

Analysis of Chlorine Content in Rice at Peunayong Market, Banda Aceh

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Abstract: The addition of chemicals in food is still commonly found, including chlorine in rice. Chlorine is hazardous for health if consumed in the long-term. People or producers still add chlorine to food. The goal of this research is to know the chlorine content in rice at peunayong market, Banda Aceh. This research uses experimental method by observing chlorine content when the sample has not been washed, has been washed, and has been cooked. The sampling technique uses systematic random sampling. There are three rice brands as samples for this study with premium and medium rice categories. This research uses qualitative analysis with laboratory test using argentometry method. The test was conducted at the Aceh Regional Government Health Analyst Academy. Based on the result of the qualitative test, there are three samples that contain chlorine. While the result of quantitative test on rice A, B, and C before being washed, there samples contain chlorine for sequentially for 0.1083 gr (0.54%), 0.0655 gr (0.33%), 0.0512 gr (0.26%) after being washed 0.0715 gr (0.36%), 0.0252 gr (0.13%), 0.0417 gr (0.21%), and cooked rice (0.22%), 0.0120 gr (0.06%), 0.0354 gr (0.18%). It can be concluded that the result of the test indicates the existence of chlorine in 3 types of rice. Quantitative test results are known that the presence of these treatments can reduce chlorine content in rice. The researchers suggest people pay attention when they buy and wash the rice to decrease chlorine content in rice. Then it is important to do further research about nutrient content in rice containing chlorine.

Keywords: Chlorine, Rice, Seller.

Introduction

At present, chlorine is not only used as pulp bleaching but also used as rice bleaching, so the medium quality rice would seem as white as the best quality rice. The chlorine contained in rice would crush intestines inside the stomach. As a result, the stomach would be prone to gastritis. In an extended period, the chlorine would cause heart cancer and kidney failure.^[1]

Food Drug Administration (FDA) sets chlorine levels in food should not exceed 0.82 grams of sodium hypochlorite or 0.36 grams of calcium hypochlorite in 100 grams of the food. Based on the result of the FDA's research from the view of the Resonant Biosciences, Chlorine dioxide is safe to add to animal food. The research conducted on mice by feeding the rats with food that has been mixed with chlorine. The food has no effect on health if the chlorine level does not exceed 0.82 grams of sodium hypochlorite or 0.36 grams of calcium hypochlorite in 100 grams of food. Permenkes No. 722/Menkes/Per/XI/1988 about Food Additives states that chlorine is not recorded as Food Additives in the bleach and flour dough group, and may not be used in the manufacture of food ingredients.^[2]

According to Olivia, chlorinated rice had chemical smells, and natural rice had the natural smell of rice. The color of rice is very white or pure white, while natural rice has fair white color even slightly dull. After being cooked, chlorinated rice turns yellow faster and then stale faster than natural rice.^[3]

In this increasingly modern era, the addition of chemicals in food is common in Indonesia. One of the chemicals added to food is chlorine, which is added to rice. Chlorine is a chemical in the form of greenish-yellow gas with a strong odor. these chemicals are

commonly used as bleach and refiners in the textile, pulp, and paper industries. Besides being able to bleach paper, Chlorine can also strengthen the surface of the paper. Chlorine is used in various industries to produce products that are beneficial to humans, such as the health sector, industry, agriculture, the chemical industry, and power plants. ^[4]

Research Methods

This research is quantitative with the type of experimental research, which is knowing the levels of chlorine contained in rice before washing, after washing and after cooking. The population in this study was 20 samples.

Results and Discussion

Results

Chlorine's qualitative and quantitative examination on rice conducted on 3 (three) rice samples that circulate at Peunayong Market, Banda Aceh. The examination of chlorine level started from qualitative and then quantitative on rice before washing, after washing and after cooking.

The results of the qualitative examination of chlorine in samples A, B, and C were positive. Furthermore, quantitative chlorine levels were examined before washing, after washing, and after cooking.

The chlorine level in sample A before washing was 0.1083 gr (0.54%). the chlorine level in sample B before washing was 0.0655 gr (0.33%), while the chlorine level in sample C before washing was 0.0512 gr (0.26%).

The chlorine level in sample A after washing was 0.0715 gr (0.36%). the chlorine level in sample B after washing was 0.0252 gr (0.13%), while the chlorine level in sample C after washing was 0.0417 gr (0.21%).

The chlorine level in sample A after cooking was 0.0440 gr (0.22%). The chlorine level in sample B after cooking was 0.0120 gr (0.06%), while the chlorine level in sample C after cooking was 0.0354gr (0.18%).

Discussion

a study to find out the chlorine level in rice circulating at the Peunayong market in Banda Aceh City was carried out. Qualitative and quantitative laboratory tests are performed to determine the chlorine level. Based on the results of the study, all rice samples contained chlorine, which had different levels after being tested quantitatively by mohr argentometry method before washing, after washing, and after cooking.

There is a difference between the first result and the result of repetition. This can be caused by an excess of few drops during the titration of the AgNO₃ reagent with the sample and at the time of weighing as well as in the process of crushing the sample so that the mass of the sample can be reduced and there is a difference in the value of the content.

The results of research on chlorine level in rice before washing indicate that there is a higher amount of chlorine content in rice A compared to rice B, and rice C. Rice A is premium grade rice produced in Medan. This rice is most in demand by the Aceh population. Meanwhile, rice B and C rice are medium grade rice.

According to Hasan's theory, which discusses the content of pesticides containing chlorine, dichloro diphenyl trichloroethane (DDT), aldrin, and dieldrin [4], the authors assume that the presence of chlorine in pesticides can lead to the presence of chlorine in rice when spraying pesticides on rice. Thus, it can have an impact on the health of people who consume it.

Chlorine is widely used in the production of paper, antiseptics, dyes, food, insecticides, paints, petroleum products, plastics, medicines, textiles, solvents, and many other products. As technology advances, chlorine is also used in sanitary napkins production from recycled materials. The purpose of using chlorine is to sterilize the materials and to make them look white.^[5]

Based on the previous theory, the authors assume that in addition to spraying pesticides, many producers use chlorine in rice in order to make consumers interested in various selling prices, but the effect of consuming chlorinated rice is hazardous for human health.

The results of research of chlorine levels in rice A, B, and C after washing showed a significant decrease in chlorine levels.

According to Elmiana, Chlorine has several properties, namely physical and chemical properties. Chlorine is the second element of halogen, located in group VII A, period III. The chemical properties of Chlorine are determined by the electron configuration in the outer shell. This situation makes it unstable and very reactive. This is because the structure does not have 8 electrons (octets) yet to get the noble gas electron structure. In addition, the chemical properties of Chlorine are soluble in water, toxic, do not ignite in air, but react chemically. In addition, the chemical properties of Chlorine are soluble in water, toxic, do not burn in the air, but react chemically. At average temperatures, Chlorine directly blends with other elements. Some physical properties of Chlorine are greenish-yellow, the smell is stimulating, the molecular weight is 70.9 dalton, the boiling point is -34.7°C , the freezing point is 0.102°C with the gravity of 1.56 at the boiling point of water vapor pressure 20°C , gas density 2.5 and water-soluble force 20°C , reactive to hydrogen/alkali metals and corrosive to all metals, strong oxidizing and natural to erupt or explode when mixed with hydrogen gas.^[6]

Proper rice washing aims to keep the benefits of vitamin B1 or thiamine in rice not disappear. the procedure of washing rice starts with pouring water into the rice. Pour enough water and dispose of it slowly so that not much vitamin B1 would disappear. Wash rice 2 times, and do not rub the rice.

From the results of the research and theory above, the authors assume that the rice washing method can significantly reduce the amount of chlorine in rice.^[7] The excellent way to wash rice is to wash rice twice and rub gently so that the vitamin B1 or thiamine needed by the body does not disappear.

The results of the study of chlorine levels in rice A, B, and C after cooking is a decrease in chlorine levels but not significant.

According to Sinuhaji's research results regarding the chlorine level in rice circulating in Medan market with 1 (one) sample using a Spectrometer, it can be concluded that the chlorine level when the rice reaches 750°C temperature is 6.945 ppm, while the chlorine level when the rice reaches room temperature ($\pm 250^{\circ}\text{C}$) is 3,488 ppm. There is a decrease in chlorine level in rice based on the lower temperature of rice. This is in accordance with the nature of chlorine, which is easy to disappear/evaporate at room temperature because chlorine has a boiling point and melting/freezing point lower than room temperature ($\pm 250^{\circ}\text{C}$).^[1]

According to Elmiana, one of the properties of chlorine is easily oxidized in the air, so when it is cooked, the chlorine is oxidized in the air. [6] However, in this study rice was cooked using a rice cooker, so the authors assume that rice cooked using a rice cooker causes a little air to come out because the lid is tightly closed and this causes the chlorine not to entirely evaporated so that the substances that stick to the lid of the rice cooker drip again with dew and go back into the rice.^[6]

However, the threshold value of the chlorine level in the three rice is still below the threshold of the Food and Drug Administration (FDA), it should not exceed 0.82 grams and 0.36 grams, respectively.^[2]

The chlorine level in rice will not have a direct impact on health but will be long term, and the impact will only be seen in a few years later. The threats will appear in the next 15 to 20 years, especially if the rice is consumed continuously. Chlorine levels in rice are accumulative if consumed by children. Chlorine substances in rice will crush the intestine in the stomach. As a result, the stomach will be prone to gastritis. In the long run, the chlorine will cause liver cancer and kidney failure. Chlorine substances contain carcinogenic substances that can cause cancer. In the early stages, the symptoms that appear are lack of appetite, the body looks thin, and lack of nutritional intake and a few years later can develop into cancer and kidney dysfunction. Rice containing chlorine can also damage the digestive tract, for example the stomach and colon. In addition, chlorinated rice can interfere with blood circulation and worsen kidney activity. Kidney failure is usually experienced in old age.^[2]

Conclusion and Recommendation

Based on the result of the research, it can be concluded that the entire samples contain chlorine. Chlorine level within rice A, B and C without washing was equal to 0.1083 gr (0.54%), 0.0655 gr (0.33%), and 0.0512 gr (0.26%). Chlorine levels in rice after washing are 0.0715 gr (0.36%), 0.0252 gr (0.13%), and 0.0417 gr (0.21%). Thereafter, the chlorine level in rice that has been cooked with a magic jar is 0.0440 gr (0.22%), 0.0120 gr (0.06%), and 0.0354 gr (0.18%). Based on the results of this study, it is known that premium rice produced from outside Aceh has a higher content than local Aceh rice. Nonetheless, the threshold value of the chlorine content in the rice A, B, and C is still below the threshold of the Food and Drug Administration (FDA), which is not to exceed consecutive 0.82 grams and 0.36 grams.

It is necessary to educate the public about the process of reducing chlorine levels in rice by washing rice 2 times slowly and cooking rice using an open container. This research can be used as a reference for students of the Faculty of Public Health, Serambi Mekkah University about the chlorine content in rice. Further research is needed regarding the nutritional content of chlorinated rice.

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Attachment

Table 1. Results of Qualitative Chlorine Examinations

Sample	Origin of Production	Result
Sample A	Medan	Positif (+)
Sample B	Pidie	Positif (+)
Sample C	Blang Bintang	Positif (+)

Source: Primary Data 2019

Table 2. Chlorine Levels in Rice Before Washing

Before Washing						
Type of Sample	Massa (gr)	Blanko (gr)	Kadar I (gr)	Kadar II (gr)	Kadar rata-rata (gr)	%
Sample A	20	0	0,1083	0,1083	0,1083	0,54
Sample B	20	0	0,0774	0,0535	0,0655	0,33
Sample C	20	0	0,0512	0,0512	0,0512	0,26

Source: Primary Data 2019

Table 3. Chlorine Levels in Rice After Washing

After Washing						
Type of Sample	Massa (gr)	Blanko (gr)	Kadar I (gr)	Kadar II (gr)	Kadar rata-rata (gr)	%
Sample A	20	0	0,0774	0,0655	0,0715	0,36
Sample B	20	0	0,0252	0,0252	0,0252	0,13
Sample C	20	0	0,0417	0,0417	0,0417	0,21

Source: Primary Data 2019

Table 4. Chlorine Levels in Rice After Cooked

After Cooking						
Type of Sample	Massa (gr)	Blanko (gr)	Kadar I (gr)	Kadar II (gr)	Kadar rata-rata (gr)	%
Sample A	20	0	0,0416	0,0464	0,0440	0,22
Sample B	20	0	0,0125	0,0115	0,0120	0,06
Sample C	20	0	0,0369	0,0339	0,0354	0,18

Source: Primary Data 2019