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The use of the Kelor Seeds (*Moringa oleifera*) as alternative coagulant in waste delivery process of textile industrial waste

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Abstract. This research is to know the influence of moringa seed as coagulant, pH of liquid waste textile industry (jeans wash), size of moringa seed particles to decrease of turbidity percentage. Measurements were made to Total Suspended Solid, Color Rate and Chemical Oxygen Demand for wastewater textile industry by coagulation - flocculation method. Variables of this study were conducted on dosage of moringa, with particle size 212 mesh. The results showed that moringa seeds as coagulant dose optimum is 1250 mg/L for the textile industry wastewater at pH 7.8. Moringa seed powder is about 212 mesh with a dose of 1250 mg/L can lower the turbidity of 77.77%. Total Suspended Solid amounted to 83.69% and Chemical Oxygen Demand amounted to 75.86%.

1. Introduction
Coagulation is a liquid water treatment process by stabilizing colloid particles to facilitate the growth of particles during flocculation, while flocculation is a process of water treatment by making contact between colloidal particles that have been destabilized so that the size of the particles grows into larger particles [1].

According to Davis and Cornwell (1991), there are two important factors in the addition of coagulant those are pH and dose. To regulate the pH of the wastewater into the optimal range of coagulation, a coagulant aid is required in the form of an acid or an alkali. The most commonly used acid to decrease the pH is sulfuric acid and to raise the pH is usually used lime [Ca(OH)$_2$], soda ash (Na$_2$CO$_3$) or NaOH [2].

The dye is a compound which can be used to form a solution or dispersion to another material so that it is colored. Colors in water can be caused by the presence of natural metal ions, namely iron (Fe) and manganese (Mn). The color that is usually measured is the real color that is the color after the turbidity is removed. While the color appears is a color that is not only caused by the solute in water but also suspended substances. The major polluter of the jeans washing industry is waste water. Wastewater from each process contains residual chemicals used and materials used and materials removed from fibers such as starches and dyestuffs.

Kelor (*Moringa oleifera*) belongs to the Moringaceae family, is a single genus of bush tree families cultivated throughout the tropics and is used for various purposes [3]. Figure 1 is an example of a moringa seed image. The use of moringa seeds as coagulant is done by first making a moringa seed solution, then the mixture is used as coagulant as is commonly used other coagulant. In this case can be used dry beans with skin and dry seeds without skin. However, dry seeds with skin are more effective than skinless seeds.
The purpose of this research is to know the ability of kelor seed as coagulant to percentage of turbidity decrease, total suspended solid (TSS), color content of textile industry liquid waste with pH of textile industry liquid waste and dosage of moringa seeds used.

2. Methodology
Materials processed in this experiment are textile wastewater of textile industry (laundering of Jeans). Liquid waste taken from one of the textile industries in Medan and brought to the laboratory. Turbidity, TSS, color and initial pH of liquid waste used first measured. The coagulant material used in this experiment was the Kelor seed.

The coagulant material used in this experiment was the Kelor seed. To make moringa seed coagulant, ripe mature fruit (brown) and dry naturally in the tree is taken then the seeds are removed from the fruit. Seeds with clean shell and then blend into powder and sifted with starch sieves and then dried in a hot oven at 105°C for 30 minutes to homogenize and lower the water content until constant. Moringa seed powder is then ready for use as a coagulant.

3. Result and Discussion
The effect of coagulation dose on the removal of turbidity wastewater (%) in all experiments can be seen in Figure 2. In moringa seeds 1250 mg/L turbidity decreased to 77.77%. In Moringa seeds also seen a noticeable change in Figure 2 shows that the decrease in turbidity on the working moringa seeds decreases turbidity by absorbing and collecting. So formed clumps followed by a quick stirring of 100 rpm which resulted in the formation of small grains and followed by stirring slowly 40 rpm potentially the occurrence of contact between the granules with each other so as to form large clumps that will settle with the force of gravity [4].

Turbidity is said to decrease when crude materials in waste have been reduced because turbidity is a measure that states how much light can penetrate water, where light penetrates water will be reflected by suspended materials and colloidal materials. Turbidity is caused by abrasive materials that are dispersed [5]. In general, if the value of turbidity increases then water filtration is more difficult and its effectiveness decreases [6].
The effect of coagulant on the reduction of TSS on the wastewater of the jeans washing industry in the coagulation / flocculation process. After observing the reduction of turbidity level to the coagulant dose used, it is further observed the effect of coagulant dosage used on TSS on industrial wastewater of jeans leaching. The complete graph can be seen in Figure 3. By using the dosage of moringa seed of 1250 mg / L, TSS was excluded (83.69%). TSS is a solid contained in water and not a solution, this material is distinguished from dissolved solids by laboratory test. TSS usually contains organic and inorganic substances. The effect of coagulant on the decreasing of color content of industrial liquid leaching of jeans on coagulation / flocculation process. Figures 4, 5 and 6 are the relationship between coagulants to decrease the color content of industrial wastewater of jeans leach in coagulation/flocculation process.
From the research, it can be seen that the decrease of color content in waste after coagulation process with the addition of coagulant is very real. By using the color measured lovibond tool is the actual color or real color, i.e. the color after the turbidity is removed while the color appears to be a color not only caused by the solute in water but the suspended substances [7].

From Figures 4 to Figure 6 it is seen that the degradation of color content is very real by using Moringa seed coagulation. On the moringa seed dropped to: red = 0.05, blue = 0.20 and yellow = 0.37 with a dose of 1250 mg/L. The process of coagulation and flocculation is a very good process for decreasing color levels to stop at a certain concentration (not working) [8].

![Graph 1](image1.png)

**Figure 4.** Effect of coagulant dose of moringa seed on the red color.

![Graph 2](image2.png)

**Figure 5.** Effect of coagulant dose of moringa seed on the blue color.

The optimum result obtained from the research of dosage of coagulant dosage of moringa seeds to the removal of turbidity of liquid waste of jeans washing industry at pH 7.8 is dose 1250 mg/L, turbidity 77.77%. According to K. Andani (2004), the use of moringa seeds, pH and coagulant dose is very real to the turbidity marginalized wastewater washing jeans [9]. The optimum pH of the coagulation 3 (three) turbidities was set aside 83.03%. The optimum dose is 120 mg/L or 250 mL or 480 mg/L with the excluded turbidity is 92.21%. 

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For comparison, according to B Enrico (2008), the use of java seeds as a coagulant to the removal of tofu industry liquid waste liquidity at pH 4 doses of 3000 mg/L capable of removing the turbidity of 83.61%, while for alum pH 6 dose 1000 mg/L can eliminate turbidity of 95.73% [10].

![Image: Figure 6. Effect of coagulant dose of moringa seed on the yellow color.](image)

4. Conclusion

From the research of the utilization of moringa seeds as coagulant on coagulation / flocculation of liquid waste of jeans leaching industry can be drawn conclusion as follows: The optimum dose of moringa seed coagulant was 1250 mg/L in pH of liquid waste of jeans washing industry, capable of removing turbidity 77.77%, TSS 83.69%, and red color 0.05, blue 0.20, yellow 0.37 on the Lovibond device at pH 7.8. The use of kelor/moringa seeds as coagulant is quite effective in terms of turbidity removal, TSS, and color content with a pH of 7.8.

References

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