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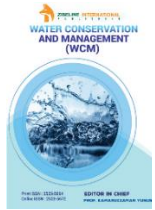

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RESEARCH ARTICLE

THE UTILIZATION OF PIMPING GRASS (*THEMEDA GIGANTEA*) AS ADSORBENT OF BABURA RIVER WATER TURBIDITY WITH BATCH OPERATION

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ABSTRACT

Adsorbent is solid substance that can absorb certain component from liquid phase. Most of adsorbents are porous materials and adsorption process take place especially in porous wall or certain location inside that particle. The research purposes are to study the influence of the adsorbent's surface area based on shape and amount variation from pimping grass (*Themeda gigantea*) with adsorption ability over time to reduce the water river turbidity and define adsorption kinetics from pimping grass. The concentration of pimping grass that has been used are spherical, half of spheric shape, and a quarter of spherical shape. The volume of the sample is 250 mL. The time measurement is 5 hours. The variation of the mass that has been used are 10 g, 15 g, and 20 g. The variation of sample takeover are in morning, afternoon, and evening. The measurement of adsorbent absorption's capacity in term of decreasing the turbidity of Babura River water is done by inputting the adsorbent to the sample, then the measurement of water's turbidity proceed by using turbidimeter for 5 hours. The analyzing result for the influence of adsorbent's surface area in decreasing Babura River water in the shape's variation from spherical, half of spherical shape, and a quarter of spherical shape is obtained in a quarter of spheric shape. Suitable time for measuring turbidity is when sample takeover at evening. The highest amount of adsorbent in decreasing the turbidity of Babura River water is at 20 g. Adsorption kinetics that has been used in the measurement of decreasing Babura River water turbidity is orde 2 kinetics.

KEYWORDS

Adsorbent, Pimping Grass, Adsorption Kinetic, Babura River

1. INTRODUCTION

River is places and water containers including non-biological nature resource that contained in it (Syauqiah et al., 2018). River water comes from source of water and rain which flow on the surface of soil. Physically, river water seems in brown color with high turbidity level because it mixed with sand, wood mud, and other contaminant. Water turbidity are occur because of particles that suspended inside the water that causing the water looks feculent, dirty, even muddy (Alamsyah, 2016).

Water is primary need to living things especially human. Water takes role in many human's activity for example water for consumption, cook, wash, sanitation, transportation, and others. Same role needed also for industrial activity. A lot of industries choose close location with the source of water like river or sea to get access and using water (Nopriansyah et al., 2016). Problem that commonly found by society is that river water always have high turbidity, so that it need to be processed before it can be used (A. and Santoso, 2019). Water turbidity are caused by particles that suspended inside the water like clay, sand, and mud (Maliandra et al., 2016). To clear this turbid water, societies usually using chlorine. However, the using of chlorine to be consumed can causing health issues (Nopriansyah et al., 2016). Various way have been provided to clear up the water using natural materials that draw attention because of the effectivity and eco-friendly nature. Farm's waste are having potential to producing bio-adsorbent, which can be used for increasing water quality (Singhal et al., 2014).

Adsorbent is solid substances that can adsorbing certain component from liquid phase. Most of adsorbents are porous materials and adsorption take place especially in porous wall or certain location inside that particle (Rahmayani and Siswarni, 2013). Adsorption is general procedure that have been widely used because having simple concept and economic. The one who work the most in adsorption process is adsorbent. Adsorption method has been developed by using plant biomass that can be called fitofiltration. Fitofiltration is by using dead plant biomass as metal ion binder (Tangio, 2013). Natural clearance from plants are easy to be done because plants are organic materials that having biodegradable characteristic, not contaminating environment and relative save for human's life (Maliandra et al., 2016). Few examples of adsorbent that usually been used is zeolite, corncob, diatomic soil, sand, and active charcoal (Legiso et al., 2019). Adsorption is substances (molecules or ion) that get adsorbed on the surface of the adsorbent (Syauqiah et al., 2011). Adsorption is a surface phenomenon because of the accumulation of a species to solid-liquid interface. Adsorption occur because the presence of push and pull force (Widayatno et al., 2017).

Natural purification from plants is easy to do because plants are biodegradable organic materials, do not pollute the environment and are relatively safe for human life (Maliandra et al., 2016). Pimping or merry grass is a kind of grass that resembles a reed, a member of the grain tribe. This plant is widespread in the Indochina region, the archipelago, to the Pacific. Pimping (*Themeda gigantea*) belongs to the family Poaceae (grains) consisting of straw, corn and sugar cane, but has not been used as a bioadsorbent to reduce the turbidity of river water. In fact, pimping has potential because it is often found in the environment. This plant can grow well in various conditions, on fertile and infertile soils, as well as on sandy soils and peat soils. Due to the absence of clear utilization, this plant is just wasted and left to dry on the side of the road (Tasyin, 2017).

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Figure 1: Pimping Grass

The following research has been conducted on bioadsorption and the manufacture of adsorbents and coagulants from natural materials which can be seen in table 1.

Table 1: Recent Research Results on Bioadsorption and Making Adsorbents to Reduce River Water Turbidity

Raw material	Research	Research result	Reference
Moringa seeds, salak seeds, papaya seeds	• Initial turbidity • Percentage decrease in turbidity • Doses 50, 80, 100, 130, 150, 180, 200, 250, 300, 400, 500, 600, 750, 900 and 1000 ppm	• The optimum dose of Moringa seeds is 130 ppm • The optimum dose of salak seeds is 100 ppm • The optimum dose of papaya seeds is 50 ppm	(Permata et al., 2013)
Moringa seeds	• Betapus river water • Turbidity levels before and after affixing Moringa seeds • pH 6.8 • Variation of dose 0.5; 1.0; 1.5; 2.0 gr/L	• At a dose variation of 0.5 g/L, the percentage of turbidity decreased was 94.28% • At a dose variation of 1.0 g/L the percentage of turbidity decreased is 90.18% • At a dose variation of 1.5 g/L, the percentage of turbidity decreased was 88.44 % • pH of water changed from 6.8 to 6.2	(Wahyuni, 2017)
Seashells, gravel, and fibers	• Kali Lamong river water • Measurement of turbidity levels before and after treatment • Diameter of seashell sand: 1 mm; 0.5 mm and 0.3 mm • Sampling time	• Clamshell sand is the result of pounding crushed shells • Optimum results were obtained at a diameter of 0.5 mm with a percentage decrease in turbidity of 95.8%	(Rachmaniyah and Darjati, 2017)
Rice husk ash	• Rice husk ash filter • Turbidity before and after filtering • Martapura river water • Thickness variations: 13, 26 and 39 cm	• Filtering Matapura river water with rice husk ash showed a significant decrease in the value of the turbidity parameter • Optimum results were obtained at 39 cm thickness variation with the percentage decrease of 97.3%	(Syarifudin A., 2018)

Based on previous research, the direct application of adsorbents derived from natural materials has successfully purified various river water locations due to their turbidity. Utilizing adsorbents generally requires more effort to make them an adsorbent, such as calcination, pyrolysis, and others. Naturally, pimping grass has components such as lignin, cellulose, and hemicellulose, essential in carbon. An adsorbent has at least the essential element of carbon present (Nedjai et al., 2022). This research makes this advantage a novelty by directly utilizing pimping grass as an adsorbent, and it cuts across the process that has been done so far. This research topic also aligns with Sustainable Development Goals (SDGs) principle no. 6 relating to clean water and sanitation, which focuses on maintaining and managing clean and sustainable water resources. In addition, SDGS no. 12, namely responsible consumption and production, includes aspects of using natural adsorbent materials, especially in terms of sustainable use of resources, the utilization of adsorbent sources derived from renewable materials that are easily obtained at low prices is also essential to do and SDG no. 14, namely life underwater, to maintain better water quality in the Babura river can have a positive impact on aquatic ecosystems, including aquatic life. A batch process was carried out to determine the turbidity measurement between Babura River water and the interaction caused by the adsorbent. The batch process was chosen because it allows the adsorption equilibrium state to be reached (Nguyen et al., 2021). This equilibrium state means that the interactions involved between the adsorbent particles and the river water have fully interacted so that after enough time has passed to reach this equilibrium, it results in stable turbidity measurements. Therefore, the research purposes are to study the influence of the adsorbent's surface area based on shape and amount variation from pimping grass with adsorption ability over time to reduce the water river turbidity and define adsorption kinetics from pimping grass.

2. Material and Methods

2.1 Materials Used in the Adsorption for Babura River Water

Pimping grass as adsorbent obtained from Doulu-Berastagi Village, Tanah Karo, Seribu Jandi Village, and Rakut Besi, Simalungun, Sumatera Utara, Indonesia. Babura River water take in Sari Rejo Street, Medan Johor Districts, Medan, Sumatera Utara, Indonesia. Tools that can be use is oven for drying the pimping grass adsorbent, Turbidimeter (Orion AQ4500) for measuring the turbidity of Babura river water Indonesia, that can see in Figure. 2, Erlenmeyer for the batch adsorption process, and Scanning Electron Microscope and Energy Dispersive X-Ray (SEM-EDX) Phenom Pro X for analyzing adsorbent surface morphology which interacting with dirt/turbidity in Babura river water.

Figure 2: Turbidimeter Orion AQ4500

2.2 Methods of Babura River Water Batch Adsorption by Using Pimping Grass as Adsorbent

The research was conducted at the Chemical Engineering Operations Laboratory (3°33'45.4 "N 98°39'24.2 "E) and Surfactant Technology and Application Laboratory (3°33'42.2 "N 98°39'20.4 "E), Department of Chemical Engineering, Universitas Sumatera Utara (3°33'51.9 "N 98°39'31.4 "E), Medan, Indonesia. The main aim of the experiment is to study the influence of the adsorbents from pimping grass to reduce the water river turbidity and define adsorption kinetics from pimping grass. Therefore, a research plan is needed to facilitate the main aim of the experiment. The research plan consists of research preparation such as preparation and collection of raw materials, namely pimping grass (3°13'25.7 "N 98°31'55.4 "E) as an adsorbent and Babura river water collection (3°33'08.5 "N 98°39'44.2 "E) was carried out in the morning, afternoon and evening time conditions, which began around August 2021. The adsorption research equipment was designed with a batch process to measure the turbidity of the Babura River water over time. The research was carried out until the research data collection was obtained and characterization until the end of the research in October 2021. In taking each sample, the main index to present based on the best results was to obtain an adsorbent with the lowest turbidity measurement in 300 minutes.

2.2.1 Sampling of Babura River Water

Babura River water taken for 5 L in the morning, afternoon, and evening respectively. Measure the initiate turbidity level of Babura river water every 20 minutes for 5 hours.

2.2.2 The preparation of pimping grass as adsorbent

Pimping grass are cleaned from dirt that attached, then washed by clean water and cut with the shape variation of spherical, half spherical, and quarter spherical with the thickness of 0.5 cm and the diameter of 0.8 cm. Then, dry it in the oven for 110 °C until constant amount of mass for 3 times.

2.2.3 Batch Adsorption Process of Babura River Water

Adsorption process has been done by batch process. Babura river water with amount of 250 mL of are pour in the Erlenmeyer flask. Then, the pimping grass with shape variation namely spherical, half spherical, and quarter spherical with mass of 10 g, 15 g and 20 g respectively are added into the Erlenmeyer flask. Then, measure the turbidity level for every 20 minutes for 5 hours.

3. Results and Discussion

3.1 Babura River Water Characteristic Before Adsorption

In this research, sample that will be use is Babura River Water which already obtained from dirt. The sampling process is done in the morning at 9 a.m. Figure 3 shows the Babura river water. After sampling, the water turbidity measure using turbidimeter. Measure the turbidity means calculating the amount of diluted materials in water, such as mud, algae, detritus and other dirt materials (Urbasa et al., 2019). Figure 4 shows the turbidity result of Babura river water taken in morning, afternoon and evening. The turbidity result for sample measurement in the morning is the highest with value of 198 NTU.

Figure 3: Babura River Water Turbidity

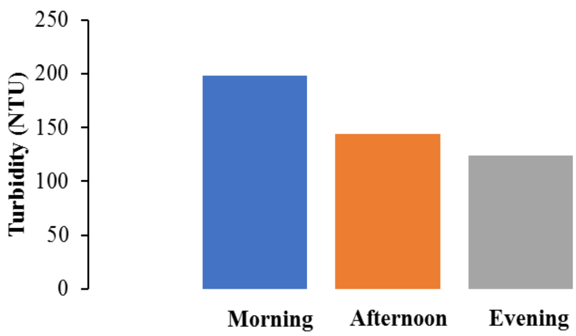


Figure 4: Turbidity of Babura River water measurement in the morning, afternoon and evening

3.2 The Relation between Pimping grass as Adsorbent in variation of Shape, adsorbent mass and Adsorbent Surface Area

Surface area of adsorbent is defined by particle size and the amount of the adsorbent. This research use pimping grass with variation of shape in spherical, half spherical, and quarter spherical. The relation between adsorbent shape adsorbent mass and adsorbent surface area can be seen in table 2.

Table 2: Adsorbent Surface Area with the Variation of Mass and Adsorbent Shape

Shape	Mass (g)	Surface Area (cm^2)
Spherical	10	429.4
	15	644.1
	20	858.8
Half Spherical	10	581.522
	15	872.328
	20	1,162.952
Quarter Spherical	10	915.952
	15	1,373.928
	20	1,831.904

From table 2 it can be seen that the surface area in quarter spherical shape is larger than spherical and half spherical adsorbent. The greater the adsorbent mass the greater also the surface area. The larger adsorbent surface area, then there will be a lot of substances that got adsorbed (Syauqiah et al., 2011).

3.3 The Influence of Pimping grass Adsorbent shape to Babura River Water Turbidity

Figure 5 shows that the experiment was done with the variation of adsorbent mass for 10 g and adsorbent shape variation (spherical, half spherical, and quarter spherical). Water turbidity measurement done for 5 hours with measurement time interval for 20 minutes. During the experiment, the data obtained for initiate water turbidity in the morning is 198 NTU. Measurement result without pimping grass adsorbent of the water turbidity in 5 hours is 42.2 NTU for spherical adsorbent, 37.3 NTU for half spherical adsorbent, and 32.3 NTU for quarter spherical adsorbent.

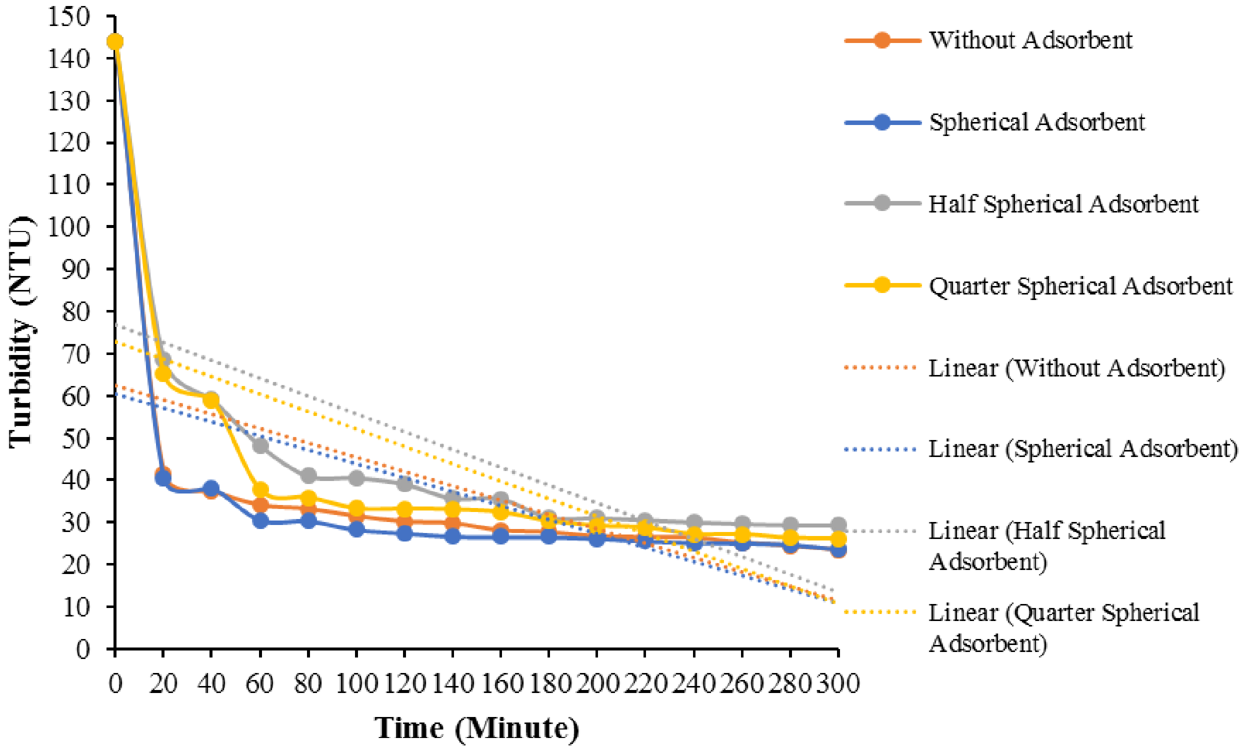


Figure 5: Relation between Turbidity along Time with pimping grass Adsorbent Mass of 10g

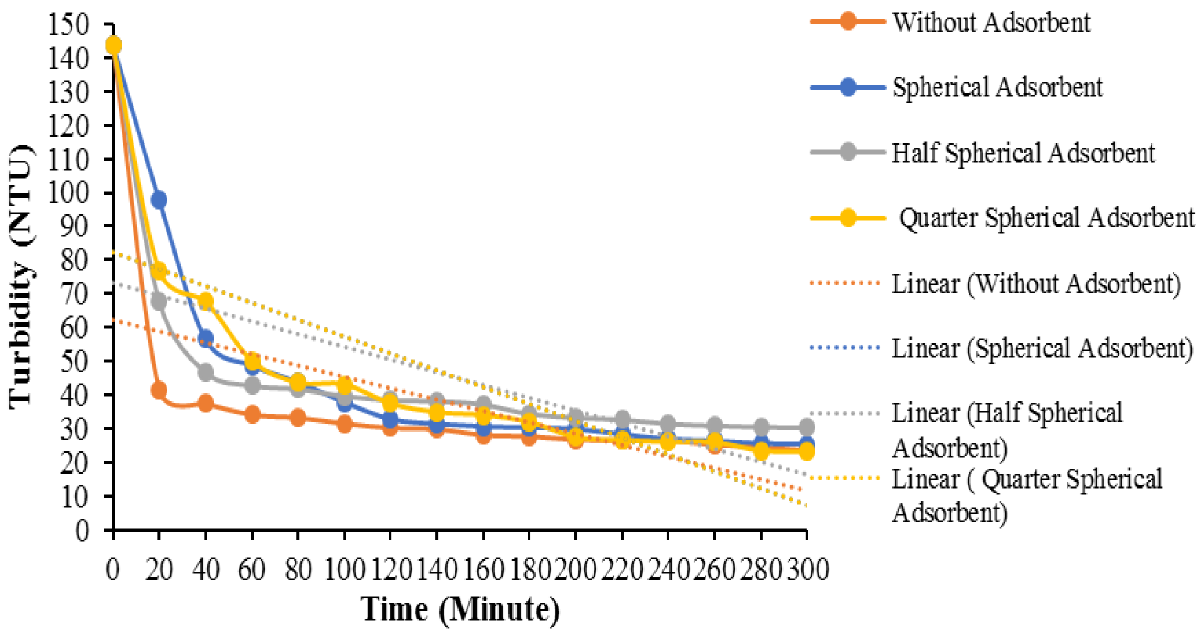


Figure 6: Relation between Turbidity along Time with Adsorbent Mass of 15 g

Figure 6 is relation between turbidity and time in various shape of adsorbents and the mass of adsorbent of 15 g. Measurement result without adsorbent of river water turbidity when 5 hours is 85 NTU. There is significant difference in the variation of adsorbent's shape with treatment without adsorbent, it can be seen from the figure 6 that along 5 hours, the turbidity become 38.9 NTU in spherical shape, 30.8 NTU in half spherical and 30.3 NTU for quarter spherical.

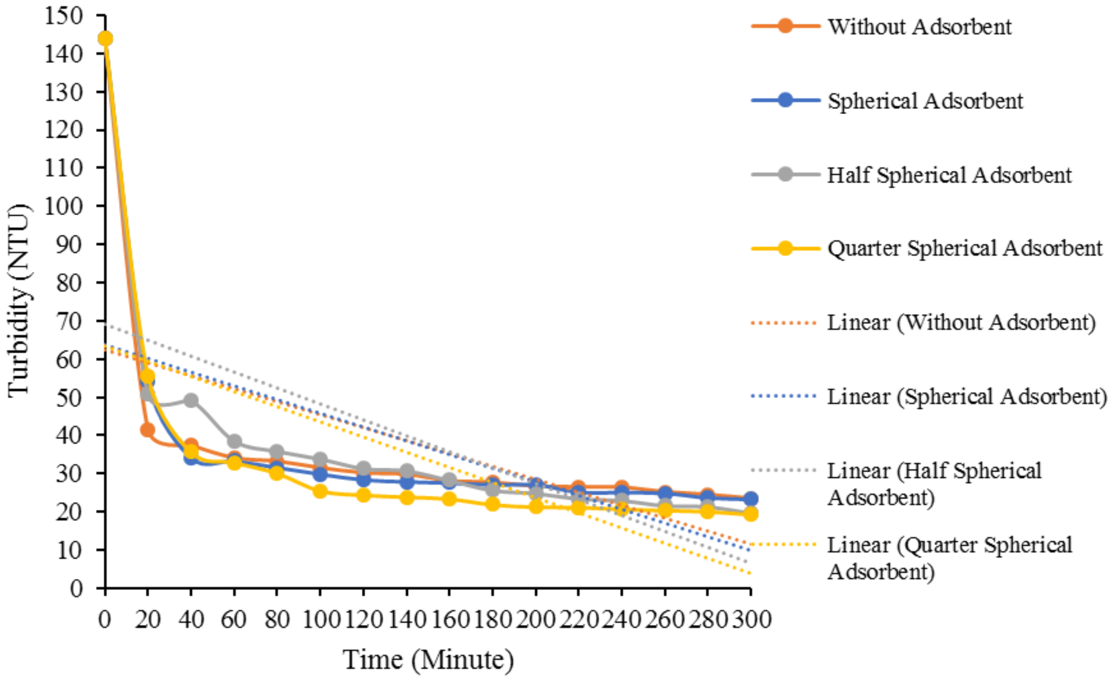


Figure 7: Relation between Turbidity along Time with Adsorbent Mass of 20 g

Figure 7 is relation between turbidity and time in various shape of adsorbents and the mass of adsorbent of 20 g. Measurement result without adsorbent of river water turbidity when 5 hours is 85 NTU. There is significant difference in the variation of adsorbent's shape with treatment without adsorbent, it can be seen from the figure 7 that along time for 5 hours, the turbidity become 33.8 NTU in spherical shape, 29.2 NTU in half spherical and 27.8 NTU for quarter spherical.

From the analysis result can be shown that the quarter spherical adsorbent has bigger adsorption power compared with spherical and half spherical adsorbent. This thing happen because quarter spherical adsorbent has bigger surface area compared with spherical and half spherical adsorbent, so it maximizing the adsorption power.

3.4 The Influence of Pimping grass Adsorbent's Amount to Adsorption Ability

The determination of adsorbent's weight need to executed to know if with the addition of weight can increasing adsorbing capacity from pimping grass adsorbent. The amount of solution are adsorbed highest when optimum adsorbent weight experience maximum adsorption power that indicate there are many active side of adsorbent that decreasing along with the rise of temperature (Fitriansyah et al., 2021).

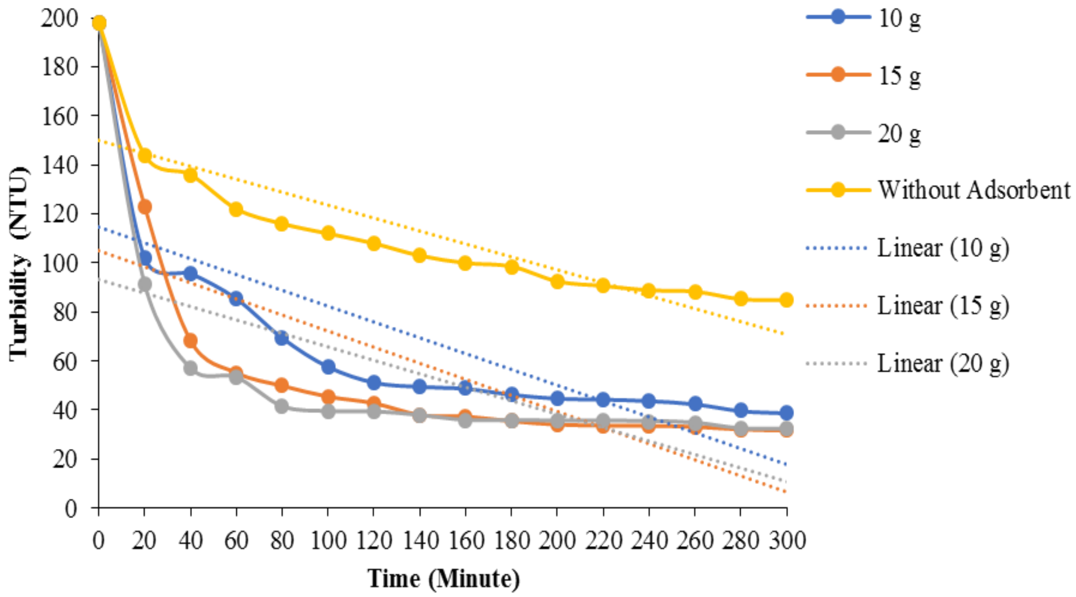


Figure 8: Relation between Turbidity along Time with Adsorbent Mass Variation in Spherical Adsorbent Shape

Figure 8 is relation graphic between turbidity and time in the variation of adsorbent's amount. The experiment was executed with adsorbent shape variation of spherical and the variation of adsorbent amount (10 g, 15 g, and 20 g). Measurement result without adsorbent of river water turbidity when time equal to 5 hours is 85 NTU. There is significant difference in the variation of adsorbent's shape with treatment without adsorbent, it can be seen from the graphic above that along time equal to 5 hours, the turbidity become 42.2 NTU in the adsorbent's mass of 10 g, 38.9 NTU in the adsorbent's mass of 15 g and 33.8 NTU in the adsorbent's mass of 20 g.

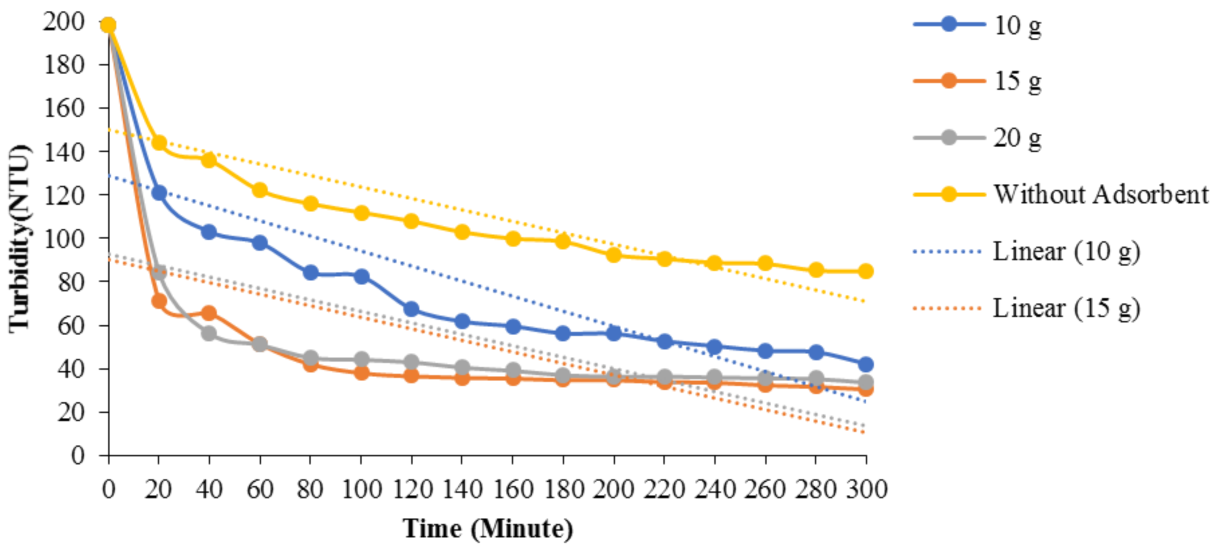


Figure 9: Relation between Turbidity along with Adsorbent Mass Variation in Half Spherical Adsorbent Shape

Figure 9 is relation graphic between turbidity and time in the variation of adsorbent's amount. The experiment was executed with adsorbent shape variation of half spherical and the variation of adsorbent amount (10 g, 15 g, and 20 g). Measurement result without adsorbent of river water turbidity when time equal to 5 hours is 85 NTU. There is significant difference in the variation of adsorbent's shape with treatment without adsorbent, it can be seen from the graphic above that along time equal to 5 hours, the turbidity become 37.3 NTU in the adsorbent's mass of 10 g, 30.8 NTU in the adsorbent's mass of 15 g and 29.2 NTU in the adsorbent's mass of 20 g.

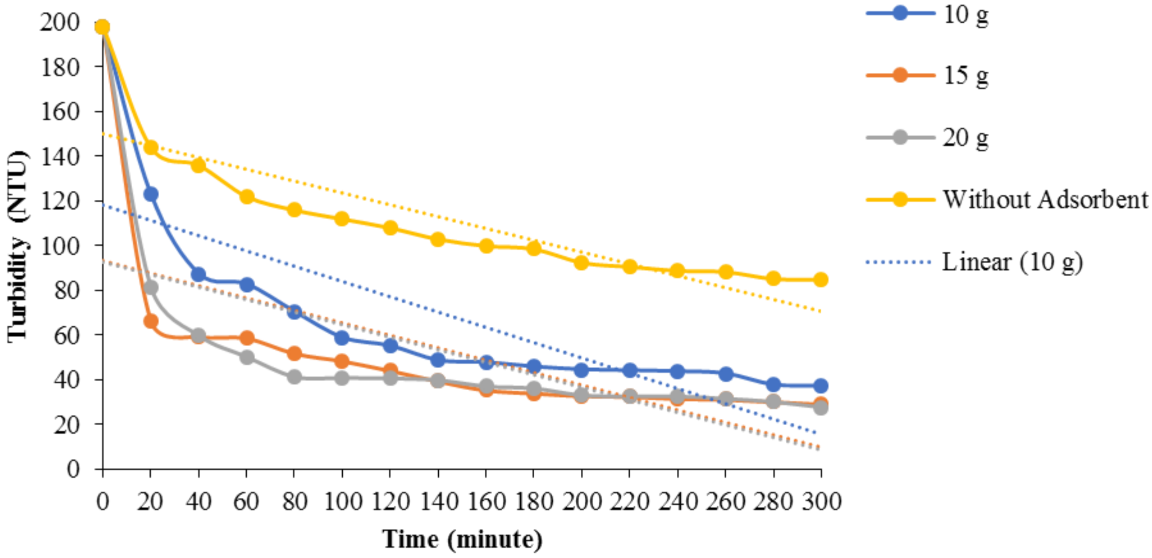


Figure 10: Relation between Turbidity alongwith Adsorbent Mass Variation in Quarter Spherical Adsorbent Shape

Figure 10 is relation graphic between turbidity and time in the variation of adsorbent's amount. The experiment was executed with adsorbent shape variation of half spherical and the variation of adsorbent amount (10 g, 15 g, and 20 g). Measurement result without adsorbent of river water turbidity when time equal to 5 hours is 85 NTU. There is significant difference in the variation of adsorbent's shape with treatment without adsorbent, it can be seen from the graphic above that along time equal to 5 hours, the turbidity become 32.3 NTU in the adsorbent's mass of 10 g, 30.3 NTU in weight of the adsorbent of 15 g, and 27.8 NTU in weight of the adsorbent of 20 g.

More adsorbent that been used, then the adsorption value will get bigger and proportional with the increase of particle amount and adsorbent surface area (Alfiany et al., 2013). The results above is the result of research experiment with the variation of mass, shape, and sampling time. From the result obtained, optimum weight is the adsorbent with the mass of 20 g with turbidity value of 27.8 NTU.

3.5 The Determination of Adsorption Kinetics Modelling of Babura River Water Turbidity by Pimping Grass as Adsorbent

Adsorption kinetics is one from many aspects which usually been researched to evaluate the characteristic from adsorbent that have been used especially in environmental rehabilitation. Many other model from various complexity has been developed to predict the rate of adsorbate's adsorption to adsorbent (Nafi'ah R., 2016). Adsorption kinetics used for knowing adsorption rate that happen in adsorbent and influenced by time. Contact time needed to achieve adsorption equilibrium are used for adsorption rate measurement (Bode Haryanto, Firmanto Panjaitan, Herman Haloho, Rifai Rawa, 2016). The rate of adsorption can be obtained from rate of adsorption constants (k) and reaction order which produced from an adsorption kinetics model. Testing phase of adsorption's rate can be executed by assuming the reaction's order (Hajar et al., 2016). Adsorption characteristics can be studied with various type of theoretical approaches, which are: kinetics model pseudo first order (equation 1) and kinetics model pseudo second order (equation 2). These kinetic models are explain the limit of adsorbate's ability which adsorbed by adsorbent that control the equilibrium time.

$$\log(qe - qt) = \log qe - \frac{k_1}{2{,}303} t \tag{1}$$

where qe is the concentration of adsorbate in equilibrium, qt is the concentration in time t, k_1 is adsorption constant rate and t is adsorption time (minute). When t=0, then qt=0 and when t=t then qt=qt. Value of k_1 can be obtained by making relation graphic of $ln\ (qe - qt)\ t$ that shown in this picture.

Kinetics model of second order depends on the ability of adsorbing each solid phases. Kinetics model of second order can be expressed in Equation 2.

$$\frac{t}{qt} = \frac{1}{k_2\, qe^2} + \frac{1}{qt} t \quad (2)$$

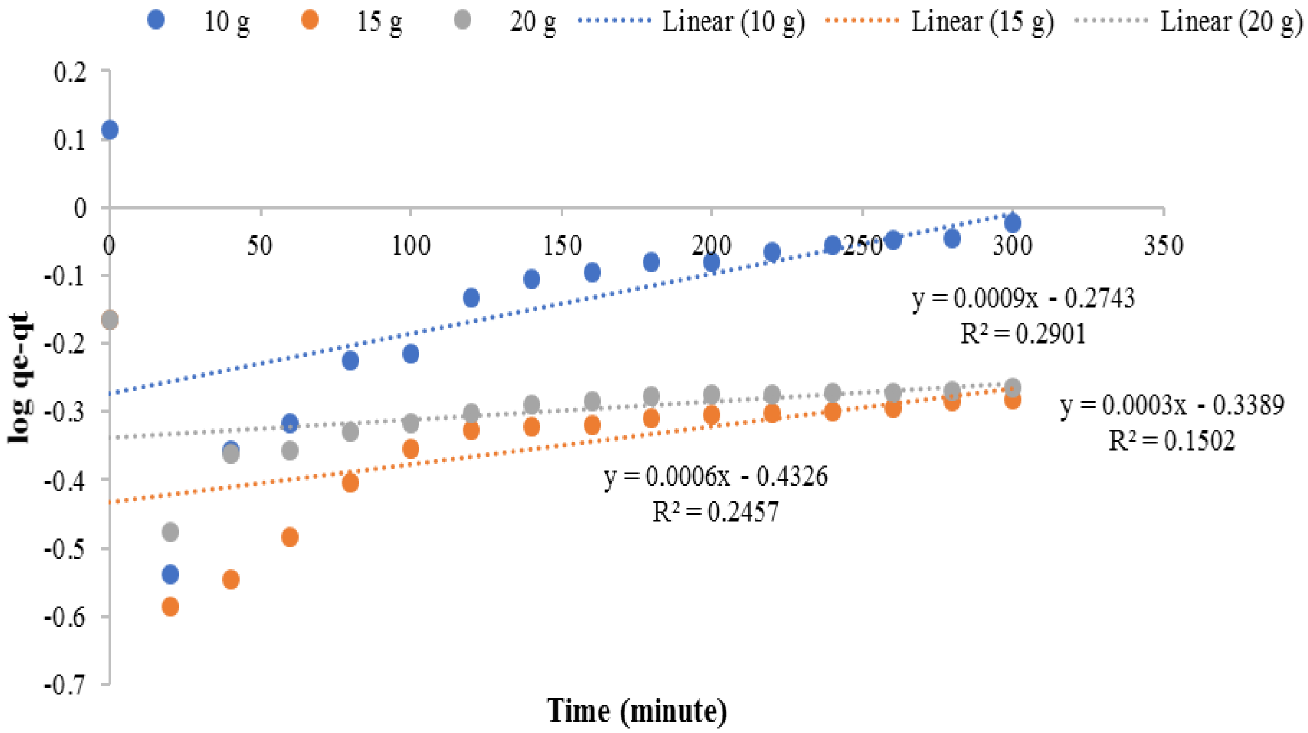


Figure 11: The Modelling of First Order Pseudo in the Variation of Adsorbent's Shape Spherical and River Water Sample in the Morning

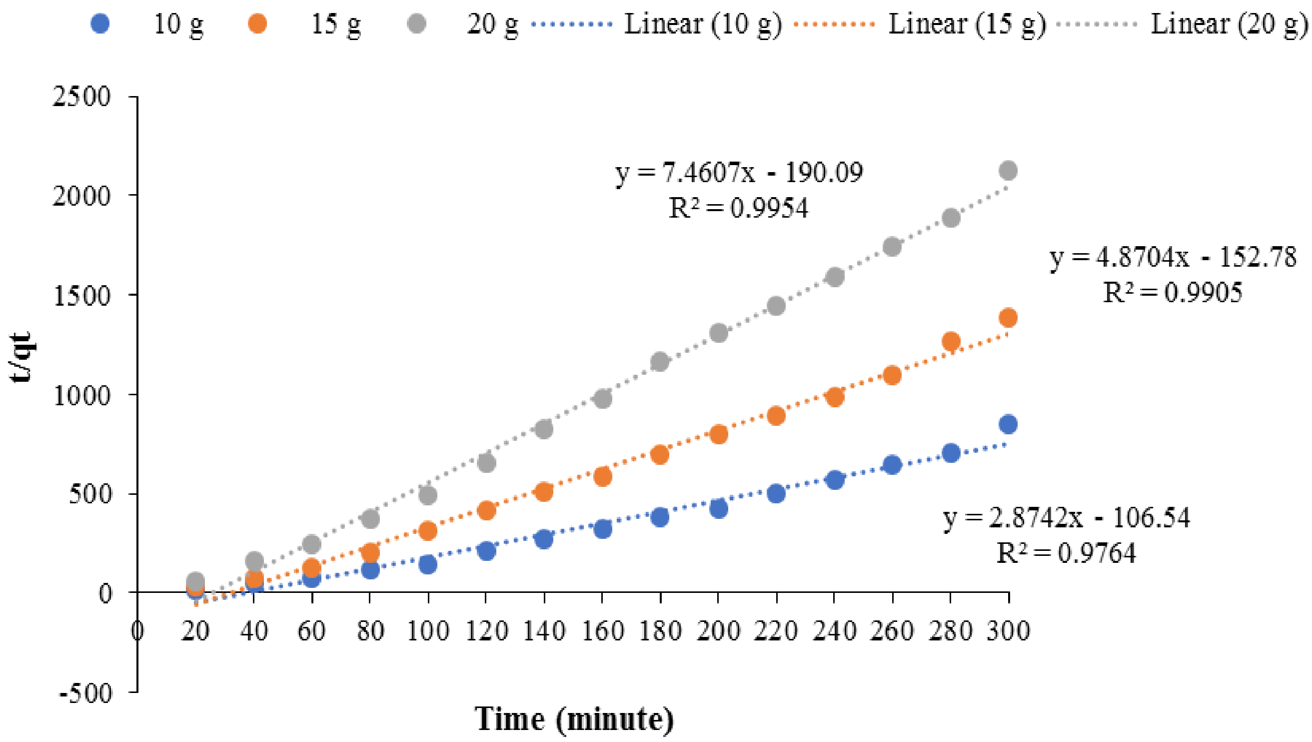


Figure 12: The Modelling of Second Order Pseudo in the Variation of Adsorbent's Shape Spherical and River Water Sample in the Morning

Figure 11 and Figure 12 are graphic of first order and second pseudo modelling that using variation of adsorbent's shape which is spherical and the sampling time in Babura's River is in the morning. Figure 11 shows R2, or correlation coefficient, value to adsorbent 10 g which is R^2 = 0,2901, to adsorbent 15 g with R^2= 0,1502 and to adsorbent 20 g with the value of R^2= 0,2457. Figure 12 shows R2, or correlation coefficient, value to adsorbent 10 g which is R^2 = 0,9764, to adsorbent 15 g with R^2= 0,9905 and to adsorbent 20 g with the value of R^2= 0,9954. From these two graphics shows that second order of pseudo modelling causing the data of adsorption become more exact. This thing can be seen from the value of correlation coefficient (R^2) of second order is higher than the first order.

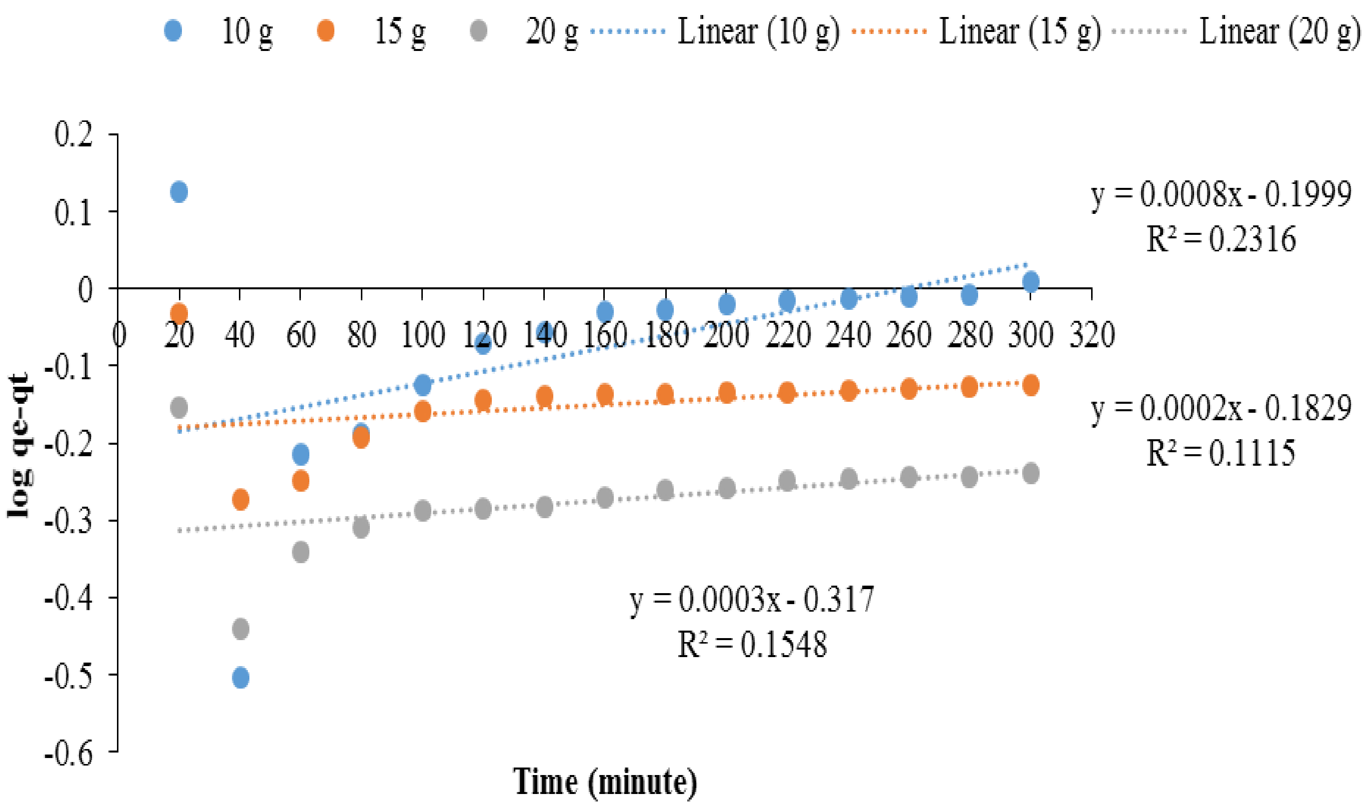


Figure 13: The Modelling of First Order Pseudo in the Variation of Adsorbent's Shape Half Spherical and River Water Sample in the Morning

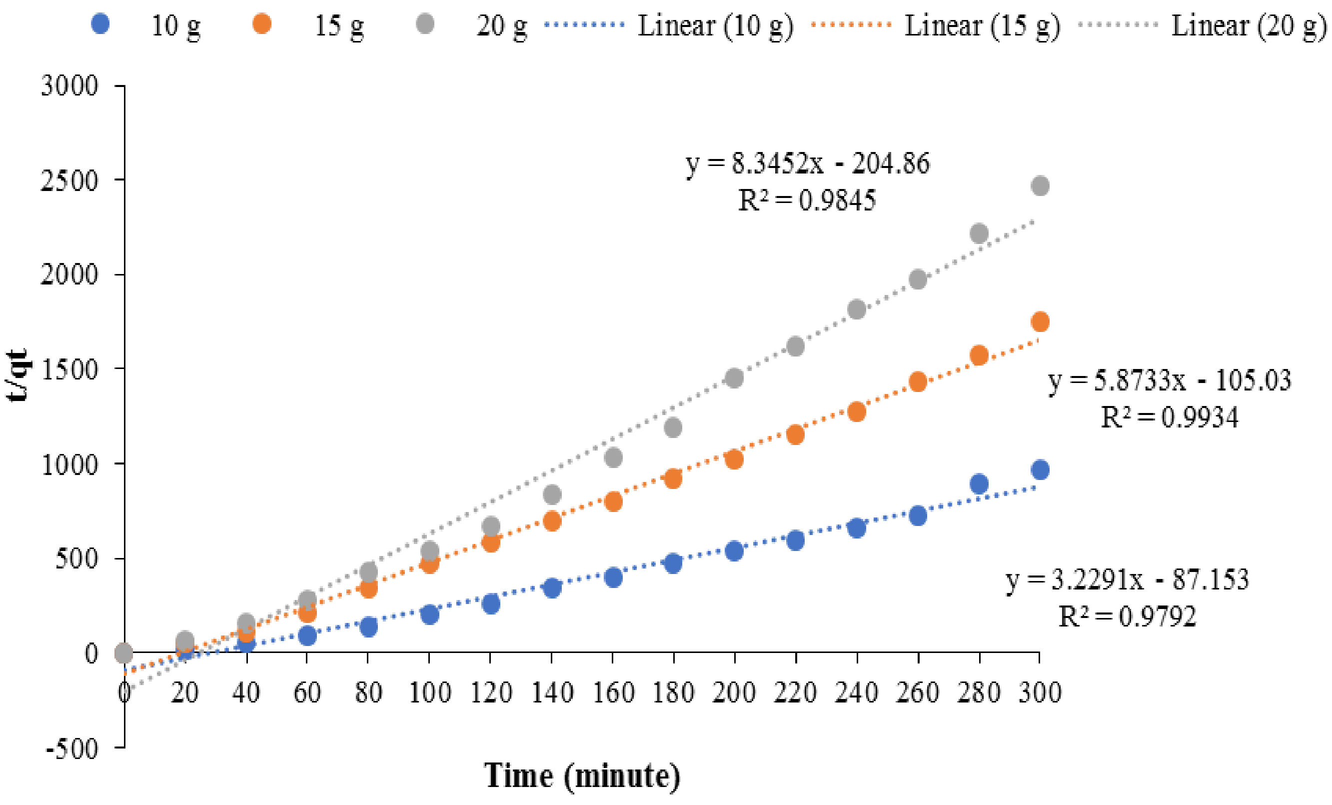


Figure 14: The Modelling of Second Order Pseudo in the Variation of Adsorbent's Shape Half Spherical and River Water Sample in the Morning

Figure 13 is graphic of first order pseudo modelling and Figure 14 is graphic of second order pseudo modelling that using variation of adsorbent's shape which is half spherical and the sampling time in Babura's River is in the morning. Figure 13 shows R2, or correlation coefficient, value to adsorbent 10 g which is R^2 = 0,2316, to adsorbent 15 g with R^2= 0,1115 and to adsorbent 20 g with the value of R^2= 0,1548. Figure 14 shows R2, or correlation coefficient, value to adsorbent 10 g which is R^2 = 0,9792, to adsorbent 15 g with R^2= 0,9934 and to adsorbent 20 g with the value of R^2= 0,9845. From these two graphics shows that second order of pseudo modelling causing the data of adsorption become more exact. This thing can be seen from the value of correlation coefficient (R^2) of second order is close to 1.

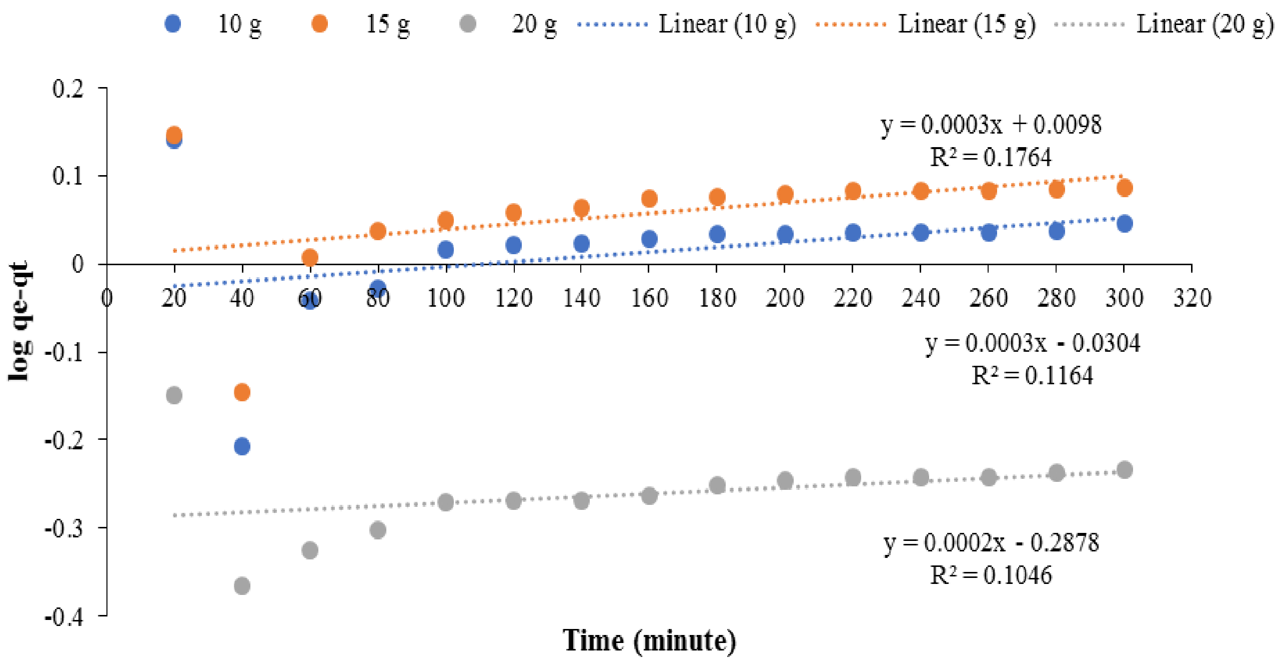


Figure 15: The Modelling of First Order Pseudo in the Variation of Adsorbent's Shape Quarter Spherical and River Water Sample in the Morning

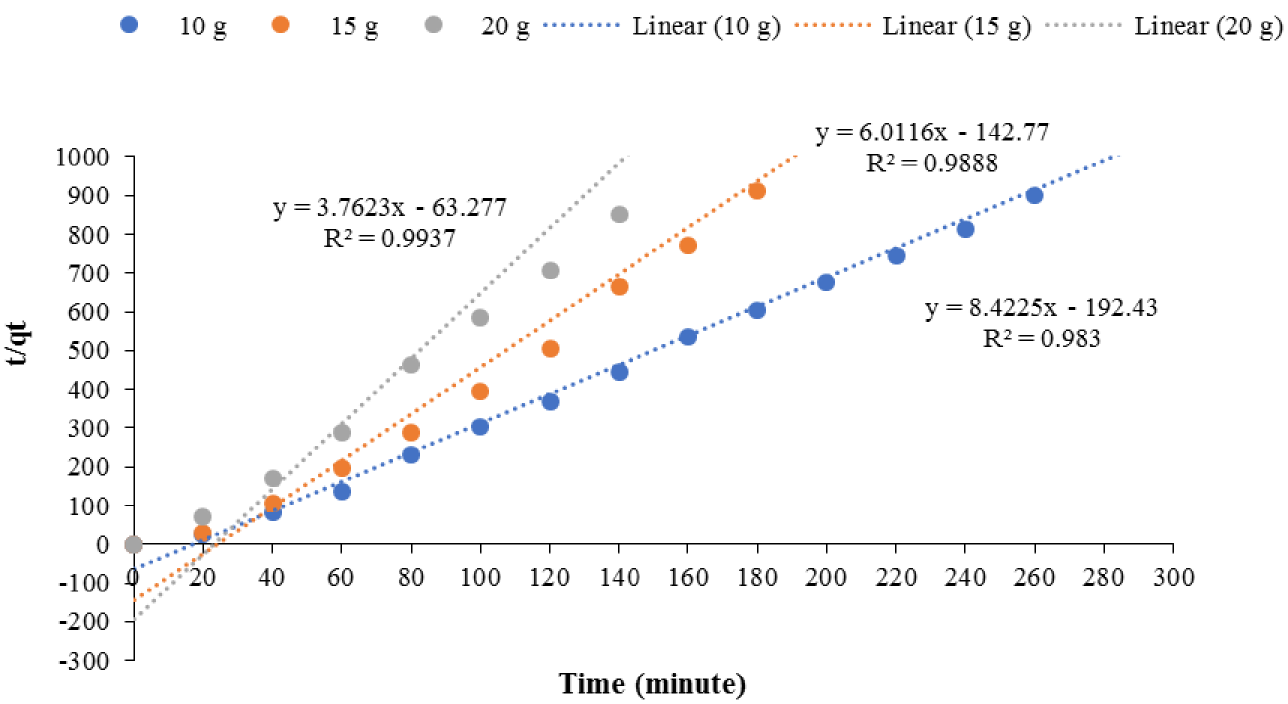


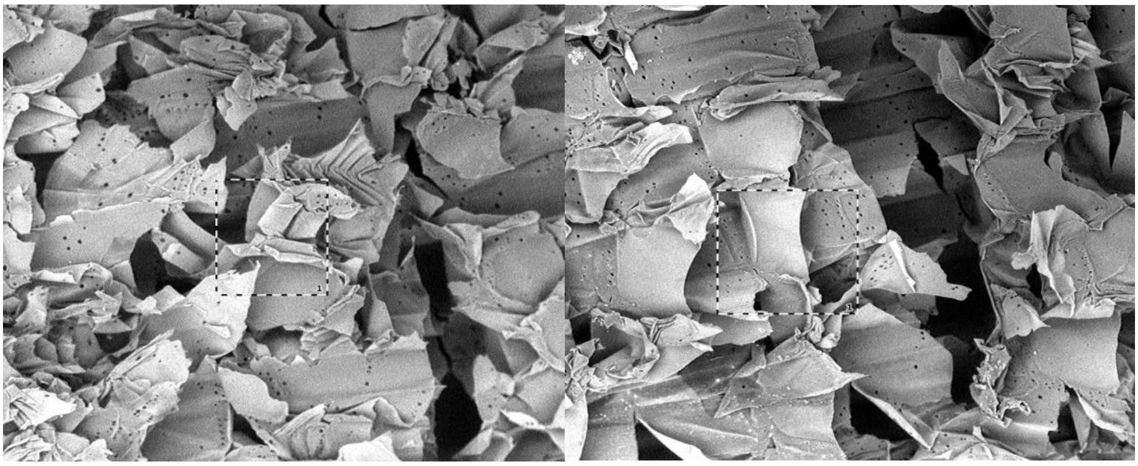
Figure 16: The Modelling of Second Order Pseudo in the Variation of Adsorbent's Shape Quarter Spherical and River Water Sample in the Morning

Figure 15 is graphic of first order pseudo modelling and Figure 16 is graphic of second order pseudo modelling that using variation of adsorbent's shape which is quarter spherical and the sampling time in Babura's River is in the morning. Figure 15 shows R^2, or correlation coefficient, value to adsorbent 10 g which is R^2 = 01164, to adsorbent 15 g with R^2= 0,1764 and to adsorbent 20 g with the value of R^2= 0,1046. Figure 16 shows R^2, or correlation coefficient, value to adsorbent 10 g which is R^2 = 0,9937, to adsorbent 15 g with R^2= 0,9888 and to adsorbent 20 g with the value of R^2= 0,983. From these two graphics shows that second order of pseudo modelling causing the data of adsorption become more exact. This thing can be seen from the value of correlation coefficient (R^2) of second order is close to 1.

Experimental data result shows better result to second order pseudo model compared to first order pseudo based on correlation coefficient value (R^2). Value of R^2 is a value that shows the linearity level of a graph, the bigger the data, then the result becomes more representative. Correlation coefficient which is R^2 has been choose as error function that suits to analyzing kinetic model. This thing happen because linear regression implicitly minimalizing quadratic total from error to determining equation parameter (Tchuifon et al., 2014). In second order kinetic, mechanism of adsorption process explained by assuming as rate determinant. Adsorption is process of chemistry attaching which involve the force between valence or electron exchange between adsorbent and adsorbate (Tenasale et al., 2007). The adsorption procedure is proven to be effective which take place in this research is adsorption process that involve chemical interaction (*chemisorption*), which is between adsorbent and adsorbate.

3.6 The Result of *Scanning Electron Microscope* (SEM) and *Energy Dispersive X-Ray* (EDX) on Pimping Grass

To knowing the morphology and elements content in pimping grass adsorbent before and after adsorption process using SEM *(Scanning Electron Microscope)* and EDX *(Energy Dispersion X-Ray)* shown in figure 17 and figure 18.



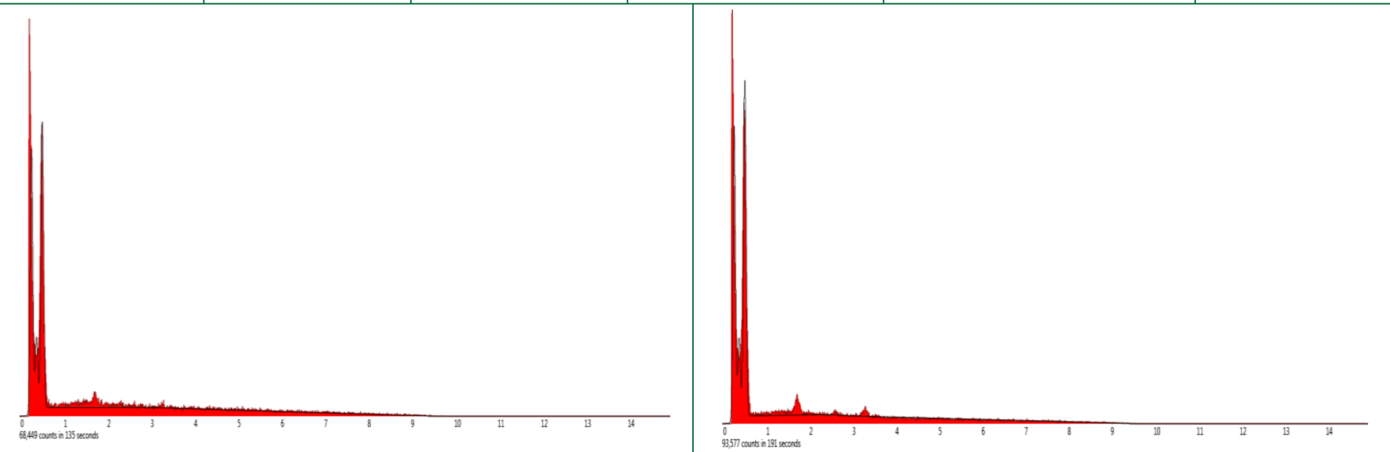
(a) (b)

Figure 17: SEM Testing Enlargement 500x in (a) Pimping grass Adsorbent before (b) After adsorption process

It can be seen in Figure 17 (a) and Figure 17 (b) from the result of SEM testing (Scanning Electron Microscope) that the shape of adsorbent's surface before and after treatment are not showing any significant difference, this thing happened because there are no activation or base washing to adsorbent that want to be treated with treatment. Adsorbent with base washing have more porous surface and rough (Setyarini et al., 2021). However, it can be seen that adsorbent pores after treatment slightly more open compared to adsorbent before treatment. One of the requirements of adsorbing material is porous (Livia et al., 2020).

Table 3: Composition of Pimping grass adsorbent

Element Number	Element Symbol	Element Name	Confidence	Concentration	Error
Pimping grass before adsorption					
6	C	Carbon	100.0	9.7	1.3
8	O	Oxygen	100.0	79.6	1.3
7	N	Nitrogen	100.0	10.7	2.9
Pimping grass after adsorption					
8	O	Oxygen	100.0	81.9	0.8
6	C	Carbon	100.0	8.3	0.9
7	N	Nitrogen	100.0	9.8	1.8



(a) (b)

Figure 18: EDX Testing on the Surface of Adsorbent (a) Adsorbent without Treatment (b) Adsorbent after treatment

As for analysis result of EDX from pimping grass adsorbent before treatment in Figure 18 (a) shows that there are chemistry elements which are O for 81.3%, C for 8.5%, and N for 10.2%. EDX analysis pimping grass adsorbent after treatment in Figure 18 (b) shows that there are chemistry elements which are O for 81.9%, C for 8.3%, and N for 9.8%. EDX result of analysis in Figure 18 (a) and Figure 18 (b) shows that the adsorbent before and after have the same elements, which are C, O, and N. The content has different weight of element percentage. Adsorbent after treatment has higher weight of Oxygen element. Higher weight of Oxygen element in adsorbent after treatment caused by the treatment to adsorbent, so that it remove other contaminant element in the adsorbent (Lestari et al., 2019).

4. Conclusions

After executing this research, then it can be concluded that pimping grass as adsorbent with quarter spherical has bigger adsorption power compared to spherical adsorbent and half spherical, because quarter spherical adsorbent has bigger surface area up to 1.831,904 cm^2 for 20 g, so it maximizing the adsorption process, optimum mass of pimping grass adsorbent in decreasing Babura River water turbidity (sample) in 5 hours and the variation of shape from spherical, half spherical, and quarter spherical is 20 g from 144 NTU to 33.8 NTU, 29.2 NTU and 27.8 NTU respectively for each adsorbent form, the best adsorption kinetics modelling based on correlation coefficient is second order equation with the value of R^2= 0,983, which in adsorption mechanism that involve interaction chemically (*chemisorption*) between adsorbate and adsorbent after rough treatment compared to adsorbent before treatment and EDX result in adsorbent shows that there is increasing phenomena in weight of Oxygen element.

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