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Maltodextrin quality prepared from spoiled and leftover rice

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Abstract. Rice is consumed by most people, especially in Asian countries. Rice consumption resulting left over rice. Rice also has a low storability and resilience because it is susceptible to microorganisms. It will change to spoiled rice if leave it at room temperature. Both kinds of rice become mull. Hence, it required further processing of spoiled rice and leftover rice. One of the alternatives that can be done is by converting rice into maltodextrin. Maltodextrin is widely used in various industries including food, beverage, chemical and pharmaceutical industries. Similar to starch, maltodextrin is widely used as a thickener as well as an emulsifier. This research was conducted to determine the quality of matodextrin resulting from spoiled rice and leftover rice. Rice converted to maltodextrin by amylase enzyme and dried by using a spray dryer. The treatment is replicated 3 times and the data is statistically analyzed by using T-test. The parameters are water content, ash content, and color. The results showed that the water content of maltodextrin from spoiled rice was 1.6% and the leftover rice was 1.35%. In addition, the ash content resulted 0.37% and 0.48% for spoiled rice and leftover rice, respectively. The color test conducted using a chromameter shows that the brightness is suitable with the expected color of the maltodextrin.

1. Introduction

Rice is a commonly consumed by people all over the world. Mostly, Asian countries tends to consume rice as their staple food daily which makes them dependent towards the rice consumption. However, rice has a low storability and resilience due to the tendency of its suitable content for microorganisms to grow. The time period of rice to get damaged is so fast which inflicts a lot of rice being wasted and not used [1,2].

This indicates the need for further processing of leftover and stale rice. One of the alternatives that can be done is by processing rice into maltodextrin. Meanwhile, maltodextrin is imported to support the low number of maltodextrin domestic production up to this point. According to data from the Central Statistics Agency, Indonesia imported maltodextrin and modified starch in 2016 amounted to 109,729.2 tons [3].

The application of maltodextrin is one of the modified starches used in various industries, including food, beverage, chemical and pharmaceutical industries. Similar to starch, maltodextrin is widely used as a



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thickener as well as an emulsifier. This study aims to determine the maltodextrin quality made of stale and leftover ice.

2. Materials and methods

2.1. Metodextrin Preparation

The making process of maltodextrin from spoiled rice and leftover rice is started by collecting the perceived rice from the targeted food stalls. Then, the process is continued by washing rice, draining and crushing using a blender. The next process is carried out by checking the pH for neutralization process, then added with 0.15 ml of α -amylase enzyme. Afterwards, the heating process is carried out to deactivate the enzyme, following the sample is cooled and pH is measured once again. Lastly, the sample is dried using the spray dryer method at inlet temperature of 140°C – 160°C and at outlet temperature of 80°C – 120°C along with the flow velocity of liquid material in the dryer which is ranging from 10 – 12 ml/min, which also produces a white-sized particles.

2.2. Water Content Analysis [4]

The test of water content is done by emptying the aluminum cup and drying it in an oven at the temperature of 105°C for 15 minutes, then being cooled in a desiccator and weighed as the weight of an empty cup. A number of samples of certain coloring preparations are put into an aluminum cup and then weighed. Next, they are put and dried in a vacuum oven at the temperature of 70°C overnight with the pressure of 25-100 mmHg. After dried, it is cooled in a desiccator and being weighed again. The drying process is yet to finish until a constant weight is finally obtained.

$$\text{Water content} = \frac{\text{Sample weight} - \text{dried sample weight}}{\text{sample weight}} \times 100\%$$

2.3. Ash Content Analysis [4]

Ash content testing is done by means of an empty porcelain cup dried in oven at 105°C for 15 minutes, then cooled in a desiccator and weighed as the weight of an empty cup. A number of samples of certain coloring preparations are put into a porcelain cup and then weighed, then dried in a furnace to form ash. The graying process is carried out in two stages, first at a temperature of around 400°C and second at 550 °C. After the ashing is complete, the cup desired in the desiccator is then weighed. The graying is repeated until a constant weight is obtained.

$$\text{Ash Content} = \frac{\text{final weight} - \text{the weight of the porcelain cup}}{\text{sample weight}} \times 100\%$$

2.4. Color analysis

Chromameter CR 300 Minolta is a tool for tristimulus color analysis to measure the color reflected by the surface. The data of measurement can be an absolute value or a difference in value with the standard. The steps are given as follows, firstly, do the calibration by pressing the 'CALIBRATE' button, enter the calibration data (Y, x, and y) on the cover of the calibration plate. Then, put the measuring head on the white calibration plate, press the 'MEASURE' button. Let the tool run automatically three times until the measurement is complete. After the calibration is complete, new sample or measured sample can be finally done. Firstly, put the measuring head on the sample to be measured, and press the 'MEASURE' button, leave the tool to run automatically, wait a few moments until the measurement is complete. The results of the color test analysis are then converted into "Hue grades. The obtained "Hue grade is then

adjusted to the 2isco area of the chromatization color range. The formula for converting L * ab values to °Hue values is given as follows:

$$\text{Hue} = \tan^{-1} (b / a)$$

3. Result and Discussion

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3.1. Water Content

Water content analysis is aimed to determine the amount of water content in maltodextrin powder, as the result of its tendency to affect the storability of the product. The lower the water content contained, the longer the storability of the product [5]. Maltodextrin with low dextrose equivalent (DE) is non-hygroscopic, whereas maltodextrin with high DE tends to absorb water (hygroscopic). The Increase of DE percentage will increase the color, hygroscopic properties, plasticity, sweetness and solubility [6].

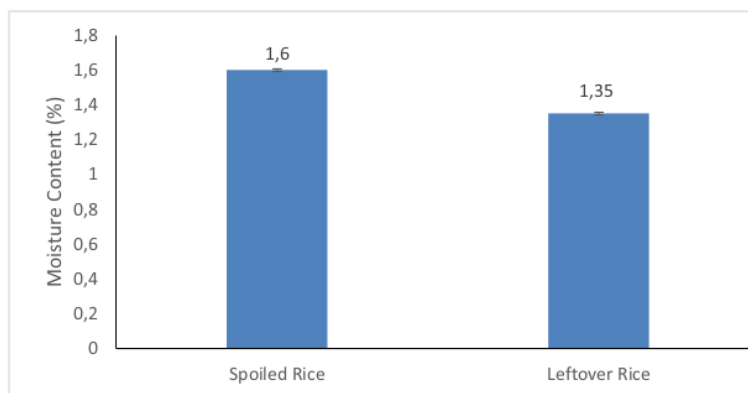


Figure 1. Water content of Maltodextrin form spoiled and leftover rice.

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The water content of maltodextrin can be seen in Figure 1. The water content of maltodeskrtrin from spoiled rice is 1.6% while the leftover rice is 1.35%. The statistical analysis resulted that maltodextrin from the two rice sources is not significantly different. This is possible due to the water vapor is trapped between the grains of rice, which is responsible for the rice to be watery. The high water content contained in the rice makes it possible, which can be seen from the physical properties of rice such as gelatinization temperature, gel consistency, water absorption, stickiness, adhesiveness, softness, and glitter of rice [6].

3.2. Ash content

Ash content states the percentage of mineral content contained in an ingredient. Ash content is determined by heating the material in the furnace (kiln) at a temperature of 600°C. Other materials contained will be burned and evaporated while what remains is ash or minerals [7].

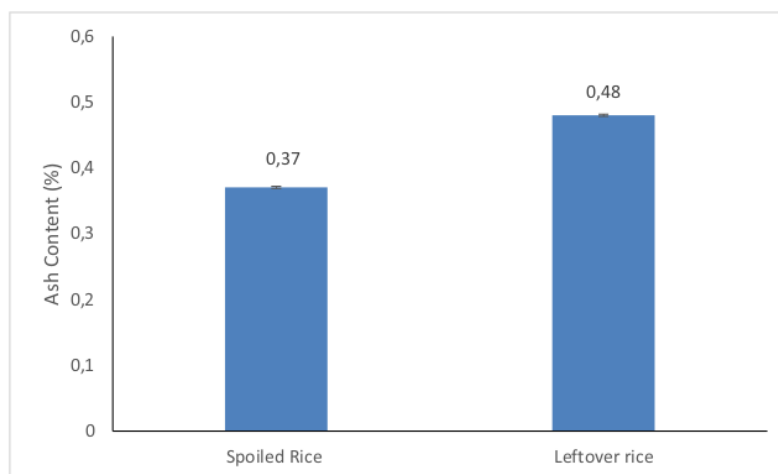


Figure 2. Ash content of Maltodextrin form spoiled and leftover rice.

Figure 2 shows ash content of maltodextrin. Maltodextrin form spoiled rice has an ash content of 0.37% while the leftover rice is 0.48%. The two kinds of rices sources are not significant difference based on statistical analysis by T-test. The element C (carbon) contained in maltodextrin is responsible for ash to be produced when it is burned in the combustion process.

3.3. Colour Test

Color is one of the attributes of food that plays an important role in increasing the interest of consumer towards the products. Not only to attract consumers organoleptically, but color also can be used as an indicator of quality and nutritional content. As can be seen in Figure 3, the color intensity of maltodextrin powder, L indicates the level of brightness of the sample. If L has a value of 0 it means absolute black and 100 means white [8]. The level of brightness (L^*) of maltodextrin obtained from spoiled rice is 95.29 and leftover rice is 95.84. The color maltodextrin from spoiled and leftover rice are not significantly different.

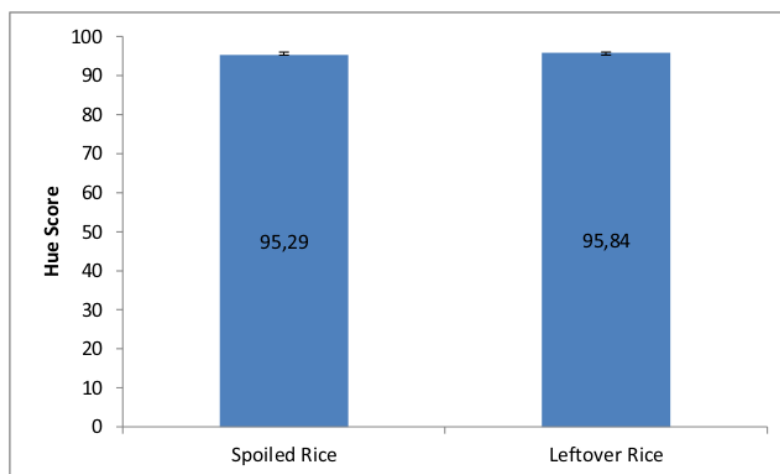


Figure 3. Color of maltodextrin form spoiled and leftover rice.

The best level of brightness (L^*) of powdered sugar is obtained from the average number of maltodextrin spoiled rice which is 1.18 and leftover rice is 1.69 Whereas the a^* and b^* numbers indicate the higher addition of maltodextrin, palm sugar powder tends to have a green and yellowish color.

4. Conclusion

1. Maltodextrin produced from spoiled rice has water content of 1.6% and ash content of 0.37%. Color test of L value is: 95.29.
2. Maltodextrin produced from leftover rice has water content of 1.35 and ash content of 0.48. Color test of L value is 95.84.
3. The result of statistical test shows that both treatment is not significantly different for all parameters.

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