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Dyeing Jumput Batik Using Clay Media From the Malo Region, Bojonegoro

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Abstract

Indonesian clay, with red color type was one kind of clay with wide distribution and yet to be well managed. The clay can be used as natural coloring material as a substitute for the textile dyes. This study aims to determine the effect of soaking time on the color produced and the effect of clay solution composition on the color produced. The variable used in this research is the variation of the solution composition (1kg/ 1 L, 1kg/ 2L, 1kg/ 3L) and variation of soaking time (24 hours, 48 hours, and 72 hours). The results of the research show that on the solution composition variation obtained the most concentrated color at 1kg/ 1L solution, and at the soaking time variation obtained the most concentrated color at 72 hours with the intensity of light that can penetrate the fabric is very small.

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INTRODUCTION

Clay is composed of various compositions and compositions of chemical elements that differ from soil units to other soil units (Zuhaida, 2018). One of the chemical elements contained in the soil is iron (Fe) (Febrina & Astrid, 2014). Iron found in nature forms compounds such as minerals hematitie, magnetite, pyrite, siderite, and limonite (Sartohadi, 2004). The content of hematite in the soil can produce a red color (Abdillah & Aldi, 2021).

Red soil is a type of soil with a wide distribution and has not been well managed (Subardja, 2007)(Prasetyo, 2009). The texture of this soil ranges from clay to sandy (Achmat et al., 2016). The use of clay as a natural dye was previously known to have magnetic minerals contained in clay so as to produce color and resistance to fabrics (Mardayani et al., 2022). Red clay has some potential to be used as a natural dye (Purnomo & Cahyana, 2019).

Natural dyes do not have side effects on the environment and health (Pujilestari, 2016)(Alamsyah, 2018). We can use this as a reference because it is in line with regulations in developed countries (such as Germany and Netherlands) which have prohibited the use of chemical dyes (Rosyida & Zulfiya, 2013). Reduced production wasted due to utilizing natural dyes by using simple Liquid Waste Final Disposal Installation (Nurcahyanti et al., 2021)(Heri et al., 2021). The prohibition refers to CBI (Center for the promotion of imports developing countries) Ref, CBI/NB-3032 dated 13 June 1996 concerning dyes for clothing, footwear, bed linen which may not use dyes that are contain chemicals (Kwartiningsih et al., 2006)(Rosyida & Zulfiya, 2013).

The use of clay as a fabric dye by researchers is seen as effective. This is aligned Purnomo and Cahyana (2009) used clay as an ancient environmentally friendly dye using a 24-hour cloth dyeing method. This research proves that the soil in the Sangiran area, Kec. Kalijambe, Kab. Sragen can be used as a natural dye. The difference from this research is that variations in concentration and soaking time are carried out, as well as tests on the color spectrum and wavelengths of light that can pass through the dyed fabric using clay. Besides that, the soil samples come from different area (Malo area, Bojonegoro).

This study aims to determine the effect of soaking time on the color of the resulting jumput batik and the effect of the composition of water and soil on the quality of the resulting jumput batik color.

METHODS

This research was conducted using two experimental methods and the results were tested qualitatively to see the effect of soaking time (24 hours, 48 hours, and 72 hours) and the effect of solution concentration (1kg/1L, 1kg/2L, and 1kg/3L) on clay. The population in this study is soil with red color criteria in Bojonegoro region.

Materials and tools

This study used clay taken from Malo area (Bojonegoro, East Java) as coloring material, 6 pieces of mori cloth with a size of 45 x 45 cm, and water as a clay solvent. The tools used includes basins, hoes, sacks, stirrers, RGB cameras, lux meter applications, clocks, and measuring cups.

Data Collection Procedures

Preparation of Materials and Tools

The type of clay chosen is red soil. It is picked by a hoe and the soil is put in a sack. The clay is weighed with 1 kg per plastic bag (as many as 6 bags).

Soaking Process

The first soaking was carried out in various solutions. The first cloth is soaked in a concentrated solution of 1 kg of clay with 1 liter of water. The second cloth is soaked in a solution concentration of 1 kg of clay with 2 liters of water, and the third cloth is soaked in a solution concentration of 1 kg of clay with 3 liters of water. Of the three variations, the cloth that obtained the darker color results was chosen from the three.

Variations in concentrations with darker colors are used for soaking in the next variation, namely variations in time with periods of 24 hours, 48 hours and 72 hours.

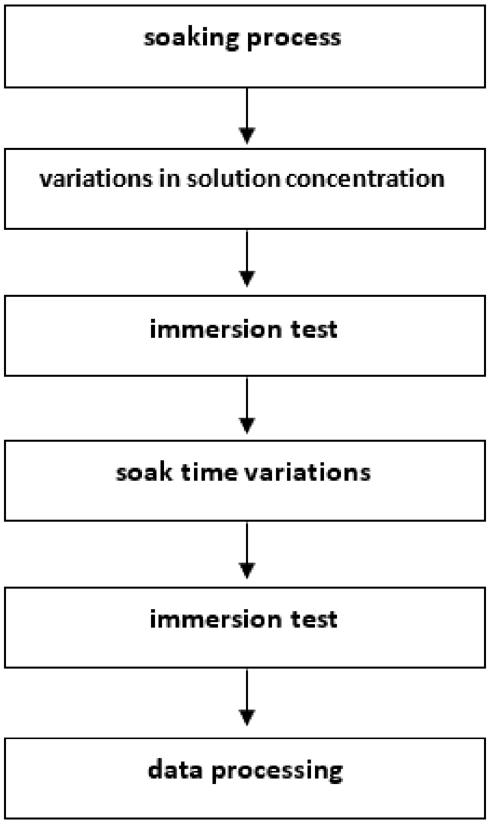

Figure 1. Soaking process (Personal documentation, 2022)

Color Quality Testing

In this study, color testing uses 2 applications, namely RGB and Lux meter. The first application, namely RGB, is used to determine the color spectrum of the resulting wavelength (Ellanda et al., 2016). From each variant, the cloth with the most intense color was chosen to be measured using RGB.

The second application is a Lux meter (light measuring instrument) which is used to determine the amount of light intensity that can penetrate each cloth (Wijaya & Sutrimo, 2020) (Ellanda et al., 2016). Each cloth in each variant is measured using a lux meter which will obtain two data, namely the results of numbers and candelas.

RESULTS AND DISCUSSIONS

Batik Dyeing Results

The results of coloring batik cloth using natural dyes from clay based on concentration variations and time variations, can be seen in Table 1.

Table 1. Results of fabric staining at various concentrations

Concentration variations	Documentation
Without treatment	
1 kg/ 3 liters	
1 kg/ 2 liters	
1 kg/ 1 liter	

The difference between the color absorption in Table 1 is the result of fabric coloring at various concentrations, each of which was soaked for 24 hours at the same time. The soaking obtained the first concentrated color, namely at a concentration of 1 kg of clay with 1 liter of water. The next dark color varies from 1 kg of clay with 2 liters of water, and a less intense color varies from 1 kg of clay to 3 liters of water.

The untreated fabrics listed in Table 1 are used as a comparison between treated and untreated fabrics, in order to determine the effect of the color. After obtaining the results of the cloth with the most intense color, the concentration variation with the most intense color is used as a sample to carry out the next variation test, namely the time variation test.

Table 2. The results of cloth staining at various times

Time variation	Documentation
Without treatment	
24 hours	
48 hours	
72 hours	

The results of the batik coloring test with time variations can be observed in Table 2. We can conclude from the four images that the more intense colors were soaking times of 72 hours, then 48 hours, and 24 hours.

Color Density

RGB camera

Measurement of color density using an RGB camera to determine the color spectrum of the resulting wavelengths obtains the following results.

Table 3. Concentration variations

Variation	RGB camera results
Concentration	#CFC7BC
Time	#C0B6AC

The results from the RGB camera at various concentrations show that at time concentrations it acquires a thick reddish yellow color with code #CFC7BC and code #CQB6AC for a more intense reddish yellow color, namely at 72 hours of time variation.

Lux Meter

In this study, the color density was carried out with two variations, namely concentration variations and solution variations.

Tabel 4. Concentration variations

Concentration variations	Lux meter results (candela)
Without treatment	42.159
1 kg/ 3 liters	24.081
1 kg/ 2 liters	25.975
1 kg/ 1 liter	11.570

The color density of each treatment at various concentrations can be observed in Table 4. Table 4 shows that the smallest light intensity that can penetrate the batik cloth is at a solution concentration of 1 kg of clay in 1 liter of water with a yield of 11.570 candela. Furthermore, for the variation of 1 kg in 2 liters, the result is 25.975 candela, and in a solution of 1 kg of clay in 3 liters of water, the result is 24.081 candela. Fabrics without treatment were still measured using a lux meter to obtain 42.159 candela.

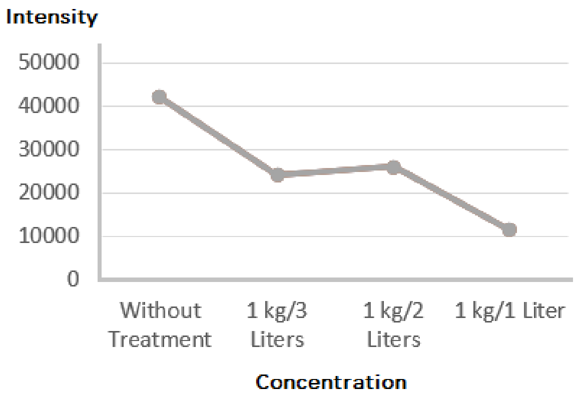

Figure 2. Light intensity as function of concentration

The light intensity for various concentration is shown in Figure 2. The curve shows the decrease in light intensity in each data. The smallest light intensity in the diagram is the variation in the concentration of 1 kg of clay in 1 liter of water, then the variation of the solution of 1 kg of clay in 2 liters of water has increased, as well as the variation of the solution of 1 kg of clay in 3 liters of water has also increased , and the highest light intensity on the unmediated fabric.

The diagram shows that the less water mixed in the clay, the less light intensity the fabric will produce. This is in line with the theory which states that the greater the viscosity the lower the intensity of the incoming light, Choose another term, as if this research is the basis for the truth of the theory in research conducted by Rengganis (2017) it is stated that the viscosity of a substance affects the intensity of light (Rengganis et al., 2017). Meanwhile, the lux meter measurement data at time variations is shown in Table 5.

Tabel 5. Time variation

Time variation	Lux meter results (candela)
Without treatment	42.159
24 hours	7.008
48 hours	5.772
72 hours	4.841

The color density of each treatment at various times can be observed in Table 5. Table 5 shows that the smallest light intensity that can penetrate batik cloth in 72 hours is 4.841 candela, then at 48 hours it was 5.771, at 24 hours it was 7.008 candela, and on fabrics without treatment the intensity of light that could penetrate the cloth was 42.159 candela.

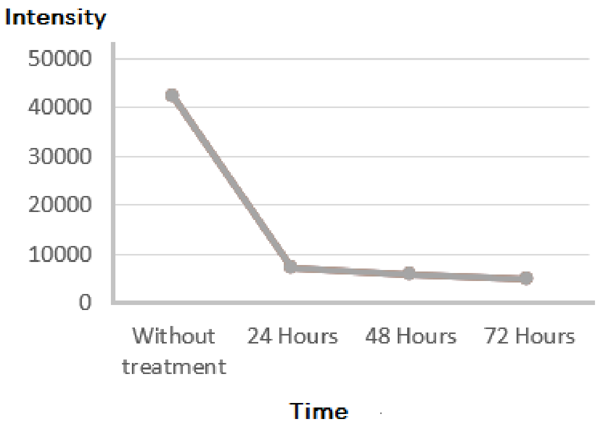

Figure 3. Light intensity vs time

The line diagram for variations in concentration can be observed in Figure 3. The smallest light intensity in the diagram is at the 72-hour time variation, then at the 48-hour time variation it has increased, as well as the 24-hour time variation has also increased, and the highest light intensity is on unmediated fabrics.

Without treatment 1 kg/ 1L 1 kg/ 2L 1 kg/ 3L

Figure 4. Light intensity of various solutuion

The light intensity obtained from lux meter from the variation of the solution can be observed in Figure 4. The light intensityon the untreated cloth is in the upper position which indicates that the light intensity that can be absorbed by the lux meter is still high. In a solution of 1 kg of clay in 1 liter of water, the light intensitybegins to decrease, the darker the color of the cloth, the intensity of light absorbed by the lux meter decreases, this is compared to the cloth without treatment.

The third candle, that is, in a solution of 1 kg of clay in 2 liters of water is also lower, compared to a light intensityin a solution of 1 kg of clay in 1 liter of water, this shows that the intensity of light absorbed by the lux meter through the cloth is lower. Likewise, the variation in the solution of 1 kg of clay in 3 liters of water has the lowest light intensitycompared to the candles on the left, it can be said that the darker the color from the results of the variation of the solution, the intensity of light through the cloth that can be absorbed by the lux meter gets the result which is getting lower.

without treatment 24 hours 48 hours 72 hours

Figure 5. Light intensity as function of time

The light intensityat the time variation of the results of the lux meter measurement can be observed in Figure 5. The figure shows that the further to the right the light intensity goes down, aligned with the more to the right the time variation experiences a 24-hour difference. The light intensityon the untreated cloth is in the upper position which indicates that the light intensity that can be absorbed by the lux meter is still high. At the 24-hour time variation, the light intensity decreased, the darker the color of the cloth, the intensity of light absorbed by the lux meter decreased, when compared to the untreated cloth.

The light intensity at 48 hours, is also lower, compared to the light intensity at 24 hours, this shows that the intensity of light absorbed by the lux meter through the cloth is lower. Likewise, the 72-hour time variation has the lowest light intensitycompared to the intensity on the left. It can be said that the darker the color from the time variation, the lower the intensity of light through the fabric that can be absorbed by the lux meter. This is in line with research conducted by Nilamsari (2018) which states that the darker the color of the cloth affects the intensity of the light that passes through it (Nilamsari, 2018).

CONCLUSION

The use of red clay dye on mori cloth produces coloring in various color directions. The use of concentration variations to obtain a dense color in a mixture of 1 kg of clay in 1 liter of water at a light intensity of 11.570 candela with the color code #CFC7BC. The results of the densest color at the concentration variation were used to test the time variation, the densest color was obtained at 72 hours with a light intensity of 4.841 candela with the color code #C0B6AC. In each treatment, tests were carried out using RGB and lux meters.

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