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The Effect Of Melon Seeds (*Cucumis melo* L.) On Reducing TSS (Total Suspended Solid) Levels Of Tahu Industrial Waste Water, Tawangrejo Village Takeran District Magetan District

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ABSTRACT

Tofu liquid waste containing high levels of TSS (Total Suspended Solid) can be treated using coagulation-flocculation. The coagulation process requires additional substances that can help the process of settling suspended particles. Flocculation is the process of combining floc nuclei to form larger floc particles. The aim of the research was to measure the effect of melon seeds (*CucumisMelo* L.) on reducing TSS levels before adding melon seed powder (*CucumisMelo* L.) at doses of 12 gr, 16 gr and 20 gr. This research is a pre-experimental one group pretest-posttest design. Tofu liquid wastewater samples were obtained from tofu factories with varying flocculation coagulation doses using melon seed powder (*CucumisMelo* L.). The independent variable is the dose of melon seeds (*CucumisMelo* L.). The dependent variable is reducing TSS levels in tofu industry wastewater. There were 4 groups of varying doses, namely before treatment, 12 gr, 16 gr, and 20 gr, and each group was repeated 6 times. Data analysis used one-way anova test. The results of the research showed the influence of melon seeds (*CucumisMelo* L.) on reducing TSS (Total Suspended Solid) levels in tofu industrial wastewater at a dose of 12 gr with a result of 91 mg/L. dose 16 with a result of 100 mg/L. and a dose of 20 gr obtained a result of 120 mg/L during the 60 minute deposition process. Based on the one-way ANOVA test analysis, the p value > 0.05 was obtained, so there was an effect of decreasing TSS levels. The suggestion for researchers who will continue is the need to increase the coagulant dose to obtain a more effective reduction in TSS levels.

Keywords: Tofu Industry Liquid Waste, TSS, Coagulation-Flocculation, Melon Seeds

INTRODUCTION

Environmental problems in Indonesia are caused by the development of industries related to waste management, namely water pollution, for example the Tofu industry releases its waste directly into the environment without prior warning that processing can cause pollution. Keep industrial waste away from the awareness of Polluting the environment, waste is treated before entering water bodies (Pamungkas and Slamet 2017). The tofu production process in Indonesia is generally still carried out with simple technology. This tofu processing process

produces solid waste and liquid waste if not handled properly will cause environmental pollution resulting in a low level of efficiency in the use of resources (water and raw materials) with a high level of waste production. Tofu industry activities in Indonesia are dominated by small-scale businesses with limited capital. In terms of location, the tofu industry is the largest industry in all of Indonesia. Human resources involved in the tofu production process generally have low levels of education (Jaya, Ariyani, and Hadijah 2019). In general, there are two types of coagulants commonly used for wastewater

treatment: inorganic and organic coagulants. Some examples of inorganic coagulants include polyalumin chloride (PAC), aluminum sulfate (alum), ferric sulfate, ferric chloride, and polyelectrolytes. Organic coagulants come from natural materials, the use of natural coagulants is carried out to minimize the use of synthetic materials with the aim of returning to nature (Kristianto et al. 2020). The use of coagulant from melon seeds (*Cucumis melo* L) has advantages over other synthetic materials because it is natural, economical and safe to use. Melon seeds (*Cucumis melo* L) contain fiber, iron, magnesium and protein, every 100 grams of melon seeds (*Cucumis melo* L) contain 31.1 grams of protein which is very high so that melon seeds (*Cucumis melo* L) have a large amount of protein content, which gives them the ability to effectively connect and neutralize colloidal particles present in liquid waste from tofu production. The presence of these proteins can substantially contribute to the coagulation process by effectively balancing and canceling the charge exhibited by colloidal particles (Kusniawati, Pratiwi, and Antari 2023). Explained in Ningsih 2020 research, Environmental Engineering Study Program, Faculty of Science and Technology, Sunan Ampel State Islamic University, Surabaya, with the title Effectiveness of Melon Seeds (*Cucumis melo* L) and Papaya Seeds (*Carica Papaya* L.) as Natural Coagulants to Reduce Pollutant Parameters of Tofu Industry Wastewater, it states that melon seed powder (*Cucumis melo* L.) against reducing TSS levels with a dose variation of 5 grams with a percentage result of 35% using a particle size of 70 mesh can reduce TSS levels where the dose given exceeds the coagulant's ability.

Based on the preliminary test above, it is necessary to conduct further research on the effect of melon seeds (*Cucumis melo* L.) in reducing TSS levels in tofu industry liquid waste by using natural coagulant

melon seeds (*Cucumis melo* L.). Thus, it is necessary to conduct research entitled "The Effect of Melon Seeds (*Cucumis melo* L.) on Reducing TSS (Total Suspended Solid) Levels in Tofu Industry Wastewater".

RESEARCH METHOD

The type of research used is Pre-Experimental research where researchers reduce the levels of TSS (Total Suspended Solid) in tofu industry wastewater using the coagulation-flocculation method with natural coagulants from melon seeds (*Cucumis melo* L.). The research design used is one Group, Pre-test and post-test Design, where researchers take measurements before and after the coagulation-flocculation process. The sampling technique used is grab sampling.

RESULT AND DISCUSSION

TSS (Total Suspended Solid) Levels Before and After Adding Melon Seed Powder (*Cucumis melo* L.) With Doses of 12 gr, 16 gr, and 20 gr.

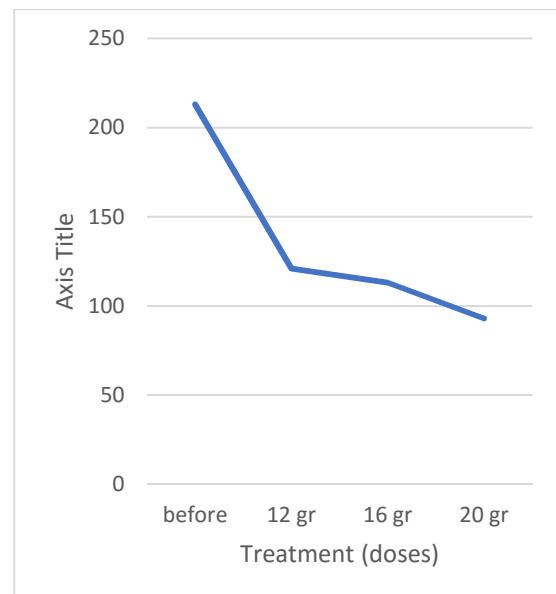


Figure 1. TSS Level Results after Addition of Coagulant

Based on table 1, it is found that the results of the homogeneity test calculation show a value of $p = 0.458$, because the value of p is greater than $\alpha = 0.05$ so that the data can be said to be homogeneous and

can be continued with the One-Way Anova statistical test. It can be seen that the optimal TSS (Total Suspended Solid) level using melon seed powder (*Cucumis melo* L.) coagulant with a dose of 20 gr produces a TSS (Total Suspended Solid) level of 93 mg/L.

Tabel 1. Statistical Analysis Results with Test (One-Way Anova)

Lavene Statistic	Value p
0,901	0,458

Source: Primary Data Test Results SPSS Application

The results of the One-Way Anova analysis show that the p-value = 0.00 ($p < 0.05$) means that statistically H1 is accepted, so there is an effect on reducing TSS (Total Suspended Solid) levels in tofu factory wastewater using melon seed powder coagulant (*Cucumis melo* L.) with doses of 12 gr, 16 gr and 20 gr.

TTS (Total Suspended Solid) Level Before Coagulation Process

From the results of the levels TSS (Total Suspended Solid) in waste water tofu industry before being given the addition of seed powder (*Cucumis melo* L.) with a dose of 12 gr, 16 gr and 20 gr, the results were 213 mg/L, with the lowest level being 212 mg/L and the highest level being 216 mg/L. The results of the TSS (Total Suspended Solid) levels indicate that they have high levels. When sampling tofu factory wastewater before being treated with the addition of melon seed powder (*Cucumis melo* L.) with a dose of 12 gr, 16 gr and 20 gr and observing the physical condition of the tofu wastewater samples. The physical condition of the sample is cloudy, yellow and smelly. The characteristics of tofu liquid waste include physical parameters. The physical properties of waste are determined based on the amount of dissolved solids, suspended solids and total solids, alkalinity, turbidity, color, salinity, electrical conductivity, odor and temperature. (Lisa, Fikri, and Rojali 2022). TSS (Total Suspended Solid) or

suspended solids are solids that cause water turbidity, are not dissolved, and cannot settle. Suspended solids consists of particles that are smaller in size and weight than sediment, such as certain organic materials, clay, waste and others. Effective treatment is needed to reduce TSS levels. Particles that reduce the intensity of light suspended in water generally consist of phytoplankton, zooplankton, animal waste, plant and animal waste, human waste and industrial waste. The presence of TSS (Total Suspended Solid) further reduces oxygen production because it interferes with the penetration of light needed for photosynthesis by plants. The more suspended solids there are under water, the higher the sedimentation of mud in the estuary (Kumalasari 2017).

TSS (Total Suspended Solid) Level After Addition of Melon Seed Powder Coagulant (*Cucumis melo* L.) 12 gr

TSS (Total Suspended Solid) levels in tofu industry wastewater belonging to one of the village residents Tawangrejo, Takeran District with the addition of melon seed powder (*Cucumis melo* L.) with a dose of 12 grams can reduce the TSS (Total Suspended Solid) level by 121 mg/L with a result of 91 mg/L. In tofu factory wastewater, it refers to solid particles suspended in water originating from the tofu production process. TSS (Total Suspended Solid) is an important parameter in assessing the quality of wastewater because these solid particles can affect the aquatic ecosystem if not managed properly. The addition of melon seed powder (*Cucumis melo* L.) is a method used to reduce the TSS (Total Suspended Solid) level in the wastewater. Tofu industry waste can have a negative impact on water quality, which is caused by the increasing content of organic matter in the water. and also disrupts biotic life. High TSS (Total Suspended Solid) in wastewater can cause various environmental problems, such as decreased water quality, damage to aquatic habitats, and negative impacts on human and animal health (Aris., 2021). In this case,

it is in line with research that states that the decrease in TSS (Total Suspended Solid) occurs because melon seed powder has a high protein content so that it is able to bind and neutralize colloidal particles found in tofu liquid wastewater. This protein can help the coagulation process by neutralizing the charges of colloidal particles (Kusniawati, Pratiwi, and Antari 2023). TSS (Total Suspended Solid) Level After Adding Melon Seed Powder Coagulant (Cucumis melo L.) 16 gr. The TSS (Total Suspended Solid) level in tofu industry wastewater belonging to a resident of Tawangrejo village, Takeran District after the addition of melon seed powder (Cucumis melo L.) with a dose of 16 gr of 113 mg/L with a result of 100 mg/L. In reducing the TSS (Total Suspended Solid) level in tofu factory wastewater, it is important to improve water quality and reduce negative impacts on the environment. The addition of melon seed powder (Cucumis melo L.) to wastewater at a dose of 16 grams can reduce TSS (Total Suspended Solid) levels. The use of natural coagulants can certainly be a profitable choice, especially for tropical countries like Indonesia which have high natural resource potential (Ramadhani et al. 2020). The process needed to remove waste material in the form of suspension or colloids. Colloids are particles that cannot settle in a certain time or by themselves and cannot be removed by the usual process. it is necessary to carry out a sedimentation process for processing tofu industry waste to reduce TSS levels. Based on research that has been carried out, it was found that the use of this inorganic coagulant can be harmful to health, therefore an alternative is needed to replace this inorganic coagulant such as a coagulant derived from natural ingredients that are easily obtained around us, for example melon (Cucumis melo L.). Natural coagulant materials such as melon seeds (Cucumis melo L.) may be able to replace synthetic coagulant materials, so that the problems faced by the community and industry can be resolved. (Kusniawati,

Pratiwi, and Antari 2023). TSS (Total Suspended Solid) Levels After Adding 20 gr of Melon Seed Powder Coagulant (Cucumis melo L.). TSS (Total Suspended Solid) levels in tofu industry wastewater belonging to a resident of Tawangrejo village, Takeran District after adding 20 gr of melon seed powder (Cucumis melo L.) of 120 mg/L with a result of 120 mg/L. In this case, it is in line with research which states that the decrease in TSS (Total Suspended Solid) levels is caused by the nature of melon seeds (Cucumis melo L.) which contain water-soluble proteins and when dissolved, melon seeds (Cucumis melo L.) produce positive charges in large quantities. Melon seed solution (Cucumis melo L.) reacts as a polymer coagulant naturally positively charged. When added to a liquid waste sample and followed by stirring, the cationic protein produced by melon seeds (Cucumis melo L.) is distributed throughout the waste and then interacts with negatively charged particles that cause turbidity. As a result, colloidal particles of waste form micro flocs through an adsorption mechanism. The basic principle of the coagulation process is the occurrence of an attractive force between negative ions on one side and positive ions on the other side. The negative ions are particles consisting of organic substances (colloidal particles) microorganisms and bacteria. The optimum reduction in TSS (Total Suspended Solid) levels of tofu liquid waste with melon seed coagulant (Cucumis melo L.) is at a dose of 20 gr with a percentage of 60%. The coagulant dose has a very significant effect on the removal of TSS (Total Suspended Solid) levels in tofu liquid waste because by giving the right dose, the removal of TSS (Cucumis melo L.) levels in the sample will be significant (Ningsih 2020). Test (One-Way Anova) Anova Results of TSS level analysis It was obtained that the p-value was 0.00 (<0.05), which means H1 is accepted, so it can be concluded that there is a difference in the addition before and after the addition of melon seed powder

(Cucumis melo L.) doses of 12 gr, 16 gr, and 20 gr to reduce TSS (Total Suspended Solid) levels in tofu industry wastewater.

CONCLUSION AND RECOMMENDATION

The TSS (Total Suspended Solid) levels in tofu factory wastewater before the addition of melon seed powder (Cucumis melo L.) obtained a result of 213 mg/L, a dose of 12 gr obtained a result of 121 mg/L, a dose of 16 gr obtained a result of 113 mg/L, a dose of 20 gr obtained a result of 93 mg/L. There is an effect of variations in the dose of melon seed powder coagulant (Cucumis melo L.) to reduce the TSS level in tofu industry waste before and after the addition of melon seed powder (Cucumis melo L.) there is an effect obtained p-value 0.00 (<0.05) on the TSS (Total Suspended Solid) level in tofu industry wastewater.

There needs to be a flocculator that works without the need for manual stirring to get maximum results, Further research is needed by increasing the coagulant dose to obtain a more effective reduction in TSS levels, and Filtering is needed after the coagulation flocculation process.

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