

EFFECTIVENESS OF BANANA NANGKA (*Musa Paradisiaca* Linn) SKIN AS A NATURAL COAGULANT IN REDUCING TURBIDITY OF RIVER WATER

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Article Info

Article history:

Received August 10, 2022

Revised August 11, 2022

Accepted January 01, 2023

Keywords:

Turbidity

Jackfruit Banana Peel

River Water

ABSTRACT

Effectiveness Of Banana Nangka (*Musa Paradisiaca* Linn) Skin as A Natural Coagulant In Reducing Turbidity Of River Water. Jackfruit Banana peel is one type of plant that can be used to reduce the turbidity of river water. Jackfruit banana peel contains cellulose, hemicellulose and lignin. Cellulose's potential as an adsorbent is substantial. This study aims to determine the effectiveness of jackfruit banana peel variations in dose and contact time as a natural coagulant in reducing river water turbidity. This type of research is experimental, the research uses a pretest-posttest design with control group design, with 5 treatments with 3 treatments. Data analysis used the Two-Way Anova statistical test to determine the difference in each treatment to the resulting decrease in turbidity with $\alpha = 0.05$. The results of the analysis showed that the p value was $0.000 < 0.05$, which means that there was a difference in the decrease in dosage variation and contact time of jackfruit banana peel powder (*Musa paradisiaca* linn). Before processing river water banana and jackfruit peel powder, the average yield was 9.29 NTU. Optimum dose 1.2 grams and presentation of 71.48% decrease in turbidity. Further researchers can use jackfruit banana peels in overcoming the pH of the air after adding banana peel powder and there are further researchers to utilize banana peels in wastewater treatment.

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INTRODUCTION

Surface water as a source of raw water has the largest amount compared to spring water, rain and ground water. However, in terms of water quality, surface water is currently worse and does not meet the quality standard requirements for physical, chemical and bacteriological parameters ⁽¹⁾⁽²⁾ Along with advances in technology, developments in science and an increase in population, the need for water will also increase. Therefore, managing water resources is very important so that they can be used sustainably according to the desired level of quality ^[3]. One of the substances necessary for the existence of organisms on earth is water. Water is used as a source of life, such as for eating and drinking, and is also used to sustain life ⁽⁴⁾.

Currently, the main problems faced by water resources include the quantity of water which is no longer able to meet increasing demand and the quality of water for domestic purposes which is increasingly declining. Industrial, domestic and other activities have a negative impact on water resources, including causing a decrease in water quality ^{[2](4)}. As the fourth most populous country in the world, the unequal supply of safe drinking water in Indonesia

has an impact on all aspects of life, from health to people's welfare. In Indonesia, only 47.73 percent of households have sustainable access to clean water ^[3] (BAPPENAS, 2010). The use of river water as drinking water by people in Banjar Regency alone is 16.96% and the percentage of households that use water suitable for consumption is only 34.09% ^[4].

In South Kalimantan, river water is characterized by a high level of turbidity due to the large amount of dissolved sediment, especially the Martapura River. The lives of the people of South Kalimantan are very close to river flows. Most of the Martapura River water is used by the community for daily needs such as bathing and washing. Physically, the Martapura River water does not meet the requirements in terms of turbidity to be used as a source of clean water. Water sources that do not meet the requirements must be treated first before being used for daily needs and must meet the clean water requirements contained in Minister of Health Regulation no. 32 of 2017 concerning environmental health quality standards and water health requirements for hygiene, sanitation, swimming pools, aqua solutions and public baths ^(5,6).

The problem that people often encounter is that the river water they use has varying turbidity qualities. According to research by Hamzani (2013), it is known that the turbidity in the water of the Martapura River in Tambak Anyar Village is around 13.5-50.9 NTU. There are also research results from Syarifudin and Santoso (2019) which were carried out regarding the average turbidity value of Martapura river water of 35.7 NTU. Then research by Hartuno et al. (2014), in Sungai Pinang Lama Village, the turbidity level in the river water before the processing was carried out was 35.49 NTU. And there are also research results from Noraida (2018). The research results showed that the level of water turbidity along the river in Tambak Anyar Martapura Village ranged from 101-904 NTU. Meanwhile, the clean water standard according to Minister of Health Regulation No. 32 of 2017 has a maximum turbidity level of 25 NTU. Turbidity in water can be caused by the presence of suspended and dissolved organic and inorganic materials, for example mud, fine sand, plankton and other microorganisms.

Water sources that do not meet the requirements must be treated first before use. To get clean water, water must be treated in various ways, both physical and chemical. The water treatment method used in general is physico-chemical water treatment, namely coagulation-flocculation which is then followed by sedimentation ^[5]. Biological treatment includes biofiltration, nitrification and denitrification. Processes The processes included in physical processing are filtration, sedimentation, gas exchange, flotation, adsorption and filtration ^[6]. Aluminum Chloride (PAC) and aluminum sulfate (alum), synthetic organic polymers (acrylamide) where these coagulants are classified as synthetic coagulants. One of the effects of using chemical coagulants is Alzheimer's disease due to aluminum sulfate ^[7].

The use of natural coagulants can be done as much as possible to reduce the use of synthetic materials which produce side effects when used. The use of natural coagulants will be cheaper than the use of synthetic coagulants which are usually used for water purification ^[8]. Not much is known about the use of banana peels as a natural coagulant to purify river water. Most people only know the benefits of bananas from the fruit, tuber and tree trunk. However, there are still many people who don't know how to reuse the peels, so banana peels are simply thrown away as trash ⁽¹⁴⁾.

Jackfruit banana peel can be used as a natural coagulant in purifying dug well water with test results showing an average decrease in the level of turbidity in a row, namely, using a dose of 10 ppm the average decrease is with a percentage of 57.96%, at a dose of 20 ppm the average decrease was a percentage of 63.28% and at a dose of 30 ppm the average decrease was a percentage of 64.91%. Banana peels can be used as an ingredient to make activated charcoal because they have quite high hemicellulose content. The composition of raw banana peel based on cell wall analysis (% dry weight) is: 37.52% hemicellulose, 12.06% cellulose, and 7.04% lignin ^[9]. stated that banana peels can be made into biosorbents. Because the pectin contained in old banana peels is much more. Pectin is a polymer that has the ability to bind metal ions in water so that polluting elements in the water can be removed ⁽¹⁵⁾.

In previous research, jackfruit banana peels were used to reduce turbidity in dug well water, while this research used river water.

MATERIALS AND RESEARCH METHODS

This type of research is experimental research. The analysis is analytical and aims to determine the effectiveness of variations in dose and contact time of jackfruit banana peel (*Musa paradisiaca* linn) as a natural coagulant in purifying river water. The research design used is pretest-posttest with control group design, in this design measurements are taken on the sample group before and after being given treatment. In the research, treatment was carried out by adding a natural coagulant from jackfruit banana peel (*Musa paradisiaca* linn). This research was carried out at the Chemistry Laboratory of the Environmental Health Department, Poltekkes, Ministry of Health, Banjarmasin, with the raw material source being Martapura River water in Martapura District, Murung Kenanga Village. The population in this study was river water in Martapura District, Murung Kenangan Village, Banjar City. The sample in this study was Martapura river water in the Martapura sub-district, Murung Kenanga village. The method used in sampling is grab sampling.

RESULTS OF RESEARCH AND DISCUSSION

Table 1. Results of turbidity, temperature and pH checks before treatment

No.	Parameter	Unit	Check up result	*Quality standards
1.	Turbidity	NTU	42	≤25 NTU
2.	Temperature	°C	28.3	Air temperature ±3
3.	pH	-	7.3	6.5-8.5

Based on Table 1, it is known that the average turbidity level of river water is 42 NTU and the pH is 7.3. The river water has met the quality standards stipulated in the Republic of Indonesia Minister of Health Regulation No. 32 of 2017. Physically the water looks murky, so it needs to be managed first.

Table 2. Measurement Results for Controls After Treatment

No.	Turbidity Data (NTU)			*Quality standards	Temperature (°C)	pH
	After Treatment					
	20 Minute	40 minute	60 Minute			
1.	36.3	31.3	28.4	≤25 NTU	28.3	7.3
2.	37.9	32.5	29.3			
3.	38.7	34.1	30.7			
Average	27.6	32.6	29.4			
Average percentage reduction in turbidity (%)	10.40	22.31	29.85			

Based on Table 2, the decrease in river water turbidity at a dose of 0.0 gram or without the addition of coagulant given stirring treatment and variations in contact time, is known to be a percentage of 10.40% for 20 minutes, 22.31% for 40 minutes and 29.85% for 60 minutes. There was no change in the temperature and pH results, this was because there was no additional dose of coagulant in the river water.

The results of measuring river water temperature using a thermometer after adding jackfruit banana peel powder and variations in contact time can be seen in Table 3 as follows:

Table 3. Temperature Measurement Results After Adding Variations

Treatment		Temperature Results with Treatment (°C)			Average
Dosage (mg/L)	Contact Time (Minutes)	r1	r2	r3	
0.0 (Control)	20	28.3	28.3	28.3	28.3
	40	28.3	28.3	28.3	28.3
	60	28.3	28.3	28.3	28.3
0.4	20	28.3	28.5	28.7	28.5
	40	28.7	28.8	28.3	28.6
	60	28.6	28.2	28.3	28.4
0.8	20	28.3	28.7	28.6	28.5
	40	28.4	28.3	28.3	28.3
	60	28.6	28.2	28.6	28.4
1,2	20	28.8	28.2	28.6	28.5
	40	28.3	28.6	28.8	28.6
	60	28.4	28.6	28.5	28.5
1.6	20	28.4	28.7	28.3	28.4
	40	28.6	28.6	28.2	28.4
	60	28.4	28.3	28.3	28.3
2.0	20	28.3	28.9	28.6	28.6
	40	28.6	28.2	28.8	28.5
	60	28.7	28.3	28.7	28.5

Based on Table 3, the results of river water temperature measurements after treatment with the addition of jackfruit banana peel powder coagulant and varying contact times, there was no significant change. The water temperature both before and after treatment was still within the normal temperature range.

The results of measuring the pH of river water using a PLI meter after adding jackfruit banana peel powder and variations in contact time can be seen in Table 4 as follows:

Table 4 Results of pH Measurements After Addition Variations in Dosage and Contact Time

Treatment		pH Results with Treatment			Average
Dosage (mg/L)	Contact Time (Minutes)	r1	r2	r3	
0.0 (Control)	20	5.8	5.8	5.8	5.8
	40	5.8	5.8	5.8	5.8
	60	5.8	5.8	5.8	5.8
0.4	20	5.2	5.0	5.1	5.1
	40	5.0	5.0	5.1	5.0
	60	5.2	5.1	5.3	5.2
0.8	20	5.1	4.9	5.0	5.0
	40	4.8	5.0	4.8	4.9
	60	4.7	4.6	4.6	4.6
1,2	20	4.2	4.8	4.9	4.5
	40	4.4	4.0	4.3	4.2
	60	4.0	4.5	4.2	4.2
1.6	20	4.0	4.3	4.4	4.2
	40	4.0	4.2	4.1	4.1
	60	4.2	4.5	4.2	4.3
2.0	20	4.5	4.3	4.2	4.3
	40	4.3	4.5	4.0	4.3
	60	4.0	4.1	4.4	4.2

Based on Table 4, the pH measurement results show that after adding coagulant, jackfruit banana peel powder, the pH decreased. This is because the pH of the jackfruit banana peel powder coagulant is acidic. The highest decrease in pH was in the treatment with an additional dose of 1.6 grams and a contact time of 20 minutes. Meanwhile, the lowest decrease in pH occurred in the treatment with an additional dose of 0.4 grams and a contact time of 20 minutes.

The results of measuring the turbidity of river water using a turbidimeter after adding various doses of jackfruit banana peel powder and variations in contact time can be seen in Table 4 as follows:

Table 5. Results of Turbidity Measurements After Addition Variations in Dosage and Contact Time

Treatment		Turbidity Results with Treatment (NTU)			Average	Decrease percentage (%)
Dosage (mg/L)	Contact Time (Minute s)	r1	r2	r3		
0.0 (Control)	20	36.3	37.9	38.7	37.63	19.40
	40	31.3	32.5	34.1	32.63	22.31
	60	28.4	29.3	30.7	29.47	29.85
0.4	20	20.8	19.7	21.3	20.60	45.25
	40	18.7	18.3	19.2	18.73	42.50
	60	18.3	17.7	18.1	18.03	38.79
0.8	20	13.9	14.3	13.7	13.97	62.90
	40	12.2	12.4	11.8	12.13	62.82
	60	10.8	11.6	10.3	10.90	63.00
1.2	20	10.2	11.3	10.7	10.73	71.48
	40	10.3	9.46	9.34	9.70	70.27
	60	9.23	9.38	9.27	9.29	68.46
1.6	20	12.3	13.4	12.1	12.60	66.51
	40	11.8	12.3	11.6	11.90	63.53
	60	11.2	10.9	11.3	11.13	61.81
2.0	20	14.7	14.3	13.9	14.30	61.99
	40	14.1	12.8	13.4	13.43	58.84
	60	13.2	12.7	12.6	12.83	56.44

Based on Table 5, the percentage reduction in turbidity was highest in the treatment with the addition of jackfruit banana peel coagulant, namely at a dose of 1.2 grams and a contact time of 20 minutes with a reduction percentage of 71.48%. Meanwhile, the percentage reduction in turbidity was lowest in the treatment with the addition of jackfruit banana peel powder coagulant, namely at a dose of 0.4 grams and a contact time of 60 minutes with a reduction percentage of 38.79%.

Effect of Adding Jackfruit Banana Peel Powder on Reducing pH in River Water. The degree of acidity (pH) of waters is influenced by temperature, photosynthesis, respiration, dissolved oxygen, and the presence of ions in the waters. River water has a pH ranging from 4 - 9. The pH value is an important factor in waters because the pH value of the water will determine the nature of the water to be acidic or alkaline which will affect biological life in the water. Murung Kenanga Village's river water is 5, 8, after processing using a natural coagulant from jackfruit banana peel powder, there was a continuous decrease in pH with each additional dose.

Based on the results of the normality test using the standardized residual test, the data is normally distributed with a sig value (0.200) > a (0.05). Then proceed to the homogeneity test. Based on the results of the homogeneity test, it shows a sig value (0.383) > a (0.05), so it can be said that the variance between populations is the same (homogeneous), meaning it is acceptable. Therefore, it can be continued with the two Away Anova test to see the effect of dose and contact time of jackfruit banana peel powder on turbidity. The results of the Two

Away Anova test show that dose and contact time have a significant influence on turbidity because the sig value (0.000) < α (0.05). Based on the description above, it can be seen that there is a difference in the quality of river water before adding jackfruit banana peel powder and after adding jackfruit banana peel powder as a natural coagulant in reducing river water turbidity.

CONCLUSIONS AND RECOMMENDATIONS

The results after processing river water using coagulant from jackfruit banana peel powder, the turbidity level reached 9.29 NTU at a dose of 1.2 grams in a contact time of 60 minutes and met the requirements, the temperature was still within the normal temperature range, while the pH still did not meet the requirements. value 4.1. Based on the research results, the optimum dose and optimum contact time for jackfruit banana peel powder was 1.2 grams with a reduction percentage of 71.48% in a contact time of 20 minutes with a turbidity value of 10.73 NTU.

Jackfruit banana peel can be used as an alternative vegetable coagulant in processing river water into clean water.

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