

Study on Nutritional Values in Paddy Crude and Parboiled Rice

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Abstract - Rice has one of the biggest consumption levels all across the world. Parboiled rice is a type of rice, which has been partially cooked during the milling process and then packaged for sale for use in homes and restaurants. During parboiling starch granules of rice are gelatinized. In this project work, paddy crude and parboiled rice samples were collected from Golden Rice Mill in Patheingyi Township, Ayeyarwady Region. Some physicochemical properties and nutritional values such as moisture, ash, protein, crude fiber, fat, carbohydrate and energy value were determined by routine laboratory methods. The moisture percent was determined by oven dry method. The ash percent is a measure of the food and it was determined by ashing method. The protein content was determined by Kjeldahl method. The crude fiber content was determined by fiber cap method. Fat content was determined by Soxhlet extraction method. From the results of this work, it is rich in carbohydrates and vitamins which is excellent for healthy diet in human body.

Keywords: paddy crude, starch granules, parboiled rice

1. INTRODUCTION

Parboiled rice is produced from paddy crude through pre-treating in with heat energy and water before drying and milling. During parboiling starch granules of rice are gelatinized (Hermansson, 1996). As a result of starch gelatinization, various property changes occur in the rice. The major objectives of parboiling are to increase the total yield of the paddy, prevent loss of nutrients during milling and prepare the rice according to the requirements of consumers.

In this study the physicochemical properties and the nutritional values of paddy crude and parboiled rice were investigated. *Oryza sativa*, commonly known as Asian rice, English as rice. *Oryza sativa* is a grass with a genome consisting of 430 Mb across 12 chromosomes. These samples were shown in Figure 1 and 2.



Figure 1 *Oryza sativa* (Paddy)



Figure 2 Paddy rice and parboiled rice samples

Parboiling of rice involves the partial cooking of paddy crude and involves the process of soaking gelatinizing and drying to milling. The objective is to impart a required hardness on the grain (with husk intact) in order to withstand milling operations. Rice is parboiled in the hull, which softens the kernel, allowing the surface starch, bran and other components to commingle (Eliasson, 1986). The water is then drained and the rice is carefully steam dried. The dried parboiled rice is sent through machines, which remove the hull and polish the kernels. This parboiled process was shown in Figure (3).

The uses of rice worldwide is great; principal among them include; staple food (Nutrition) both human and animals. Countries also benefit from rice production by getting foreign exchange, and above all medicine. The grain products of rice,

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include; flakes, rice flour, starch, rice milk, rice cakes, and the extended uses of rice include; rice husk for fuel, rice bran for oil and animals feed, broken rice used as snacks, rice flour and rice beverage.

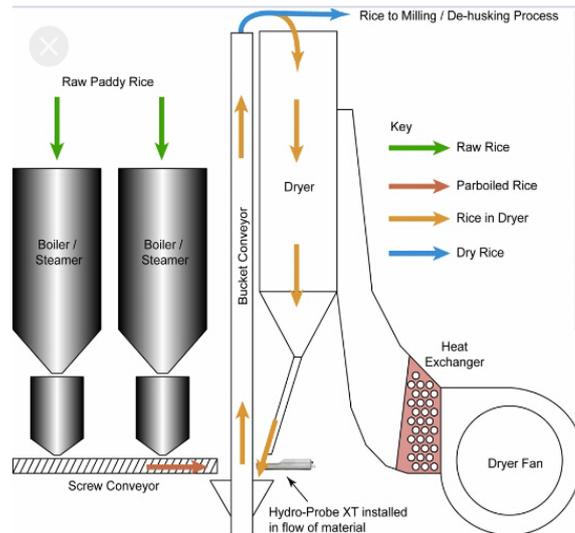


Figure 3 Parboiling process plant

Parboiled rice has a higher vitamin content than raw milled rice. Parboiled rice is quite nutritious, being an excellent source of niacin, a good source of thiamine and magnesium and a moderate source of protein, iron and zinc (Kyritsi, 2011). Levels of vitamins and minerals fall between rice and brown rice.

The science nutrition is the study of all process of growth, maintenances and repair of living body that depend upon the digestion of food and the study of that food (Buss and Robertson, 1978). Good nutrition is the major determinant of good health, growth and development.

The elements in foods that are required for the maintenance and growth of the body are called nutrients. These are the 25 carbohydrates comprised of starches and sugars; the protein made up of 20 amino acids, fats consisting of 15 fatty acids; 20 vitamins; and 13 minerals. Most foods contain more than one nutrient but vegetables, fruits, cereals are primarily sources of carbohydrates, proteins and fats. Most foods contain various amounts of various minerals, some having more of certain vitamins and minerals than other (Henkel, et al., 1972).

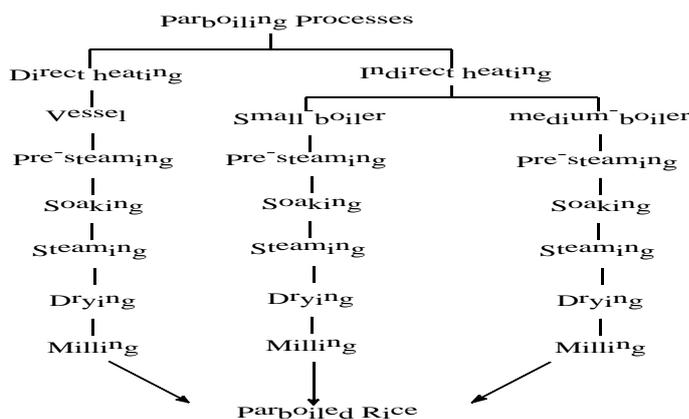
2. EXPERIMENTAL

Material

One *oryza sativa* paddy rice was used. This variety was obtained from the Golden Rice factory, Pathein Township, Ayeyarwady Region. The *oryza sativa* paddy rice and parboiled rice was stored in self-sealing plastic bags before being used.

Method

Parboiled rice preparation



3. RESULTS AND DISCUSSION

The yield percent of sample was shown in Table 1.

Table 1 The Yield Percent and LOI Value of Paddy Crude and Parboiled Rice Samples

| Sample | Yield (%) | LOI (%) |
|----------------|-----------|---------|
| Parboiled Rice | 64.8 | 35.2 |

LOI = loss on ignition

The physicochemical properties and nutritional values of paddy crude (paddy rice) and parboiled rice samples were determined based on ASTM standard.

The determination of moisture content or rather the water content is one of the most important and most widely used analytical measurement in the processing and testing of food products. Moisture is usually determined by drying to constant weight with the loss in weight being considered as water. In this research, moisture contents of samples (paddy crude and parboiled rice) were as shown in Table 2, and Figure 4. It was found to be 13.23 % (Paddy) and 12.61 % (parboiled rice) respectively.

The ash percentage is a measure of the quality of food; the smaller the ash percentage, the better the quality of food. Ash is the most convenient assessment of the total mineral matter of food. In this work, the ash contents of the samples (paddy and parboiled rice) were shown in Table 2, and Figure 4. It was found to be 4.90 % (paddy) and 0.57 % (parboiled rice) respectively.

In the kjeldal method, the nitrogen in the sample is converted to ammonium by digestion with concentrated sulphuric acid and the ammonium is determined from the amount of ammonia liberated by the distillation of the digest with alkali. The ammonia liberated by distillation is collected in an accurately measured quantity of standard mineral acid and determined by titration of excess acid using indicators such as methyl red, bromocresol green, and methyl red-methylene blue mixtures. The rate of increase of digestion temperature plays an important role in the conversion to ammonia. Digestion at low temperatures either necessitates too long a digestion time or fails to give good results, while too high temperature may result in loss of nitrogen.

In this work, the nutritional values of the samples were shown in Table 2 and Figure 4. The protein percentage of the samples (paddy and parboiled rice) were found to be 5.80 % (paddy) and 6.14 % (parboiled rice) respectively.

Fiber stimulates the secretion of digestive fluids. Fiber stimulates the accumulation of cancer-causing materials because it shortens the retention period of waste materials. The fiber content of samples (paddy and parboiled) were shown in Table 2 and Figure 4, were found to be 10.37 % (paddy) and 0.20 % (parboiled rice) respectively.

Fats are important constituents of a normal diet and the most concentrated of all sources of calorie. Fat occurs widely in plants and animals as a means of storing food energy, having twice the calorie value of carbohydrates. In this work, fat contents of the samples (paddy and parboiled rice) were determined by Soxhlet extraction method by using petroleum ether. As seen in Table 2 and Figure 4, the fat percent of sample were found to be 2.18 % (in paddy) and 0.20 % (in parboiled rice) respectively.

Carbohydrates are composed of sugars and starches that are easily digested into glucose, with functions are the body's primary source of energy. The body stores carbohydrates as glycogen in the muscles and liver, however its storage capacity is limited. Many foods contain a mixture of different types of carbohydrate. The carbohydrate contents of samples (paddy and parboiled rice) were as shown in Table 2 and Figure 4. It was found to be 63.52 % (paddy) and 80.28 % (parboiled rice) respectively. The carbohydrate content of parboiled rice was higher than that of paddy crude.

The energy value of paddy crude and parboiled rice samples were calculated by multiplying the number of grams of carbohydrate, protein and fat by 4, 4 and 9 respectively. Then the result were added together. The results of the energy for these samples are shown in Table 2.

Calculation of Energy Value

| | | | | |
|--------------|---|---------|---|--------------------|
| Protein | = | 4 x 17 | = | 68.0 kcal |
| Fat | = | 9 x 9 | = | 81.0 kcal |
| Carbohydrate | = | 4 x 0.2 | = | 0.8 kcal |
| | | | | = 149.8 kcal/100 g |

Table 2 Physicochemical Properties and Nutritional Values of Paddy Crude and Parboiled Rice Samples

| No. | Test Parameter | Paddy Crude | Parboiled Rice |
|-----|-------------------------------|-------------|----------------|
| 1 | Moisture (%) | 13.23 | 12.61 |
| 2 | Ash (%) | 4.90 | 0.57 |
| 3 | Crude Protein (%) | 5.80 | 6.14 |
| 4 | Crude Fiber (%) | 10.37 | 0.20 |
| 5 | Crude Fat (Ether Extract) (%) | 2.18 | 0.20 |
| 6 | Carbohydrate (%) | 63.52 | 80.28 |
| 7 | Energy Value (Kcal/100g) | 298 | 346 |

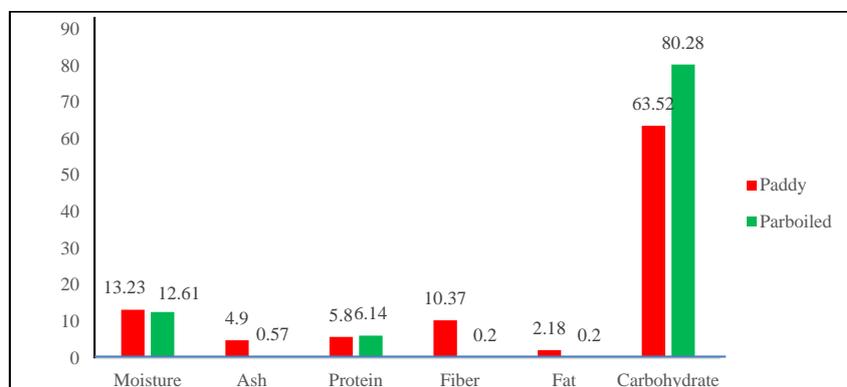


Figure 4 Nutritional values of paddy and Parboiled rice samples

CONCLUSION

The paddy rice and parboiled rice samples were analyzed for contents of moisture, ash, protein, fiber, fat, carbohydrates and then were calculated energy values. The presence of moisture was determined by oven-dried methods. The moisture contents of samples (paddy rice and parboiled rice) were found to be 13.23 % and 12.61 % respectively. The ash contents of samples (paddy rice and parboiled rice) were found to be 4.90 % and 0.57 % respectively.

The total nitrogen percentages were determined by the kjeldahl digestion method followed by distillation. The amount of protein in samples (paddy rice and parboiled rice) was found to be 5.8 % and 6.4 % respectively. The fiber contents of samples (paddy rice and parboiled rice) were found to be 10.37 % and 0.20 % respectively. Fat contents were determined by the Soxhlet extraction method using petroleum ether as solvent. The percentage of fat in samples (paddy rice and parboiled rice) was found to be 2.18 % and 0.20 % respectively. The carbohydrate contents of samples (paddy rice and parboiled rice) were found to be 63.52 % and 80.28 % respectively.

The moisture and ash content of paddy were found to be higher than parboiled rice. The fiber and fat content of paddy were found to be higher than parboiled rice. From the result, the protein and carbohydrate of parboiled rice were found to be higher than paddy crude. According to the data, parboiled rice had higher energy value. This study pointed out that parboiled rice is excellent for the body as its rich in minerals, carbohydrates and vitamins. The diet person should be consumed it for good health.

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