

Effectiveness of Moringa Oleifera and Poly Aluminum Chloride Leaves in Peat Organic Substances in Rasau Jaya Village, Kubu Raya Regency

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Abstract—One source of surface waters in West Kalimantan is peat water that has low turbidity, dark brown to black (124 - 850 units of PtCo), high organic content (138-1560 mg/L KMnO₄), and is acidic (pH 3,7 - 5,3). The purpose of this study is to determine the effect of the addition of PAC and Moringa Oleifera leaves to the decrease in levels of peat organic water in the Rasau Jaya Village area, Kubu Raya Regency. The method used in this research is by mixing Moringa leaf powder and PAC (Poly Aluminum Chloride) in peat water accompanied by stirring and precipitating. Furthermore, peat water samples were analyzed for their organic content using the permanganometric titration method. The results showed that the levels of organic substances in peat water before the addition of PAC and Moringa leaf powder amounted to 176.96 mg/l, after the addition of 125 mg PAC and Moringa leaf powder with concentrations of 25, 50, 75 l, 100, 125, 150, 175, 200 mg/l, respectively: 42.04 mg/l, 46.97 mg/l, 58.14 mg/l, 66.15 mg/l, 67.20 mg/l, 60.25 mg/l, 63.41 mg/l, and 53.07 mg/l. Based on the results through regression statistical tests obtained sig = 0.015 <0.05 which means H_a is accepted that there is an effect of increasing the concentration of Moringa oleifera powder and PAC on Organic Content in Peat Water in Rasau Jaya Village, Kubu Raya Regency.

Keywords—Peat Water, Moringa Oleifera, Poly Aluminum Chloride, Organic matter

I. Introduction

Kubu Raya Regency is a relatively flat plain area with a slope of land 0 - 3% covering 792,320 Ha, slope area 3 - 15% covering 7,205 Ha and slope above 40% covering 850 Ha. The total area of the sea is 2,197 km² of the total area of the regency, which is 6,982.20 km². Based on the division of physiographic areas, namely an area that has almost the same physical and geographical characteristics, the Kubu Raya region is included in the physiographic unit area of the Kapuas

Coastal Swamp Plain, which is also called peat landform, which is landform formed in swampy areas with a fairly thick accumulation of organic material [1].

Organic matter in peat water is dominated by humid substances which have molecular weights of up to 100,000 Dalton (Da) and are in the colloidal size range [2]. The measurements of the organic compounds present in peat water are difficult to separate.

In peatlands, surface water is available which is difficult to use as a source of raw water for daily needs. The surface water is yellow or brown in color and contains high organic matter and is acidic, so it needs to be treatment before use. Surface water in West Kalimantan has low turbidity, dark brown to black color (124 - 850 units of PtCo), high organic content (138-1560 mg/L KMnO₄), and is acidic (pH 3.7 - 5.3) [3].

The most common and economical processes for reducing high organic content are coagulation and flocculation processes. Coagulation and flocculation processes can use chemical coagulants, natural coagulants or a combination of chemical and natural coagulants. The research that has been done used extracts of Nirmali (*Strychnos Potatorum*), *M. oleifera* seeds, Tamarind seeds (*Tamarindus Indica*) and Chitosan, as effective coagulants to reduce textile dyestuffs (red acid and orange acid) by 60 - 80% [4]. The other research conducted a study that compared the use of *Moringa* leaves and alum as water purification agents which obtained optimal results on the use of *Moringa* leaf coagulant in reducing Fe and Mn [5].

II. Research Methods

A. Material

In general, Alum is mostly used as a coagulant. However, currently a new type of coagulant has been found with better performance than the use of alum coagulant, mentioned as Poly Aluminum Chloride (PAC). PAC has several advantages, including low corrosiveness, the resulting floc is easier to separate, and the pH of the treated water is not too low.



Figure 1. Moringa leaf



Figure 2. Moringa leaf powder

B. Research Methodology

The research design used in this study is experimental research. The population of this study was peat water obtained in the area of Rasau Jaya Village, Kubu Raya Regency, West Kalimantan. The peat water sample used in this study was added with PAC 125 mg/L, then Moringa leaf powder was added with various concentrations of 25 mg/L, 50 mg/L, 75 mg/L, 100 mg/L., 125 mg/L, 150 mg/L 175 mg/L and 200 mg/L.

Measurement of levels of organic matter in peat water is based on permanganate values. A total of 100 mL of peat water that had been added by PAC and Moringa leaf powder with various concentrations was put into a 300 mL Erlenmeyer and 3 boiling stones were added. After that, a solution of 0.01 N KMnO_4 is added a few drops to form a pink color. Then added 5 mL of 8 N solution H_2SO_4 free of organic substances and heated on an electric heater at a temperature of $105^\circ\text{C} \pm 20^\circ\text{C}$ (continued boiling if there is a smell of H_2S). Next pipette 10 mL 0.01 N standard KMnO_4 solution and reheated until boiling for 10 minutes.

Then pipetted back 10 mL of 0.01 N oxalic acid standard solution. Finally titrated with 0.01 N KMnO_4 to form a pink color. The volume of titration used is recorded [6].

III. Results and Discussion

This study is aimed to determine the effect of Moringa oleifera and PAC (Poly Aluminum Chloride) Leaves in Reducing Organic Content in Peat Water in Rasau Jaya Village, Kubu Raya Regency. The sample used amounted to 24 samples. Samples were treated with no Moringa leaf powder and PAC as a control and 25, 50, 75, 100, 125, 150, 175 and 200 mg/l of Moringa leaf powder and PAC were added.

A. Descriptive Analysis

Tabel 1. Descriptive Statistics Test

Sample Code	Mean	Standard Deviation (SD)
A	176.9600	28.96199
C	42.0400	2.48024
D	46.9733	0.36950
E	58.1400	4.42000
F	66.1467	5.73723
G	67.2000	2.63251
H	60.2467	5.26101
I	63.4067	4.06537
J	53.0867	8.28753

Based on table 1, it can be seen that there is a decrease in levels of organic substances before and after the addition of PAC and Moringa leaf powder.

B. Normality Test

Furthermore, to investigate whether the data are normally distributed, the Normality Test was performed. Based on the results of the normality test data with the Shapiro-Wilk test obtained a significant value of $p(0.137) > 0.05$ so it shows the data that are normally distributed.

C. Bivariate Analysis

Simple Linear Regression Test is used to investigate the effectiveness of the concentration of Moringa leaf powder and PAC on the levels of organic substances in peat water.

Table 2. Correlations

		Organic Substance Levels	Treatment
Pearson Correlation	Organic Substance Levels	1.000	0.492
	Treatment	0.492	1.000
Sig. (1-tailed)	Organic Substance Levels		0.007
	Treatment	0.007	
N	Organic Substance Levels	24	24
	Treatment	24	24

Based on table 2, it can be seen that the relationship (correlation) between the addition of Moringa leaf powder and PAC with peat water organic matter content is $R = 0.492$. Positive sign on the correlation shows that there is an increase in levels of organic substances after the addition of Moringa leaf powder and PAC.

Anova Test is then performed to determine whether there is a significant (significant) effect of the independent variable on the dependent variable. Based on the ANOVA test, the significance/ probability value of $0.015 < 0.05$, which means that H_a was accepted so that it can be stated that there is an effect of increasing the concentration of Moringa oleifera powder and Poly Aluminum Chloride on Organic Substance Content in Peat Water in Rasau Jaya Village Regency of Kubu Raya.

Moringa leaves can be used to purify water because it contains nine amino acids, sucrose, D-Glucose, Alkaloids, Candles, Quercetin and Kaempferat are also rich in potassium and calcium [7].

Besides the leaves and roots contain lots of protein compounds, vitamins, alkalis, amino acids, and carbohydrates that can also be used as medicine [8]. Moringa leaf powder can be used as a coagulant in the coagulation process because of the protein content contained in these leaves which acts as a polyelectrolyte.

Protein in Moringa leaf powder in the form of amino acids is able to adsorb and form bonds between peat water particles and amino acids to form bonds that are stable and precipitate [9]. In this study the best results were obtained in reducing the concentration of organic substances using Moringa leaf powder and PAC with a mass of 25 mg with an initial concentration of organic substances 176.96 mg/l to 42.04 mg/l. This is due to organic substances in peat water which are reducing in nature have reacted with ammonium cations from cationic proteins contained in Moringa leaf powder. In this process cationic protein in Moringa leaf powder interacts with organic substances in peat water to form colloidal particles [8].

On the addition of PAC and Moringa leaf powder above 25 mg/l levels of organic substances tend to increase. The addition of coagulants is the addition of cations to neutralize the negative charge of colloidal particles in water so that the Van der Waals force occurs, so that colloidal particles flocculate. On the addition of PAC and Moringa leaf powder above 25 mg/l the caption is released too much more than needed by colloidal particles in negatively charged water to form floc.

As a result, there will be excessive absorption of cations by colloidal particles in water so that colloidal particles will be positively charged and repulsion forces occur between particles, resulting in floc deflocation. Floc defoculation will cause the solution to become more turbid and organic substances to increase. In addition to the addition of Moringa leaf powder of more than 25 mg the increase in concentration of organic substances is caused because the mass of the coagulant which exceeds the maximum coagulant no longer enlarges the size of the floc, because the floc is already in saturated condition.

IV. Conclusions

The conclusions of this study are:

1. Average levels of organic matter in peat water before the addition of PAC and moringa leaf powder at 176.96 mg/l. Average levels of organic substances after the addition of PAC 125 mg and Moringa leaf powder at 53.07 mg/l with the average Fe content of 0.48 mg/l in old Lemiding.
2. The results of computerized data processing through statistical regression tests obtained $\text{sig} = 0.015 < 0.05$ which means H_a is accepted so that it can be stated that there is an effect of increasing the concentration of Moringa oleifera leaf powder and PAC on Organic Substance Content In Peat Water in Rasau Jaya Village, Kubu Raya Regency.

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