Reducing Natrium Chloride Concentration by Using the Alkali from Banana Stems in Bracket Water

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Abstract

Objective: This study aims to reduce the concentration of sodium chloride using banana stem media with a thickness of 10 cm, 15 cm, and 20 cm. **Method:** This type of research is quasi-experimental research by conducting trials of hard water management using banana stem media with variations in the thickness of the media, namely 10 cm, 15 cm, and 20 cm by replicating 3 times. Sampling was carried out in rivers containing chloride levels in Makassar. The sampling method is using Grab Sample which is taken directly from a river flow which is classified as brackish water. The data analysis technique was carried out by using the ANOVA test. **Result:** The results obtained are banana stem media with a thickness of 10 cm can reduce levels of chloride (Cl) 2377, 69 mg/l, a thickness of 15 cm can reduce levels of chloride (Cl) 1772.27 mg/l, and a thickness of 20 cm can reduce levels of chloride (Cl) 1166.18 mg/l. **Conclusion:** The decrease in chloride levels in water is due to the presence of 4.60 grams of charcoal hydrate content in banana stems which functions to bind chloride levels in the water, besides that there is also a membrane in the banana stem in the form of cellulose which plays a role in binding chloride levels in water and also as an osmosing. Banana stalks can bind chloride levels.

Keywords: *Brackish Water, Sodium Chloride Content, Banana Stems.*

Introduction

Water is an aspect of necessities that are essential for all creatures living in this world. For humans, water is a source of energy, quenching thirst by drinking a few sips of water, so that at the same time the body becomes fresh and the energy in the body is awakened.

You can imagine if you are thirsty and then you don't have drinking water, people can suffocate. Clean water is a means to improve the health status of the community because it is used for drinking, washing clothes, and bathing. According to doctors and health experts, the human body needs a minimum of 2.5 liters of water per day. (1)

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Diarrhea disease is the main cause of death and illness in children in the world. Generally the result of contaminated water and food sources. More than 780 million people worldwide lack access to clean drinking water and two and a half billion suffer from insufficient sanitation. Diarrhea due to infection is widespread in all developing countries. (2) This disease is the leading cause of death of more than 5 million children each year. Based on a symptom that occurs in coastal or mountainous areas where the water is brackish, like some areas in Papua, people use banana stalks to get fresh water to meet their drinking water needs. (3) The trick is to soak the banana stalks in brackish water for a while, then the soaked banana stalks are squeezed and filtered and then used as raw material for water to be processed into drinking water or for cooking rice.

Meanwhile, in other areas that lack salt and brackish water, they also use banana leaves to get salt. (4) The

trick is to soak the dry/alkaline banana for some time in brackish water, then take the salt along the submerged banana stalk. It is indeed a symptom that needs to be studied more deeply through research to find a solution to help deal with the problem of lack of clean water for people with brackish water so that they can get clean water to fulfill their daily needs, for the sake of creating a healthy and prosperous society. One solution to the aforementioned problems is that it requires appropriate technology that is easy to do at low prices to process brackish water into fresh water and is suitable as raw material for clean water.

The current technology that can be reached by the general public is the technology for purifying fresh water into clear water[5]. Meanwhile, brackish water treatment technology[6] is very expensive. Therefore, on this occasion, community service was carried out to be introduced to the community so that it could be used to ease the community in water filtering. The use of banana stalks was chosen because they are easy to obtain and available in many areas both in coastal areas and in mountainous areas and the pseudo-stems that are cut down after taking the fruit cannot be used as something useful for the community.

Based on the description above, we would like to research the ability of banana stems to reduce the concentration of sodium chloride in brackish water. This was intended to introduce to the public that banana stems can reduce the concentration of sodium chloride and hardness in brackish water.

Method

The research design was used namely quasi-experimental design by conducting trials of hard water management using banana stem media[7] with variations in the thickness of the media, namely 10 cm, 15 cm, and 20 cm by replicating 3 times. In this study, the sample used was clean water from Makassar residents who had high levels of chloride. This research was conducted in a workshop of the Environmental Health Department of the Makassar Health Polytechnic. Sampling was conducted in Makassar City.

The preparatory stage, including data collection, preparation of research proposals, and preliminary tests conducted in October-December 2019. The implementation stage includes research activities, research results seminars, results reports to be carried out in January-May 2020. The Independent Variable in this study was the process of filtering brackish water with Kepok banana leaves. The dependent variable, in this case, was the decrease in chloride (NaCl) levels.

The population in this study was all well water in Makassar City. Samples in this study were part of the well water which contained sodium chloride (NaCl) in the water. The sampling method was using Grab Sample (a sample was taken directly from well water that was being monitored and this sample only describes the characteristics of water at the time of sampling) which was taken directly from well water which was classified as brackish water.

Primary data were obtained from the results of examining water containing sodium chloride (NaCl) both before and after processing. Secondary data were obtained from the results of library searches in the form of books, articles, journals, previous research results, and the internet and other information media that were considered to have an interest in this research.

The analysis technique was carried out by using the ANOVA test from the observations obtained during the experiment and depicted in table form. The research results were accompanied by descriptions based on supporting theories.

Results

The result of this research detailed described in Table 1 – 5 below:

Table 1. Average Sodium Chloride Removal in Control

Parameter	Control	Consentration Average (mg/l)		Allowance
		Initial Sample	Control	
Nacl	1	2818.56 mg/l.	2818.31 mg/l.	0.25 mg/l.
	2	2818.56 mg/l.	2686.9 mg/l.	131.66 mg/l.
	3	2818.56 mg/l.	2627.61 mg/l.	190.95 mg/l.
	Average	2818, 56 mg/l.	2710,94 mg/l.	107, 62 mg/l.

Table 2. Average Sodium Chloride Removal at 10cm Media Thickness

Parameter	Media Thickness	Trial	Rata-Rata Konsentrasi (mg/l)		Allowance
			Initial Sample	Trial	
NaCl	10 cm	1	2818.56 mg/l.	2360.3 mg/l.	458.26 mg/l.
	10 cm	2	2818.56 mg/l.	2375.08 mg/l.	443.48 mg/l.
	10 cm	3	2818.56 mg/l.	2397.69 mg/l.	420.87 mg/l.
	Average		2818.56 mg/l.	2377, 69 mg/l.	440,87 mg/l.

Table 3. Average Sodium Chloride Removal at 15 cm Media Thickness

Parameter	Media Thickness	Trial	Concentration Average (mg/l)		Allowance
			Initial Sample	Trial	
NaCl	15 cm	1	2818.56 mg/l	1557.11 mg/l	1261.45 mg/l
	15 cm	2	2818.56 mg/l	1847.83 mg/l	970.73 mg/l
	15 cm	3	2818.56 mg/l	1911.89 mg/l	906.67 mg/l
	Average		2818,56 mg/l	1772,27 mg/l	1046,28 mg/l

Tabel 4. Average Sodium Chloride Removal at 2 0cm Media Thickness

Parameter	Thickness	Trial	Concentration Average (mg/l)		Allowance
			Initial Sample	Trial	
NaCl	20 cm	1	2818.56 mg/l	1024.93 mg/l	1793.63 mg/l
	20 cm	2	2818.56 mg/l	1231.89 mg/l	1586.67 mg/l
	20 cm	3	2818.56 mg/l	1241.74 mg/l	1576.82 mg/l
	Average		2818, 56 mg/l	1166,18 mg/l	1652.37 mg/l

Tabel 5. Results of Analysis Using One Way Anova Test for Decreasing NaCl Levels in Brackish Water Using Alkali Kapok Banana Stem

ANOVA					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	7689622.865	4	1922405.716	237.851	0.000
Within Groups	121235.675	15	8082.378		
Total	7810858.540	19			

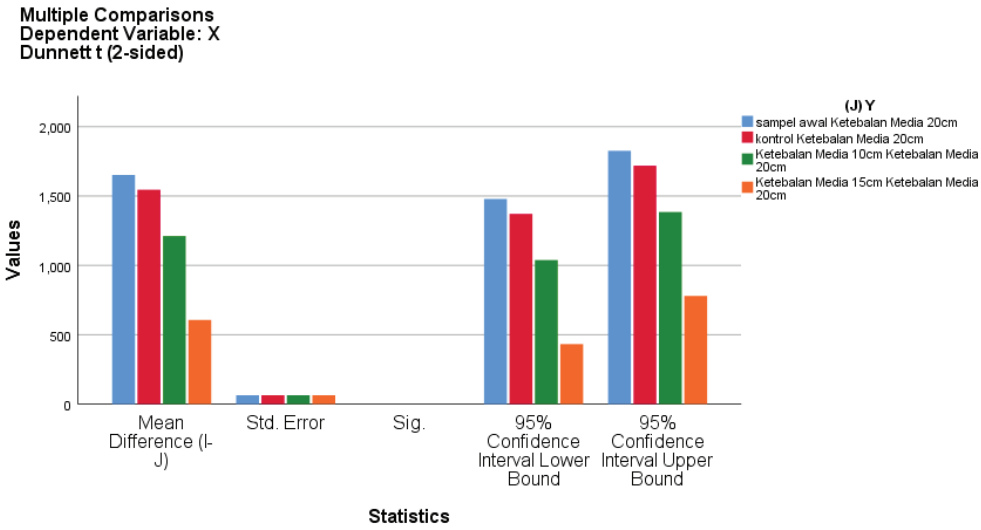

Figure 1. Test Result Anova Multiple Comparison

Discussion

The experiment has been carried out on decreasing the concentration of sodium chloride (NaCl) using alkaline kapok banana stems in brackish water. The study used alkaline kapok banana stems with a thickness variation of 10cm, 15cm, and 20cm.

Decreased levels of NaCl in brackish water using kapok banana stem media with a thickness of 10 cm. After checking the NaCl levels, it can be seen that the decrease in NaCl levels in brackish water using kapok banana stem media with a thickness of 10 cm, each experiment, the decrease was not significant with an average allowance of 440,87mg/l. The results of the one-way ANOVA statistical test show the value of F (79.075) and the significance or probability (Sig) of (0.000). Because the significance value of 0.000 is less than 0.05, it can be concluded that the average of each treatment performed is "different" significantly.

The decrease in chloride levels in water is due to the presence of 4.60 grams of charcoal hydrate content in banana stems which functions to bind chloride levels in the water, besides that there is also a membrane in the banana stem in the form of cellulose which plays a role in binding chloride levels in water and also as an osmosing, banana stalks can bind chloride levels. [8]

Banana stems are composed of deep skin fibers connected by small cavities called spider webs. The spider's nest is a square filled with a liquid in the form of a banana sap called cellulose. [9] Among the cobwebs are limited by a very thin layer that functions as a membrane in the osmosing to reduce the salts in the soil with water, so that the salt concentration of banana sap is low even though it grows in areas with brackish groundwater.

Decreasing levels of NaCl in brackish water using kapok banana stem media with a thickness of 15 cm. After checking the NaCl levels, it can be seen that the decrease in NaCl levels in brackish water using kapok banana stem media with a thickness of 15 cm, the decrease not significant with an average allowance of 1046,28 mg/l. The results of the one-way ANOVA statistical test show the value of F (79.075) and the significance or probability (Sig) of (0.000). Because the significance value of 0.000 is less than 0.05, it can be concluded that the average of each treatment performed was "different" significantly.

Banana stems have white fibers which are very strong so that no bleaching is required, and can be produced as thick as 20 gsm. The banana stem consists of 2 layers which can produce various products at once. The outer layer has a rugged structure, high wet strength, barrier properties, and is not flammable. The inner layer has the same properties but has a finer fiber structure. [10]

Mechanical properties of banana stem fiber have a density of 1.35 gr/cm^3, cellulose content is 63-64%, hemicellulose (20%), lignin content 5 %, the average tensile strength is 600 Mpa, the average tensile modulus is 17.85 Gpa and the length increase is 3.36%. [11] Banana fiber diameter is 5.8 μm, while the length of the fiber is about 30.92- 40.92 cm.

Decreased levels of NaCl in brackish water using kapok banana stem media with a thickness of 20 cm. After checking the NaCl levels, it can be seen that the decrease in NaCl levels in brackish water using kapok banana stem media with a thickness of 20 cm, each experiment, the decrease is not significant with an average allowance of 594.59 mg/l. The results of the one-way ANOVA statistical test show the value of F (79.075) and the significance or probability (Sig) of (0.000). Because the significance value of 0.000 is less than 0.05, it can be concluded that the average of each treatment performed is "different" significantly.

The difference in decreasing the concentration of chloride (Cl) levels from various media thickness variations is due to the thicker the media used, the media (banana stem) which functions as a filter in this processing process will be more effective, the fibers contained in banana stems can withstand or reduce chloride levels in brackish water. The decrease in chloride levels in water is due to the presence of 4.60 grams of charcoal hydrate content in banana stems which functions to bind chloride levels in the water, besides that there is also a membrane in the banana stem in the form of cellulose which plays a role in binding chloride levels in water and also as an osmosing. banana stalks can bind chloride levels.

From various variations in the thickness of the banana stem media used, it is known that the average

reduction in chloride (Cl) levels in brackish water at a medium thickness of 20cm compared to media thickness of 10cm and 15cm, can be analyzed that the thicker the media used, the greater the reduction in levels. Chloride (Cl) occurs.

The factor affecting the adsorption in reducing sodium chloride levels is the size of the media. The media size determines the surface area of the adsorbent. The more the adsorbent surface area, the more adsorbate is absorbed, so that the adsorption process can be more effective. The smaller the adsorbent diameter, the larger the surface area. The total adsorption capacity of an adsorbate depends on the total surface area of the adsorbent. The adsorption process depends on the number of collisions that occur between the adsorbate and adsorbent particles.

The effective collision between the particles will increase as the surface area increases. So, the larger the adsorbent surface area, the greater the adsorption. The smaller the particle size, the longer the contact time. The time to reach an equilibrium state in the metal absorption process by the adsorbent ranges from a few minutes to several hours. [12]

Conclusion

Based on the research that has been conducted, the researchers concluded that the use of kapok banana stems as a medium in brackish water treatment can reduce levels of chloride (Cl). Banana stem media with a thickness of 10 cm can reduce levels of chloride (Cl) 2377.69 mg/l with a percentage reduction of 22.3%. Banana stem media with a thickness of 15cm can reduce levels of chloride (Cl) 1772.27 mg/l with a percentage reduction of 37%. Banana stem media with a thickness of 20 cm can reduce levels of chloride (Cl) 1166.18 mg/l with a percentage reduction of 50%.

Suggestion for future research to use a varied medium with a simple filtering method to produce better quality water. For the community, especially coastal communities who have dug wells with high levels of chloride (Cl), this method is an option to improve the quality of clean water that contains high levels of chloride (Cl). For the sodium chloride content in brackish water to meet the requirements, a combination of filtering should be carried out using natural zeolite media, pumice stone, and banana stem alkalis which can absorb sodium chloride levels in brackish water.

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Ethical Clearance: This study has been ethically approved and allowed by the Regional Investment and Coordination Board of South Sulawesi in Makassar.

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