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Analysis of Physical, Chemical, and Biological Peat Water Quality on The Degree of Health of Gampong Sumber Bakti Communities

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Abstract

Peat water is the source of water used by the people of Gampong Sumber Bakti. This study aimed to analyze the quality of peat water with parameters ofß color, taste and smell, turbidity, pH, TDS, iron (fe), manganese, E. coli, temperature, and complaints about public health status. Sampling was done by purposive random sampling of as many as 42 respondents in Gampong Sumber Bakti. The sampling of peat water was carried out by random sampling. The data is obtained from the experimental results of the Tirta Meulaboh Regional Drinking Water Company Laboratory. At the same time, data on public health degree complaints through surveys and interviews using questionnaire media. The results of the study stated that the examination of physical and chemical parameters exceeded the threshold based on Permenkes No. 32 of 2017, color 120 TCU, taste and smell, temperature 28.5 oC, turbidity 34 NTU, Mn 0.69 Mg/l, Fe 1.6 Mg/ l, pH 6.84 Mg/l, TDS 1200 Mg/l and no biological E.coli was detected. Meanwhile, public health complaints were itching at 21.4%, diarrhea at 7.1%, scaly skin at 23.8%, porous teeth at 4.8%, stickiness at 33.3%, and other complaints at 9.5%. The suggestions that researchers can give are providing simple filtration, building clean water facilities, improving

Keywords: Peat Water; Water Quality Parameters; Health Complaints

Introduction

Peatlands are natural resources that have the potential for human well-being. Indonesia is the fourth country with extensive peatlands after Canada, the Soviet Union, and the United States (Masganti et al., 2020). Peat can generally be classified according to various perspectives, including maturity, fertility, depth, formation process, growth, and depositional environment (Bina et al., 2020).

Peat is soil consisting of semi-decomposed plant remains and therefore is high in anaerobic acids. The organic matter that makes up peat soil is formed from plant residues that have yet to wholly decompose under environmental conditions rich in water and poor in nutrients. Peatlands are more common in former swamp areas or poorly drained basin areas. The swamps in Indonesia are estimated at 39.4 million hectares, most of which are in Sumatra, Kalimantan, Sulawesi, and Papua, of which only 9.4 million hectares are suitable for agricultural management (Bina et al., 2020).

Aceh Province is one of the peat swamp ecosystem areas that has been converted into plantations and agricultural land located in the Tripa Peat Swamp Forest (TPSF) area of Nagan Raya Regency and Southwest Aceh Regency, Nagan Raya Regency, indicating that there are 57,191 hectares of peat land (Sufardi, Manfarizah, 2016).

Peat water is surface water from accumulated plant residues in swamps or lowlands, and it is stressed by acidic and anaerobic conditions, especially in Sumatra and Kalimantan (5). Peat water generally needs to meet the clean water requirements set by the Ministry of Health of the Republic of Indonesia through PERMENKES No. 32 of 2017 concerning Environmental Sanitation Quality Standard Requirements. In addition, peat water is unsuitable for bathing, washing, drinking, and other types of hygiene. Typically, peat water has a high-intensity reddish-brown color (Bina et al., 2020).

Peat water has a high heavy metal content (Said et al., 2019). The condition of peat swamps with poor water quality causes an unhealthy environment (Said et al., 2019), impacting human health. According to Permenkes RI No.492/MENKES/PER/IV/2010, drinking water quality that meets hygiene requirements is odorless, colorless, and tasteless. Water quality is defined as the content of water parameters that have

been carefully analyzed to reveal the quality and characteristics of the water. The quality and properties of water depend on the type and nature of the substances contained therein.

For this reason, it is necessary to conduct continuous research and observe the quality and utilization of peat water that does not meet physical, microbiologic, and chemical health requirements. Because the water is often found to contain certain seeds or substances that are opaque, smelly, cause disease and endanger human existence (Amalina, 2018). Not only physical quality but also microbiological and chemical qualities, it is used for bathing, washing, cooking, and even drinking. The water that does not meet health requirements, causing health complaints (Amalina, 2018). Water drilled for tens to hundreds of meters still needs improvement (Kiswanto, Wintah, Nur Hafni, 2017). Heavy metals in water can cause poisoning, allergies and skin pain, vomiting, dizziness, cancer, and even death (Said et al., 2019).

Gampong Sumber Bakti is one of the villages in the Darul Makmur sub-district, Nagan Raya Regency, with 375 households. It is a village that still uses peat water for bathing, washing, drinking, and other sanitation purposes for daily needs; this is because the drinking water network (PAM) provided by the local government has not yet reached Gampong Sumber Bakti, so the community uses relatively cheap and affordable peat groundwater as an alternative. Many can have tried drilling wells to meet their clean water needs, but the results still need to be as expected (Busyairi et al., 2019).

One of the leading causes is the identification or not yet definitive of Gampong Sumber Bakti. The village needs a good water source because there is no village budget to help distribute clean water; this prompted researchers to examine the quality of peat water and its impact on public health.

Methods

The research was conducted in Gampong Sumber Bakti, Nagan Raya Regency, Darul Makmur District, a lowland and swamp area. The location is quite far, less than 2 hours from the city. Existence of this village still, many people who use peat water for their daily needs have reddish brown water. This type of research is a proportional descriptive survey and uses questionnaire media.

The research population is all people who use peat water, totaling 375 heads of families in the area. The sampling technique is purposive random sampling. According to Sugiyono, purposive random sampling is a technique with consideration (Amalina, 2018). The formula used to determine the number of respondents is the solving formula, so the sample obtained is 42. This research is also experimental at the Tirta Meulaboh Regional Drinking Water Company Laboratory. Peat water was used as an experimental medium with a random sampling method in conducting experimental research using measuring instruments such as litmus paper, spectrophotometer, photometer, turbidimeter, colorimeter, conductivity meter, thermometer, and coliform tester.

The analysis used was in the form of univariate, using a frequency distribution table processed with SPSS to describe all variables as information material to determine the extent to which the physical, chemical, and biological quality of peat water affects public health in there

Results

The table below shows the distribution of the number of respondents who are at risk and not at risk of being overweight.

Peat Water Parameters

The results of laboratory tests on peat water parameters physically, chemically, and biologically were carried out by randomly sampling samples of peat water. Table 1 below shows the quality of peat water from the Physical parameters in the Environmental Health Quality Standards for Peat Water Media for Sanitation Hygiene based on the standard parameters of Permenkes No. 32/2017**.**

Physical Parameters:

(1) Color: Colored peat water is caused by high (2) TDS and Fe parameters, which can cause peat water to turn reddish-brown. (3) Taste and Smell: Tastes and Smells mild but not bothersome. (4) Temperature: Temperature (25.1-30 ^{o}C) is still acceptable for consumption, but it is starting to be unfavorable for health due to the higher risk of bacterial and viral contamination. (5) Turbidity: Medium turbidity looks cloudy with particles visible to the naked eye

Chemical Parameters:

(1)Manganese (Mn): High manganese content. (2) Iron (Fe): high Fe content. (3) pH: The pH of the water is neutral. (4) TDS: Water with a high TDS. (5) Biological Parameters: E.coli: Not detected

Table 1. Examination Results of Physical, Chemical, and Biological Parameters of Peat Water

Parameter	Unit	Maximum Permitted Level		Analysis results
		Drinking water	Raw Water	
Physical Parameters	TCU			120
Color	-	15	50	Taste and
Taste and Smell	ºC	-	-	smell
temperature	NTU	±3ºC	±3ºC	28,5
Turbidity		5	25	34
Chemical Parameters	Mg/l			
Manganese (Mn2+)	Mg/l	0,3	0,5	0,69
Iron (Fe3+)	Mg/l	0,3	1	1,6
pH	Mg/l	6,5-8,5	6,5-9,0	6,84
TDS		1000	1000	1200
Biological Parameters	CFU/10			
E.coli or Fecal coli	0ml	0	0	-

Primer data, 2022

Table 2. Examination Results of Physical, Chemical, and Biological Parameters of Peat Water

Characteristics of Respondents	Amount	Percentage
Gender		
Man	25	59,5
Woman	17	40,5
Total	**42**	**100**
Age		
Teens 12-24	1	2,4
Adults 25-54	34	81,0
Elderly >54	7	16,7
Total	**42**	**100**
Education (Equivalent)		
No school	1	2,4
Primary school	17	40,5
Junior high school	16	38,1
High school	6	14,3
Higher education	2	4,8
Total	**42**	**100**
Job		
Does not work	10	23,8
Work	32	76,2
Total	**42**	**100**
Usage		
Short-term <5	4	9,5
Medium Term 5-20	20	47,6
Long-term>20	18	42,9
Total	**42**	**100**
Impact (Complaint)		
Itchy rash	9	21,4
Diarrhea	3	7,1
Scaly Skin	10	23,8
Porous Teeth	2	4,8
Sticky	14	33,3
Other	4	9,5
Total	**42**	**100**

Primer data, 2022

Discussion

The Effect of Physical Use of Peat Water on Public Health Degrees

The use of poor quality peat water that does not meet the standards of the Minister of Health No. 32 of 2017 physically can harm the health status of the community with a short-term impact period (direct infection) or a long-term period. The following is the impact that will occur from the physical parameters of peat water on the degree of public health.

The color of peat water, brown to deep reddish, is due to the high organic matter content in the form of humus acid and its derivatives (Said et al., 2019). According to the Regulation concerning Environmental Health Requirements, if the color of the water exceeds the threshold, it can affect the color of the water. It can be a source of disease in humans. Diseases that can be caused by polluted water include diarrhea, poisoning, and respiratory infections. The area still has a reddish brown watercolor, and the Color parameter test results show that it exceeds the standard threshold.

Unpleasant taste and odor in water can indicate contamination by chemicals or organic materials such as industrial, domestic, and agricultural waste, which can cause human disease. If the water is drunk or used for other domestic purposes, it can cause health problems in humans. Diseases that can be caused by polluted water include diarrhea, poisoning, and respiratory infections. Gampong Sumber Bakti is a vast oil palm plantation area located on peat soil that uses pesticides for land clearing so that it can contaminate water through absorption from the soil. Based on the Taste and Smell lab test results, it is still in the mild category but can harm health.

Temperature can play a role in controlling the condition of aquatic ecosystems, for example, the type, number, and presence of flora and fauna. Temperature can affect the metabolic activities of aquatic organisms at these water temperatures (RIFAI, 2022). According to the Minister of Health 32 years, if the water temperature exceeds the threshold, it can cause a decrease in the degree of public health because it can trigger various diseases and health conditions related to exposure to hot water, which will have adverse effects from exposure to water that is too hot such as dehydration, burns, infections, and system disorders. The lab test results showed that peat water was still acceptable for consumption. However, the higher bacterial and viral contamination risk was starting to be unfavorable for health.

Suppose the turbidity of water exceeds the threshold. In that case, it can cause a decrease in public health status because it can contain bacteria, viruses, and chemicals that are harmful and have various adverse effects, such as respiratory, skin, and eye infections, chemical poisonings such as heavy metals and pesticides, and cardiovascular system disorders. Exposure to contaminated water can trigger an increase in heart rate and blood pressure, which can cause disturbances in the cardiovascular system, with the presence of organic and inorganic materials contained in water, such as mud and those derived from weathered

animal and plant materials (Kiswanto et al., 2019). Moreover, it can potentially interfere with digestion (Musli, 2016). The results of laboratory tests on peat water showed that the quality parameter had a high manganese content.

The Influence of Chemical Use of Peat Water on the Degree of Public Health

Manganese is a metal that is found naturally in the environment and is also sometimes used in industry. The adverse effects of water manganese levels exceed the maximum limit, such as nervous system disorders, cognitive problems, growth disorders in children, and other health problems. In the human body, tiny amounts do not cause health problems, but large amounts can affect the liver and kidneys (Agustina & Febriza Aquarista, 2021); Mn is also toxic and can attack a person's nerves causing Parkinson's syndrome in the elderly (Musli, 2016). The results of lab tests on manganese in peat water showed that it is on high levels.

If the maximum amount of iron (Fe) is exceeded, it can cause poisoning, vomiting, diarrhea, and damage to the intestinal tract. Besides health problems, color and taste problems can also cause scale to stick to household appliances, make clothes yellow, and blacken the results of cooking rice (Agustina & Febriza Aquarista, 2021); this disease causes intestinal damage, itching, scaly skin, and diarrhea (2). Fe can also cause heart, pancreas, and liver failure (Musli, 2016). Lab results show that the water content of peat shows parameters of Fe with high content. In contrast, complaints from the community about the use of peat water in the village are still related to the results of previous research from quotations (2) and (Musli, 2016) as diarrhea, itching, scaly skin, and various other diseases caused.

Changes in the pH of water can cause changes in color, smell, and taste, as well as health impacts such as tooth decay and stomach aches. However, the results of this measurement have a neutral pH; it can be stated that it is still by the water quality standards (Agustina & Febriza Aquarista, 2021). The pH of Gampong Sumber Bakti peat water from the results of lab tests is the pH of the water, which is Neutral, while complaints from respondents who experienced tooth decay from 42 respondents there were 4.8% of these complaints.

High Total Dissolved Solids that enter the body can have negative or positive effects. In addition to health, the high TDS is also a cause of scale and corrosion in water (RIFAI, 2022). TDS can also interfere with digestion (Musli, 2016). The peat water lab test results showed that the water had a high TDS.

Effect of Biological Use of Peat Water on Public Health Degrees

The results of measurements of peat water in Gampong Sumber Bakti on Escherichia Coli found no results or were not detected. E. coli is an apportions germ commonly found in the human large intestine as normal flora. However, it can cause nausea and vomiting and cause primary intestinal infections and body tissues outside the intestine (Musli, 2016) because they were far from community latrines when the researchers took the sample.

Conclusion

Peat water in Gampong Sumber Bakti, Nagan Raya, is reddish-brown with high manganese, iron, and TDS levels, neutral pH, and undetectable E. coli. Of 42 respondents, most are adult male laborers using the water for 5-20 years, with complaints of stickiness. The water quality exceeds health standards, posing potential public health risks.

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