

Combination Of Coal Waste And Pecans Shell Waste In Reducing Iron (Fe) In Dig Wells

Riang Adeko

Jurusan Kesehatan Lingkungan Politeknik Kesehatan
Kementerian Kesehatan Bengkulu
Bengkulu, Indonesia
riangadeko1807@gmail.com

Defi Ermayendri

Jurusan Kesehatan Lingkungan Politeknik Kesehatan
Kementerian Kesehatan Bengkulu
Bengkulu, Indonesia
deff.manna@gmail.com

Abstract - Air source was chosen because it is relatively better than the air of the river which is viewed from its quality aspect for its turbidity factor. Groundwater as a source of clean water, in general, can be directly used for everyday life. However, without realizing that ground air contains much metal dissolved in air, also iron (Fe). The initial survey was conducted on February 8, 2017 at the dig wells of residents RT.08 Padang Serai Village, Bengkulu City after measuring iron (Fe) 2.28 mg / L. Coal is sedimentary rock which is chemically and physically heterogeneous and contains elements of carbon, hydrogen, and oxygen as the main elements and sulfur and nitrogen as additional elements. Waste produced from the pecan formation process is a pecan shell so far has not been used optimally. Pecan shell weight reaches two-thirds of the weight of whole pecan seeds, and one third is the core (kernel) of candlenut. This waste will be very helpful for people who use products that have selling value, namely as active charcoal products. This type of research uses a pure experimental method (True Experimental) with the design of the Post Test with the control group, which is research conducted before and after. The results of the study showed that iron (Fe) content in screening using a combination of control tests was 2.28 mg / l. Results or a decrease of around 84.21%. Based on the table the average of iron (Fe) is 0.360 mg / l. The lowest mean was 0.23 mg / l, and the highest was 0.45 with a confidence level of 95% or a significance of 5%, averaging a decrease in the range of 0.2483 mg / l to 0.4717 mg / l.

Keywords - Coal Waste, Pecan Shell, Digging Well, Water Treatment

I. INTRODUCTION

Water is an essential substance in life. Water is used for cooking, washing, bathing, and cleaning the dirt around the house. Water is also used for industrial, agricultural, fire fighting, recreation, transportation, and others. Water can spread and transmit diseases to humans [2]. Water for Hygiene Sanitation Purposes is water of a certain quality that is used for daily needs whose quality is different from the quality of drinking water [4].

Groundwater sources are chosen because they are relatively better than river water in terms of their quality, especially the turbidity factor. Groundwater as a source of clean water, in general, can be directly used for everyday life. However, without realizing that groundwater contains many metal elements that are dissolved in water, including Fe [1].

Coal is a sedimentary rock which is chemically and physically heterogeneous and contains elements of carbon, hydrogen, and oxygen as the main elements and sulfur and nitrogen as additional elements. Other substances, namely organic compounds that form "ash" are scattered as particles of mineral substances and are separated in all coal compounds [5].

Chemically, the main constituents of coal waste are Si, Al, Fe and Ca, K, Na, and Ti in a significant percentage. Besides, the blackish gray color depends on the amount of carbon that is not burned, and this can affect the level of carbon content. Most of the constituent particles are spherical, mostly hollow and others filled with amorphous particles and smaller crystals [6]. The waste produced from the process of cracking the pecan seeds in the form of candlenut shells has not been utilized optimally. Pecan shell weight reaches two-thirds of the weight of whole pecan seeds, and the third is the core (kernel) of candlenut. This waste will undoubtedly be very potential for the community if it is used as a product that has a selling value, including as an active charcoal product [3].

The initial survey was conducted on February 8, 2017, at the great digging of residents of RT. 08 Padang Serai Village, Bengkulu City, after measurements were taken, iron (Fe) was 2.28 mg / L. The measurement results in the initial survey revealed that the great water dug up the residents of RT. 08 Padang Serai Village, Bengkulu City, still exceeds the threshold required by the Republic of Indonesia Health Minister Regulation No.32 of 2017.

The water purification process is carried out as an effort to overcome the problems that occur by making a purification device with a medium that is easily obtained in the market, namely activated carbon because it is capable of absorbing organic and inorganic substances, as cation exchangers and catalysts for various reactions. The raw material to be developed as activated carbon is coal waste which is combined with hazelnut shell waste. Coal waste is the result of waste processing in the coal industry, and candlenut waste is also the result of waste from the agricultural business, which has an impact on environmental pollution.

II. METHODS

The type of research used is a simple experiment (True Experimental) with the design of the post-test with a control group namely the research carried out before and after treatment. Then look for differences between measurements of both and these differences are considered as a result of treatment.

Location of research on well-dug residents of RT. 08 Padang Serai Municipality, Bengkulu City, with the allocation of research time for three months. This research was conducted in the Environmental Health Department's workshop to determine the effectiveness of the combination of coal waste and candlenut shell as an adsorbent to reduce Fe levels in wells dug by residents of RT. 08 Padang Serai Village, Bengkulu City.

Tools and materials

The tools used in this study, namely:

- a. Drum
- b. Meter / Mist
- c. Measuring cup
- d. Hour
- e. Fe test kit

Materials used include:

- a. Coal
- b. Tempurug Kemiri
- c. Jerigen
- d. Scoop

Work procedures

1. Preparation stage
2. Pre-test stage

Execution phase

1. Work procedures

-Sampling

Sampling of well water from residents of RT. 08 Padang Serai Kota Bengkulu Village is carried out through the following work steps:

1. Prepared bottles that will be used to take samples of well water.
2. The bottle is rinsed three times with well water before taking a sample of well water to be examined.
3. The taking of well water is carried out in the morning to ensure that the sample comes from groundwater and has not been contaminated by activities around the well.
4. For dug wells, the sample is taken at a depth of 20 cm below the water surface and 20 cm above the bottom of the well carefully so as not to mix with the soil. Samples of water taken have been taken directly to the laboratory for water quality checks.

- Pre-test examination

- Treatment of various thicknesses

- Post test

3. How to check Fe

The method of examining iron (Fe) levels in water refers to SNI (Indonesian National Standard) with the method of water quality testing and will be examined in the

Environmental Laboratory of the Bengkulu City Environmental Agency.

Sample Preparation

A total of 100 ml of the sample is included in a glass breaker. Added 5 ml of concentrated HNO₃, then evaporated until the sample is almost exhausted. After that 50ml of distilled water was added and put in a 100ml measuring flask through filter paper. Diluted with distilled water to the mark and homogenized.

The treatment was carried out three times for each Sample Filter material. There are four kinds of filter material used in this study, namely quartz, zeolite, coal and candlenut shell. The four ingredients are combined in a dual-media filter into two variations of the filter material arrangement.

The filter media layer used in this study is as follows:

- a) Gravel buffer layer with a total thickness of 10 cm layer with stratification:

- 1) grain diameter of 20 mm - 40 mm, a thickness of 3 cm
- 2) grain diameter 10 mm - 20 mm, thickness 3 cm
- 3) grain diameter 5 mm - 10 mm, 1 cm thick
- 4) grain diameter 1 mm - 5 mm, 3 cm thick.

- b) The bottom layer is quartz sand with a total thickness of 12 cm layer with an effective diameter, $d_{10} = 0.8$ mm and uniformity coefficient, $d_{60} / d_{10} = 1.5$

The upper layer is coal and candlenut shell, with a total thickness of 18 cm layer and effective diameter, $d_{10} = 1.2$ mm and uniformity coefficient, $d_{60} / d_{10} = 1.6$. Overall the thickness of the filter media is 50 cm with a thick media buffer of 10 cm

III. RESULT

TABLE 1 AVERAGE FE CONTENT OF PADANG SERAI CLEAN WATER

variab le	Thickness	N	Mean	Low	Up	Min	Max
Fe	50:50 cm	5	0,3600	0,2483	0,4717	0,23	0,45
	30:30cm	5	0,8520	0,6383	1,0657	0,74	1,15
	20:20 cm	5	1,1860	0,9937	1,3783	0,97	1,40
	Control	5	2,2800	2,6014	2,6014	2,00	2,50

Based on Table 1 the average decrease in Fe is 0.360 mg / l. The lowest average is 0.23 mg / l, and the highest is 0.45 with a confidence level of 95% or a significance of 5%, an average decrease in the range of 0.2483 mg / l to 0.4717 mg / l.

To determine the difference in the level of decline in Fe levels in each treatment by using the Oneway ANOVA test by doing the Kolmogorov-Smirnov One-sample Test Test of the Kolmogorov-Smirnov One-sample Test with Sig. (2-tailed) Obtained results in Fe content is 0.588. This shows that the data is standard so that it can proceed to the Oneway ANOVA Test and the test homogeneity test conducted by Levene Test Calculate Fe is 3.118 with a probability (α) of 0.56. Because the probability (α) > 0.05, then Ho is accepted or all treatments have the same variation.

TABLE 2 ANOVA TEST IS USED FOR TESTING MORE THAN TWO TREATMENTS

		Sum of Square	df	Mean Square	F	Sig
Fe	Between Group	9,948	3	3,316 0,32	103,060	0,000
	Within group	0,515	16			
	Total	10,463	19			

Seen in table 2 that Fe count F is 103,063 with Probability (α) 0,000, then the probability (α) $< 0,05$, so H_0 is rejected or the average decrease in treatment is significantly different. After knowing a significant difference, then it will be discussed with Bonferroni and Tukey analysis in the post hoc test

TABLE 3 BONFERONI TEST RESULTS TABLE

Variable	Treatment (I)	Treatment (j)	Mean Difference	Sig
Fe	50:50	30:30	0,49200	0,03
		20:20 Control	0,82600 -1,92000	0,00 0,00
	30:30	20:20 Control	0,33400 -1,42800	0,57 0,000
	20:20	Control	-1,09400	0,000

In table 3 it is known that p-value = 0,000 so that $p < \alpha$ (0,05) then H_0 is rejected and H_a is accepted, or there is a significant effect of thickness variation in decreasing Fe content.

IV. DISCUSSION

The results of the analysis showed that the Fe content in screening using a combination of coal and shell control was 2.28 mg / l. Results or a decrease of around 84.21%. Based on table 5.1 the average decrease in Fe is 0.360 mg / l. The lowest average is 0.23 mg / l, and the highest is 0.45 with a confidence level of 95% or a significance of 5%, an average decrease in the range of 0.2483 mg / l to 0.4717 mg / l.

These results indicate that the combination of coal and pecan shell affects decreasing Fe levels in water. Coal is a sedimentary rock which is chemically and physically heterogeneous and contains elements of carbon, hydrogen, and oxygen as the main elements and sulfur and nitrogen as additional elements. Other substances, namely organic compounds that form "ash" are scattered as mineral particles and are separated in all coal compounds while the pecan shell has hard characteristics with a rough and grooved surface. This shell is very suitable to be used as raw material from activated carbon because it contains cellulose, hemicellulose, and lignin.

V. CONCLUSION

Media combination of coal and candlenut shell was obtained 50 cm thickness which could reduce Fe content up to 84.21%. In the case of science, it is hoped that there will be innovations in water treatment using coal waste and candlenut shells.

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