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# The Effect of Rice Husk Charcoal on the Reduction of Iron Levels (Total Fe) in Dug Well Water in Lhong Raya Village, Banda Raya District, Banda Aceh City

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**ABSTRACT**

*The bacround Water is a chemical compound that is very important for the life of living things on earth, excessive iron content in water is considered to endanger the life of aquatic organisms. The designation of iron content in clean water is <10 mg/l. The result of burning rice husk produces rice husk charcoal which can be used as adsorbent of heavy metals in water. This was a quasi experimental study, this study was conducted at the researcher's home and in the laboratory of Regional Technical Implementation Unit UPTD on 15 June 2017, the subject of this study was 9 liters of dug well water. The data were obtained directly from the examination results of iron (Total Fe) levels in dug well water. The study results obtained an average amount of Fe content with a dose of 20 grams of -0.265 mg/l, Fe content with a dos0065 of 30 grams of -0.301 mg/l, Fe content with a dose of 40 grams of -0.388 mg / l. From the conclusion, it can be concluded that the most effective dose of rice husk charcoal in lowering iron (total Fe) levels was 40 grams. It is necessary to conduct further study using other methods to lower iron (total Fe) levels to avoid turbidity in the water.*

**Keywords:** Rice husk charcoal, iron (total Fe), well water

## Introduction

Water is an element that cannot be separated from human life. It is certain that without the consistent development of water resources, human civilization will not reach the level enjoyed to date. Therefore, the development and processing of water resources is the basis of human civilization[1].

Water is a chemical compound that is very important for the life of living things on this earth. The function of water for life cannot be replaced by other compounds. The main use of water and very vital for life is drinking water. This is to meet the needs of water in the body. According to Notoadmodjo, about 55 - 60% of adult body weight consists of water, for children it is around 65% and for babies, it is around 80%[2].

Iron is the most abundant metal and has the most diverse uses. One of the disadvantages of iron is that it is prone to corrosion. Corrosion is material damage caused by environmental influences. The influential environment can be in the form of an acidic environment, dew, fresh water, seawater, lake water, river water, and ground water[3].

Excess iron (Fe) can cause poisoning where vomiting occurs, intestinal damage, premature aging to sudden death, irritability, arthritis, birth defects, bleeding gums, cancer, diabetes, diarrhea, dizziness, fatigue, black skin, headache, liver failure, hepatitis, irritability, hypertension, infection, insomnia, liver disease, mental problems, metallic taste in the mouth, easily agitated and irritated, rheumatism, canker sores, stomach pain, stubbornness, impaired absorption of vitamins and minerals. Health problems Iron compounds in small amounts in the human body function as forming red blood cells, where the body requires 7-35 mg/day which is partly obtained from water. However, Fe substances that exceed the dose required by the body can cause health problems[4].

Rice husk is one of the residues from rice processing that needs to be handled further or reused. The chemical composition of the largest husk is organic carbon, which is 45%-50%. The high organic carbon composition indicates the amount of husk cellulose content. Rice husk is a material that contains lignocellulose like other biomass and also contains high silica. The chemical content of rice husk consists of 45%-50% cellulose, 25%-30% lignin, and 15%-20% silica[5].

Most of the people of Lhong Raya Village use dug well water for their daily needs, such as washing, bathing, and even drinking. The water they use is water that is yellow, smells, cloudy, and can cause yellow deposits on clothes and water reservoirs, and there is a layer of oil on the water. With the characteristics of the water described above, the water likely contains iron (Fe). To overcome this problem, many ways have been researched and have good prospects for development, one of which is using rice husk charcoal.

**Research purposes**

The purpose of this study was to determine the effect of rice husk charcoal on reducing total Fe levels in dug well water by differentiating the doses of husk charcoal 20 g/l, 30 g/l and 40 g/l.

**Methods**

This type of quasi-experimental research (quasi-experimental study), with the subject is 9 L of dug well water for 3 doses, each dose is carried out 3 times for every 1 repetition, 1 L of water and 270 gr rice husk charcoal are needed for 3 repetitions. , each repetition requires 20 grams, 30 grams and 40 grams of rice husk charcoal. This research was conducted at the researcher's house and in the UPTD laboratory on June 15, 2017.

The experimental stage with rice husk charcoal into a container containing samples with varying amounts, namely 20 gr 30 gr 40 gr. Do a quick stir for 10 minutes at a speed of 100 RPM. slow stirring for 20 minutes at a speed of 20 RPM. left for 30 minutes for the settling process. Filtered using filter paper. The filtered water is checked for Fe content. The results of data analysis with the ANOVA[6] .

**Result and Discussion**

Research on reducing Fe levels by using rice husk charcoal is shown in Table 1 below:

Table I Reduction of Iron (Total Fe) Levels in Dug Well Water Using Rice Husk Charcoal in Lhong Raya Village, Banda Raya District Banda Aceh City

| No | Repetition | Dosage of rice husk charcoal to decrease Fe levels (mg/l) | | | |
|---|---|---|---|---|---|
| | | Control | 20 gr | 30 gr | 40 gr |
| 1 | I | 0,936 | -0,246 | -0,383 | -0,419 |
| 2 | II | 0,936 | -0,426 | -0,376 | -0,304 |

| | | | | | |
|---|---|---|---|---|---|
| 3 | III | 0,936 | -0,123 | -0,145 | -0,441 |
| | Average | 0,936 | -0,265 | -0,301 | -0,388 |

*Source: Primary data (2017)*

Table 1 shows that the average Fe content in the dug well water before soaking with rice husk charcoal is 0.936 mg/l, after soaking using rice husk charcoal at a dose of 20 grams the Fe content becomes an average of -0.265 mg/l, with a dose of 30 grams the Fe content averaged -0,301 mg/l, with a dose of 40 grams the Fe content averaged -0.388 mg/l. The percentage decrease is presented in Table 2:

Table 2.Percentage of Decrease in Iron (Total Fe) Levels in Dug Well Water Before and After Using Rice Husk Charcoal in Lhong Raya Village, Banda Raya District, Banda Aceh City

| Repetition | Decrease | | | | | |
|---|---|---|---|---|---|---|
| | 20 gr | % | 30 gr | % | 40 gr | % |
| I | 1,182 | 38,58 % | 1,319 | 35,53 % | 1,355 | 34,11 % |
| II | 1,362 | 44,46 % | 1,312 | 35,34 % | 1,24 | 31,21 % |
| III | 0,519 | 16,94 % | 1,081 | 29,12 % | 1,377 | 34,66 % |
| Jumlah | 3,063 | 99,98 % | 3,712 | 99,99 % | 3,972 | 99,98 % |
| Average | 1,021 | | 1,237 | | 1,324 | |

*Source: Primary data (2017)*

Table 2 shows that the average reduction in Fe levels in dug well water using rice husk charcoal at a dose of 20 grams is 1.021 mg/l, at a dose of 30 grams is 1.237 mg/l, and a dose of 40 grams is 1.324 mg/l. The results of the decrease in Fe levels were the decrease in Fe levels using rice husk charcoal with reduced control, then averaged. The results of the ANOVA test can be seen in the following table:

Table 3.ANOVA Test Results Effect of Rice Husk Charcoal on Reduction of Fe Levels in Dug Well Water

| Variable | Average | | 95%CI | | P value |
|---|---|---|---|---|---|
| | | Std. Deviation | Lower Bound | Upper Bound | |
| Kontrol | 0,936 | 0,000 | 0,936 | 0,936 | 0,00 |
| 20 gr | 0,096 | 0,000 | 0,096 | 0,096 | |
| 30 gr | 0,096 | 0,000 | 0,096 | 0,096 | |
| 40 gr | 0,096 | 0,000 | 0,096 | 0,096 | |
| Average | 0,306 | 0,379 | 0,064 | 0,547 | |

*Source: Primary data (2017)*

Based on the results of the research described above, it is known that rice husk charcoal is effective in reducing Fe levels in dug well water after an experiment with 4 treatments and 3 repetitions with each dose of 20 g, 30 g, 40 g and control reduces Fe levels in the water.

The results of the highest reduction in Fe levels after soaking with rice husk charcoal were obtained using a dose of 40 g the average Fe content decreased to -0.388 mg/l while using a dose of 30 g the Fe content decreased was -0.301 mg/l and using a dose of -0.301 mg/l 20 grams of decrease in Fe levels on average is -0.265 mg/l.

In the treatment using rice husk charcoal with a dose of 20 g, the first repetition of the Fe content became -0.246 mg/l, the second repetition of the Fe level became -0.426 mg/l, the third repetition of the Fe content became -0.123 mg/l, in the treatment using rice husk charcoal with a dose of 30 g for the first repetition the Fe content became -0.383 mg/l, the second repetition Fe content became -0.376 mg/l, the third repetition the Fe content became -0.145 mg/l, in the treatment using rice husk charcoal with a dose of 40 g the first repetition Fe content became -

0.419 mg/l, the second repetition of Fe content became -0.304 mg/l, the third repetition of Fe content became -0.441 mg/l.

The results of this study are in line with Wardani's 2014 theory, which states that rice husk charcoal contains several important chemical elements, namely water content (9.02%), crude protein (3.03%), fat (1.18%), crude fiber 35.68%, ash (17.17%) and carbohydrates (33.71%) so that the results of burning rice husks called rice husk charcoal can be used for various purposes including as an adsorbent of manganese heavy metals in water7. The main compounds of rice husk cell walls are polysaccharides, namely crude fiber or cellulose, lignin, and hemicellulose which have hydroxyl groups that can play a role in the adsorption process. The husk has a density of 1.125 kg/m3, so it can be used as a good filter[7].

The results of previous studies explained that the decrease in iron content by using rice husk charcoal and zeolite sand decreased by 72.99%. The results of testing Fe levels in water using rice husk charcoal, that rice husk charcoal is indeed effective in absorbing iron in water8. Water-soluble iron content can also be removed by using various filter media such as zeolite, ferrite, and manganese greensand.

Until now, the use of rice husk charcoal has started to vary. Aside from being a fuel, it is also being developed as a natural water purifier that can absorb odors and colors from dirty water to produce clear water.

When linked with the Minister of Health Regulation No. 416/SK/VII of 1990 concerning the requirements and supervision of clean water quality, the results of the above research have met the requirements because the standard for iron content is a maximum of 1.0 mg/l for clean water[11].

According to the authors, the dose of rice husk charcoal had an effect on decreasing Fe levels in dug well water at a dose of 20 g, 30 g, and 40 g but in the control (without the inclusion of rice husk charcoal there was no significant decrease in Fe levels. effective, which is 40 g because it shows a standard number of decreasing Fe levels, and the higher the dose of rice husk charcoal, the greater the decrease in turbidity which proves that the content of rice husks (water content (9.02%), crude protein (3.03%), fat (1,18%), crude fiber 35.68%, ash (17.17%) and carbohydrates (33.71%)) so that the result of burning rice husk called rice husk charcoal serves as an adsorbent for heavy metals in water[12].

Rice husk charcoal is very good to use as a medium in reducing Fe levels because rice husk charcoal is effective in reducing Fe levels in dug well water and is very easy to get from nature.

**conculusion**

There is an effect of the use of rice husk charcoal on the decrease in iron content (total Fe) in dug well water, the average dug well water after soaking with rice husk charcoal at a dose of 40 g is -0.388 mg/l dug well water sample. The effective dose of rice husk charcoal in reducing Fe levels in dug well water is 40 grams, so the more doses of rice husk charcoal, the more effective it is in reducing iron (total Fe) levels in the water.

People can use rice husk charcoal as a natural ingredient to reduce Fe levels in the water. Further research needs to be done using other methods to reduce the iron content (total Fe) so that there is no turbidity in the water.

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