

Effectiveness of Activated Carbon Filter Corn Cob and Durian Skin Dnature Lowers Lead Levels (Pb) in Rain Water

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ABSTRACT

Lead levels (Pb) cause adverse effects on health, toxic effects on the gastrointestinal tract, nerves and kidneys. This study aims to determine the effectiveness of using activated carbon filters for corn cobs and durian husks in reducing lead (Pb) levels in rainwater that passes over zinc. This type of study is an experiment by comparing the decrease in lead (Pb) levels before and after the filtration of activated carbon of corn cobs and durian husks with adsorption times of 30 minutes and 35 minutes. The results of the study before processing obtained lead (Pb) levels in 3 different locations, namely 0.079 mg / l, 0.053 mg / l, and 0.059 mg / l. After processing the activated carbon of corn cobs and activated carbon of durian skin, it is effective in reducing lead (Pb) levels < 0.05 mg / l in accordance with water quality standards according to Permenkes No. 23 of 2017. This can be seen after filtration of activated carbon of corn cobs with an adsorption time of 30 minutes, which is 91% of 0.007 mg / l in PM houses, and an adsorption time of 35 minutes, which is 100% of 0.0 mg / l in HD houses. Then after filtration of activated carbon durian skin with an adsorption time of 30 minutes, which is 64.4% of 0.021 mg / l in HD houses, and an adsorption time of 35 minutes, which is 60.4% of 0.021 mg / l in SU houses. This research suggests that health agencies provide empowerment to the community about the management of clean water and the use of activated carbon in reducing levels of harmful metals, especially lead (Pb).

Keyword: Lead; Adsorption; Filtration; Activated Carbon of Corn Cobs and Durian Husks

INTRODUCTION

Water is one of the natural resources that plays an important role in the survival of all living things, including humans. Water is the source of life, hence civilization rose and developed. The availability of raw water for household, agricultural, and industrial needs is a top issue and priority because various biological processes cannot occur without it (1).

That is why the United Nations (UN) declares water a human right, meaning that every human being on the planet has the same basic right to the use of water. In Indonesia, the freedom to use water is guaranteed by the Constitution of the Republic of Indonesia of 1945 (2).

Hartoyo (2010), states that the total amount of water available in Indonesia is 694 billion cubic meters per year. This amount is basically a potential that can be utilized, but in reality only about 23% has been utilized, with only about 20% used to meet the raw water needs of households, cities, and industries, and the other 80% used for irrigation (3).

Water with sufficient quality as drinking water is called drinkable water. Ideally water, which can be drunk should not be polluted with things like harmful bacteria, viruses or harmful chemicals. The World Health Organization (WHO) estimates that 80 percent of all diseases and disease spread in the world are the result of poor water quality and sanitation (4).

Rainwater is created in a chain of hydrological cycles by evaporation of seawater followed by condensation of raindrops. Rainwater falls to the earth's surface through a layer of air containing various gases such as oxygen, carbon dioxide, and other gases (5).

Some residents in Bugis Village use rainwater as a means of clean water, the rainwater that is accommodated flows through the roof from zinc. Lead (Pb) added or coated on zinc roofing sheets, has sturdy quality and is corrosion resistant, and is used for various purposes, including tin sheets used as roofing material or tiles (6). Rainwater is corrosive due to the presence of aggressive CO₂ and a low pH of about 5.4 causing the zinc roof to rust quickly. As a result, the superimposed lead (Pb) can dissolve in rainwater, increasing the lead (Pb) content in the rainwater storage tank (7).

The presence of lead (Pb) levels in rainwater can have adverse effects on health. Toxic effect on the gastrointestinal tract, nerves and kidneys. Intestinal colic (small intestine spasms) is the most common side effect, followed by gray pigmentation of the gums known as the "lead line" (6).

Research conducted by Khayan and Taufik Anwar (2016), that the level of Pb (lead) in rainwater through the zinc roof before and after processing with shell sand filtration techniques and absorption with activated carbon of coconut shells in the filter tubes was effective in reducing lead (Pb) levels, the effectiveness of lead content (Pb) in rainwater using filter tubes by 99.47% (7). Meanwhile, research conducted by Khoirunnisa Dyah Kartikasari and friends (2018), that activated carbon of corn cobs with an adsorption time of 10 minutes, 30 minutes, and 50 minutes is effective in reducing lead (Pb) levels (8), as well as research conducted by Rizqi Nuvicha et al (2016), activated carbon of durian bark with mass variants and contact time of 60 minutes, 90 minutes, and 120 minutes, effectively lowering lead levels (Pb) (9).

Based on the problems mentioned above, this study aims to determine the effectiveness of activated carbon filters for corn cobs and durian skins in reducing lead (Pb) levels in rainwater in Bugis Village, Biau District, Buol Regency.

METHOD

This study is an experiment to test the effectiveness of activated carbon filters for corn cobs and durian skins in reducing lead (Pb) levels in huja water. The design of this experiment is to determine the initial content of lead levels (Pb) before processing, then after that an analysis of the effectiveness of reducing lead levels (Pb) is carried out by processing activated carbon filtration of corn cobs and durian skins in a 4-inch pvc pipe filter tube. This study was carried out as many as 2 times filtration at 3 different location points with the number of samples produced by 12 samples with the first filtration adsorption time of 30 minutes and the second filtration of 35 minutes. The object of this study is rainwater that passes through the zinc roof which has a lead level (Pb) that exceeds the water quality standards according to the Minister of Health of the Republic of Indonesia Number. 32 in 2017, it was 0.05 mg/l.

RESULTS

Based on the results of preliminary measurements, before the filtration process of activated carbon of durian skin and corn cobs against 5 samples at different location points, the 5 samples will be selected samples that exceed the Water Quality Standards of the Minister of Health Regulation R.I No. 32 of 2017, which is 0.05 mg / l. After the research process of lead (Pb) levels with activated carbon filtration of durian skin and activated carbon of corn cobs which was carried out 2 times with adsorption time of 30 minutes and 35 minutes, this study began to be carried out on February 17, 2022.

The results of sample examination before and after filtration using activated carbon of durian bark and activated carbon of corn cobs, for more clarity can be seen in the following table:

Table 1. Preliminary Examination Results of Lead (Pb) Levels in Rainwater

No	Sampling location point	Lead content (Pb) Before processing(*)	Standards of lead levels in clean water
1	Direct rainwater	0.006 mg/l	
2	PM's House	0.076 mg/l	
3	Elementary School House	0.016 mg/l	0.05 mg/l
4	Su House	0.053 mg/l	
5	Home HD	0.059 mg/l	

Source: Labkes Palu(*), 2022 Primary Data

Based on table 1 above, that of the 5 samples examined, there are only 3 samples that will be carried out further research, namely at the location point of the PM house with a lead level (Pb) of 0.076 mg / l, the SU house with a lead content of 0.053 mg / l, and the HD house with a lead content of 0.059 mg / l. The results of the initial examination before treatment of the 3 samples can be seen in the following table:

Table 2. Results of Examination of lead levels (Pb) Before filtration of Activated Carbon

No	Sampling location point	Lead content (Pb) Before Filtration (mg/l) (*)
1	PM's House	0,076
2	Su House	0,053
3	Home HD	0,059

Source : Labkes Palu(*), 2022 Primary Data

Based on Table 2 above, the results of the initial examination before filtration exceeded the Water Quality Standards based on Permenkes No. 23 of 2017, namely 0.05 mg/l. The percentage of decrease in lead levels (Pb) can be seen in the following table:

Table 3. Percentage decrease in Lead (Pb) Levels Before and After Activated Carbon Filtration of Corn Cobs and Durian Husks

No	Sampling location point	Lead content (Pb) Before filtration (*)	Activated carbon of corn cobs (**)			Activated carbon of durian bark (**)				
			The first filtration 30 min, (mg/l)	%	Filtration to the second 35 minutes, (mg/l)	%	The first filtration 30 min, (mg/l)	%	Filtration to the second 35 minutes, (mg/l)	%
1	PM's House	0,076	0,007	91	0,019	75	0,066	13,2	0,013	83
2	Su House	0,053	0,049	7,5	0,025	53	0,058	9,4	0,021	60,4
3	Home HD	0,059	0,019	68	0,0	100	0,021	64,4	0,042	29

Source: Labkes Primary Data(*), Lab PSMB Sulteng(**), 2022

In table 5.3 above, that the lead content (Pb) in the PM house before filtration is 0.076 mg / l, then after processing the percentage of lead content reduction using activated carbon of corn cobs in the first filtration 30 minutes adsorption time is 91% of 0.007 mg / l, and the second filtration with an adsorption time of 35 minutes is 75% of 0.019 mg / l. Meanwhile, the percentage of using activated carbon from durian skin in the first filtration time of 30 minutes is 13.2% of 0.066 mg / l, and the second filtration with an adsorption time of 35 minutes is 83% of 0.013 mg / l. Then at the SU house before filtration 0.053 mg / l, after processing the percentage of lead (Pb) levels using activated carbon corn cobs in the first filtration 30 minutes adsorption time, which is 7.5% of 0.049 mg / l, and the second filtration with an adsorption time of 35 minutes, which is 53% of 0.025 mg / l. Meanwhile, the

percentage of using durian skin activated carbon in the first filtration of 30 minutes of lead content of 9.4% from 0.058 mg / l increased before filtration of 0.053 mg / l, and the second filtration with an adsorption time of 35 minutes the lead level decreased back 60.4% from 0.021 mg / l. Then at home HD before filtration lead content (Pb) which is 0.059 mg / l, after processing the percentage of lead content reduction using activated carbon corn cobs in the first filtration of 30 minutes adsorption time is 68% of 0.019 mg / l, and the second filtration with an adsorption time of 35 minutes is 100%. Meanwhile, the percentage of durian skin activated carbon use in the first filtration time of 30 minutes is 64.4% of 0.021 mg / l, and the second filtration with an adsorption time of 35 minutes is 29% of 0.042 mg / l.

Based on the results of percentage decrease and lead levels before and after filtration in the two activated carbon materials, it is effective in reducing lead levels (Pb).

DISCUSSION

Judging from the results of research that has been carried out between before and after the filtration of durian skin activated carbon and the filtration of activated corn cobs, the two activated carbons significantly reduce lead levels (Pb) according to water quality standards according to Permenkes No.32 of 2017, namely 0.05 mg / l, but when compared to the effectiveness of the two activated carbons at three different locations, the results were obtained that the activated carbon of corn cobs was much more effective at reducing lead levels (Pb) compared to durian bark activated carbon.

This can be seen in the highest percentage decrease in lead (Pb) levels in PM houses and HD Houses. After filtration of activated carbon of corn cobs at the pm house the first filtration with an adsorption time of 30 minutes is 91% of 0.007 mg / l, while the filtration of activated carbon of durian peel in the first filtration PM house with an adsorption time of 30 minutes is 13.3% of 0.066 mg / l. Then at home HD after filtration of activated carbon cobs corn first filtration with an adsorption time of 30 minutes, which is 68% of 0.019 mg / l, and the second filtration with an adsorption time of 35 minutes, which is 100% of 0.0 mg / l. While the first filtration with an adsorption time of 30 minutes is 64.4% of 0.021 mg / l, and the second filtration with an adsorption time of 35 minutes 29% of 0.042 mg / l. Based on the percentage decrease in lead (Pb) levels of the two activated carbons, the activated carbon of corn cobs is more effective than the activated carbon of durian skin.

This can be seen in the highest percentage decrease in lead (Pb) levels in PM houses and HD Houses. After filtration of activated carbon of corn cobs at the pm house the first filtration with an adsorption time of 30 minutes is 91% of 0.007 mg / l, while the filtration of activated carbon of durian peel in the first filtration PM house with an adsorption time of 30 minutes is 13.3% of 0.066 mg / l. Then at home HD after filtration of activated carbon cobs corn first filtration with an adsorption time of 30 minutes, which is 68% of 0.019 mg / l, and the second filtration with an adsorption time of 35 minutes, which is 100% of 0.0 mg / l. While the first filtration with an adsorption time of 30 minutes is 64.4% of 0.021 mg / l, and the second filtration with an adsorption time of 35 minutes 29% of 0.042 mg / l. Based

on the percentage decrease in lead (Pb) levels of the two activated carbons, the activated carbon of corn cobs is more effective than the activated carbon of durian skin.

Filtration of activated carbon of corn cobs with an adsorption time of 30 minutes and 35 minutes, taking this time variant is based on research conducted by Khoirunnisa Dyah Kartikasari et al (2018), in reducing lead levels (Pb) with activated carbon of corn cobs in managing it requires a contact time of between 10 minutes, 30 minutes and 50 minutes to absorb lead metal (Pb) and the results are effective in reducing lead levels (Pb) (8), this study is the same as that conducted by Rizqi Nuvicha et al (2016), using activated carbon durian skin in lowering lead metal (Pb) with a contact time of 60 minutes, 90 minutes and 120 minutes (9), according to Rizqi Nuvicha et al (2016), the longer the adsorbent time of activated carbon between corn cob activated charcoal and durian bark charcoal with lead metal (Pb) the more chances of activated charcoal particles colliding with lead metal (Pb) bound in lead metal (Pb) adsorbent pores until the required contact time.

From the results of this study, activated carbon filtration using corn cobs is much more effective in reducing lead (Pb) levels than activated carbon of durian skin, this is because the percentage of activated carbon absorption of corn cobs is more than the activated carbon of durian husk, then from its structure the activated carbon of corn cobs is not easily destroyed and denser, while the activated carbon of durian husk is easily destroyed and softer, so that the lead (Pb) content is more adsorbed in the pores of the activated carbon particles of the corn cob.

CONCLUSION

This study concluded that activated carbon of corn cobs and activated carbon of durian peels are effective in reducing lead (Pb) levels < 0.05 mg / l in accordance with water quality standards according to Permenkes No. 23 of 2017. This can be seen after filtration of activated carbon of corn cobs with an adsorption time of 30 minutes, which is 91% of 0.007 mg / l in PM houses, and an adsorption time of 35 minutes, which is 100% of 0.0 mg / l in HD houses. Then after filtration of activated carbon durian skin with an adsorption time of 30 minutes, which is 64.4% of 0.021 mg / l in HD houses, and an adsorption time of 35 minutes, which is 60.4% of 0.021 mg / l in SU houses.

SUGGESTION

For health agencies to encourage the community about the management of clean water and the use of activated carbon in reducing levels of harmful metals, especially lead (Pb). Furthermore, carry out regular supervision of the level of risk of pollution of clean water used by the community.

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