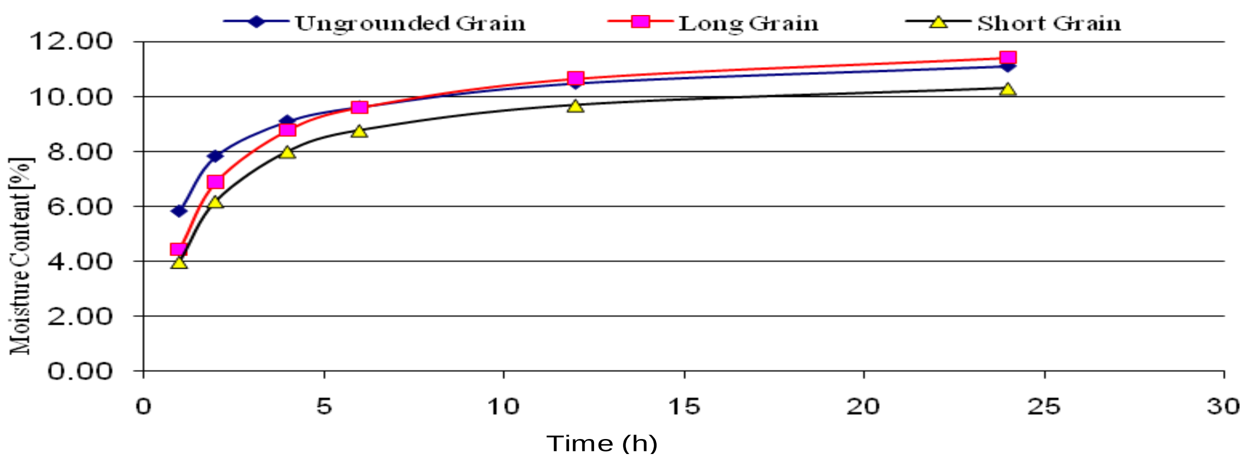

Figure 1. Shows moisture content trend in different rice grain samples.

all three types is almost the same. It is recommended that the same kind of study be conducted on full spikes.

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