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ECOPRINT COLOR FASTNESS RESISTANCE ON GOATSKIN MEDIA AGAINST WET RUB AND SUNLIGHT

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ABSTRACT

Many artisans prefer to use artificial (synthetic) dyes because they are faster and easier. However, chemical substances from synthetic dye waste are harmful to the environment. Eco-print technique minimizes environmental losses due to natural coloring techniques on printing or transferring colors and motifs from plants directly to the medium. This study aimed to determine the color fastness of eco-print on goatskin material against wet rubbing and sunlight using mordant and *tunjung*. This research was descriptive research with a quantitative approach. The results showed that the average evaluation value of color fastness to sunlight was 4.75, better than wet rubbing, which got an average evaluation value of 4.42. The bivariate analysis showed the value of sig. (0.043) or H_0 was rejected. In conclusion, there was a difference in color fastness from eco-print on goatskin material against wet rubbing and sunlight.

Keywords: *eco-print, fastness resistance, goatskin.*

INTRODUCTION

The textile industry in Indonesia grows rapidly with a wide variety of textile products in various motifs and colors such as weaving, batik, tie-dyeing, *songket* and eco-print (Wahyuni & Mutmainah, 2020). The process of giving color to textile products to produce a particular color composition is called coloring (Prahastuti, 2016). Many artisans prefer to use artificial (synthetic) dyes because they are faster and easier. However, chemical substances from synthetic dye waste are harmful to the environment. The abundance of Indonesia's natural resources provides an excellent opportunity to be used as a coloring and replace the chemical substances to give more product value and avoid negative impacts onthe environment. A form of developing natural coloring techniques is eco-print

(Flint, 2008: 25; Wahyuni & Mutmainah, 2020).

The eco-print technique is a textile processing technique using natural dyes through a process of printing or transferring colors and shapes of motifs from plants directly on cloth or other media; thus,the motifs from this technique are unique and cannot be repeated since the materials such as leaves, flowers, or twigs are also different (Flint, 2008: 26). Young teak leaves can be used in eco-print techniques because they contain anthocyanin pigments that produce a clearer, brighter, and more concentrated reddish color. Also, young teak leaves contain carotenoids vital in coloring and contain high tannins; they could attach an intense color.

The eco-print technique can be used on fabric media and animal skin. However, animal skin medium is still rarely used due to its relatively lengthy process with high production costs, although it also has a relatively high selling price. A specific point of the eco-print process between fabrics and animal skins is the steaming process, in which the flame should not be too hot on animal skin because it results in curly and stiff media. Animal skin eco-printing uses the steaming technique to maximize the release and absorption of natural colors. Additionally, there is a mordanting process on animal skine co-prints to relax the skin and facilitate the colouring to absorb and lock the natural pigment into the leather material (Larasati et al., 2021; Wahyuni & Mutmainah, 2020).

Eco-printing of teak leaves on goatskin could be developed into a trend that adds the aesthetic value of goatskin to increase the business potential and function of processed goatskin. Goatskin has more unique characteristics and is solid and flexible than sheepskin or cowhide. The harmonious application of colors and motifs from young teak leaves allows the creation of modern, more expansive,innovative, and creative works such as bags, wallets, shoes, and so on (Enita, 2014).

From the interviews that authors conducted with the leather eco-print craftsman Griya Madukara and the Textile Evaluation Laboratory of the Indonesian Islamic University (UII) Yogyakarta, the mordant types affect the color fastness of the produced leather eco-print because mordant is a natural dye binder to bound colors to the fabric or leather. Mordant is an auxiliary material that generates color from natural dyes and strengthens color resistance. Some examples of mordant substances are an alum, *tunjung*, palm sugar, rock sugar, lime water, and so on (Ramanto, 2007: 57). Hence, researchers were encouraged to make further observations to determine the color resistance of the eco-print on goatskin media against wet rubbing and sunlight using a solution of alum and *tunjung* mordants.

RESEARCH METHOD

This research was descriptive research with a quantitative approach. There were 12 observations and 6 samples to test. Data collection was carried out in August–September 2021 at Griya Madukara, which conducts eco-print on animal skin. The object of this research was goatskin, dyed using the eco-print technique with a mordanting process using alum and *tunjung* solutions. This research data was primary data obtained directly from color fastness testing by a team of testers at the Textile Evaluation Laboratory, Islamic University of Indonesia, Yogyakarta, using the grayscale and staining scale following the SNI ISO 105-X12:2012 on color fastness to rubbing and SNI ISO 105-B01:2010 on color fastness to sunlight. There were two variable types in this study: dependent and independent variables. The dependent variable was the color fastness test results against wet rubbing and sunlight.

The independent variables were the type of mordant solution in making eco-prints on goatskin media: alum ($Al_2(SO_4)_3$) and *tunjung* ($FeSO_4$). Data analysis was carried out using descriptive analysis and bivariate analysis. Descriptive analysis was conducted to determine the color fastness of eco-print on goatskin media treated with alum and *tunjung* mordant against wet rubbing and sun exposure. Bivariate analysis was used to determine the difference between the color fastness of eco-print on goatskin media against wet rubbing and sunlight. The statistical tests in this study used the Kruskal Wallis test with the help of SPSS 22 computer software at a 0.05 significance level.

Color Fastness Resistance Test Results Against Wet Rubbing

Table 1. Color Fastness Resistance Test Results Against Wet Rubbing

Color Fastness Resistance Test	Test Number	Mordant Type	
		Alum	*Tunjung*
Wet Rubbing	1	4 (Good)	4.5 (Good)
	2	4.5 (Good)	4.5 (Good)
	3	4.5 (Good)	4.5 (Good)
	Average	4.3 (Good)	4.5 (Good)

Based on the above data, the average score results were a good score of 4.3 using alum mordant and a good score of 4.5 using *tunjung* mordant. Therefore, the eco-

print color fastness test on goatskin media using alum and *tunjung* mordants against wet rubbing had a good evaluation value.

Color Fastness Resistance Test Results Against Sunlight

Table 2. Color Fastness Resistance Test Results Against Sunlight

Color Fastness Resistance Test	Test Number	Mordant Type	
		Alum	*Tunjung*
Sunlight	1	4.5 (Good)	5 (Excellent)
	2	4.5 (Good)	5 (Excellent)
	3	4.5 (Good)	5 (Excellent)
	Average	4.5 (Good)	5 (Excellent)

Based on the above data, the average score results were a good average score of 4.5 on alum mordant and an excellent score of 5 on *tunjung* mordant. Thus, the eco-print color fastness test results on goatskin media using alum mordant and *tunjung* against sunlight were good and excellent evaluation values.

Analysis of Color Fastness Test Against Sunlight and Wet Rubbing

The data obtained from the Islamic University of Indonesia Textile Evaluation Laboratory test results were hypothesized using the SPSS 22 program. The following are the results:

Table 3 Results of Color Fastness Resistance Test Against Wet Rubbing and Sunlight

Color Fastness Resistance Test	Mordant Substances			H count	Sig.	Information
	Alum	*Tunjung*	Average			
Wet Rubbing	4.3	4.5	4.42	4.083	0.043	There's a differ ence
Sunlight	4.5	5	4.75			

Based on the data analysis using Kruskal Wallis above, the value of Sig. (0.043) < α (0.05) or calculated H value (4.083) > χ^2 table (3.841). It can be concluded that there are differences in the results of eco-print color fastness on goatskin media against wet rubbing and sunlight, or H_0 is rejected.

DISCUSSION

Color Fastness Resistance Test Results Against Wet Rubbing

Based on the above data, the average score results were a good average score of 4.5 on alum mordant and an excellent score of 5 on tunjung mordant. Thus, the eco-print color fastness test results on goatskin media using alum mordant and tunjung against sunlight were good and excellent evaluation values.

These followed the research of Priambodho (2015) and Rosyida (2014), which showed that the staining of teak leaves treated with alum and *tunjung* solutions had a good evaluation of the colorfastness value (Priambodho, 2015; Rosyida & Achadi W., 2014). During the coloring process, mordant functions as a bridge between natural dyes and skin tissue to bind well, thereby increasing the color fastness properties (Pancapalaga et al., 2021; Vankar, 2000). Young teak leaves have high anthocyanin, tannin and carotenoid pigments so that the color pigments can be bound and absorbed maximally on the goatskin, making the color difficult to remove even with repeated rubbing (Aradhana et al., 2010; Astiti, 2017; Fathinatullabibah et al., 2014).

Color Fastness Resistance Test Results Against Sunlight

Based on the data analysis using Kruskal Wallis above, the value of Sig. (0.043) < α (0.05) or calculated H value (4.083) > χ^2 table (3.841). It can be concluded that there are differences in the results of eco-print color fastness on goatskin media against wet rubbing and sunlight, or H0 isrejected.

These followed the researches of Murwati (2011) and Nugraha (2020), which showed that the test sample using *tunjung* ($FeSO_4$) as a mordant had the highest value compared to alum mordant ($Al_2(SO_4)_3$) (Murwati et al., 2011; Nugraha & Rakhmatiara, 2020). It occurred because $FeSO_4$ forms complex bonds with a combination of metal salts to protect color pigments from sunlight which breakdown and fade colors (Nugraha & Rakhmatiara, 2020). The Fe^{+2} ions in the *tunjung*/ferrous sulfate reacted with the natural color pigment molecules of young teak leaves into the skin pores, which formed a larger color bond and made it darker than the alum solution (Pujilestari, 2015).

Comparison of Color Fastness Resistance Test Results Against Wet Rub and Sunlight

Based on the data analysis using Kruskal Wallis above, the value of Sig. (0.043) < α (0.05) or calculated H value (4.083) > χ^2 table (3.841). It can be concluded that there

are differences in the results of eco-print color fastness on goatskin media against wet rubbing and sunlight, or H0 is rejected.

This research aligned with Kharisma (2020), who got a better color fastness value in the sunlight test than wet rubbing (Kharisma & Sudiarso, 2020). This study also followed the statement of Vankar (2000), which stated that anthraquinone compounds in teak leaves produce a reddish color and have good fastness to light. These anthraquinones form complex bonds with a combination of metal salts (mordant substances) and produce colors with good fastness (Vankar, 2000). The natural color pigments of young teak leaves during the heating and processing were attached to the goatskin so that the color could be more resistant to the sun's heat (Kwartiningsih et al., 2009). The researcher assumed that if the goatskins is exposed to water or wet cloth, it will cause the skin pores to open and release some of the absorbed dye and leave a mark when repeated 10 times in machine-scrubbed with large enough pressure (Chintya & Utami, 2017; Kharisma & Sudiarso, 2020).

CONCLUSION

Based on the described results, it can be concluded that the color fastness of teak leaf eco-prints on goatskin media using alum and *tunjung* mordants against wet rubbing resulted in the good category. In contrast, the color fastness to sunlight results in a good score for the alum treatment and excellent value evaluation for the *tunjung* treatment. The data analysis using the Kruskal Wallis statistical test showed differences in eco-print's wet rubbing and sunlight results. The level of color resistance to sunlight was better than wet rubbing. The surface of the eco-print on the goatskin media was uneven due to the use of corrugated pipe hoses, and the surface color followed the waves of the pipe hose.

SUGGESTION

Further research in making eco-prints on leather media to use pipe hoses on a flat surface so that the color would more evenly match the pipe hose's surface. Besides, future researchers could alsouse other types of plants such as *lanang* leaves, African leaves, and so on to determine the fastness that could occur. In addition, it is hoped that the fashion study program can provide knowledge and insight to fashion design students about eco-printing on leather media using natural materials.

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