

The application of natural dyes from *rambutan* skin for eco-printing on tanned leather

Penerapan pewarna alami dari kulit rambutan dalam kreasi *eco printing* pada kulit tersamak

RA. Ataswarin Oetopo ^a , Ririn Despriliani ^b , Fariz Al Hazmi ^c * 

^{a b} Universitas Negeri Jakarta, Indonesia

^c Institut Seni Indonesia Yogyakarta, Indonesia

Submitted: July 7, 2022; Accepted: February 22, 2023; Published: February 27, 2023

KEYWORDS

natural dyes,
rambutan skin,
eco-printing,
tanned leather

ABSTRACT

The use of natural materials is a creative and innovative process to increase the potential of the surrounding environment, such as the use of natural dyes. As rambutan skin has been rarely used and reported as a natural dye, this study explores its usage on leather. In this study, we applied rambutan skin as a natural dye to tanned leather from goat crust skin using the creative eco-printing method. We used an experimental method with a pre-experiment one-shot case study design. Each sample was dyed at different times using distinct solutions during the mordant process. The solution was made from rambutan skin and different solvents, such as alum (Al₂(SO₄)₃), calcium oxide (Ca(OH)₂), and ferrous sulfate (FeSO₄). The results show that crust-tanned leather from goat skin can be successfully colored with natural dye from rambutan skin. The more amount of dyes used results in a darker color. In addition, the type of mordant used produces a different color. In the eco-printing process, the background color is influenced by the type of mordant used on the blanket, which serves as a cover for the eco-print process. Meanwhile, the leaves stop the mordant from penetrating the leather and become the source of the motive.

KATA KUNCI

pewarna alami,
kulit rambutan,
eco printing,
kulit tersamak,

ABSTRAK

Memanfaatkan bahan alam sebagai proses berkreasi adalah salah satu upaya dalam melakukan inovasi untuk meningkatkan potensi lingkungan sekitar, salah satunya melalui penggunaan pewarna alami. Pemanfaatan kulit rambutan sebagai pewarna alami masih terbatas pada media yang digunakan sehingga perlu adanya eksplorasi terhadap bahan lain seperti bahan kulit. Tujuan penelitian ini adalah untuk menerapkan kulit rambutan sebagai pewarna alami yang diterapkan pada bahan kulit kambing tersamak jenis crust dan penerapan pada proses berkreasi eco printing. Metode penelitian yang digunakan adalah metode eksperimen dengan bentuk pre-eksperimen jenis *one-shot case study*. Setiap sampel dicelup dengan jumlah pencelupan yang berbeda lalu dilakukan proses mordant dengan larutan yang berbeda yaitu tawas (Al₂(SO₄)₃), kapur (Ca(OH)₂), dan tunjung (FeSO₄). Hasil menunjukkan bahwa kulit kambing tersamak jenis crust dapat diberi warna dengan larutan pewarna alami kulit rambutan. Semakin banyak jumlah pencelupan, maka warna yang dihasilkan semakin pekat dan jenis mordant yang digunakan menghasilkan warna yang berbeda. Dalam proses eco printing, warna pada latar dipengaruhi oleh jenis mordant yang digunakan pada blanket sebagai penutup proses *ecoprint* dan motif yang dihasilkan berasal dari daun yang merintang zat mordant masuk ke dalam kulit.

How to cite this article:

Oetopo, RA, A., Despriliani, R., & Al Hazmi, F. (2023). The application of natural dyes from rambutan skin for eco-printing on tanned leather. *Bahasa dan Seni: Jurnal Bahasa, Sastra, Seni, dan Pengajarannya*, 51(1), 107–119. <https://dx.doi.org/10.17977/um015v51i12023p107>

* Corresponding author: farizalhazmi16@gmail.com

Introduction

Human creativity comes through the process of understanding what they learn in their environment. The creative process produces valuable works of art involving various explorations and innovations. The exploration provides freedom of expression using numerous materials and media, resulting in valuable innovative work for the creator and the surrounding community. Thus, people must comprehend the potential of their surroundings as it is a source of profitable resources for the creative process.

As a country with a tropical climate and abundant natural wealth, Indonesia has many plants with the potential to be used as materials for artistic works offering economic value, including the potential as natural dyes. In addition to its economic benefit, using natural dyes is also environmentally friendly, so the product is sustainable. People are beginning to understand the need to conserve the environment when working in today's society. The increasing environmental concern has provided an understanding to explore new and sustainable sources in the creative sector, such as using natural dyes (Batool et al., 2019). Natural dyes are produced from plants or extracted raw materials such as flowers, leaves, wood, fruit, or other organic materials producing color (Mayliana, 2016).

Natural dyes have long been used as industrial and artistic materials, especially in the field of art crafts such as textiles, leather, wood, and others. However, since 1960 people have begun to abandon natural dyes and shift to using artificial (synthetic) dyes, especially in the handicraft industry (Suheryanto, 2017), although natural dyes are environmentally friendly and safe for health. Anchana (2014) described natural dyes as harmless and non-toxic because they do not cause pollution, so they are safe both for humans and the environment. Thus, natural dyes are a wise choice for protecting the environment from waste pollution produced by synthetic dyes. However, many industries use synthetic dyes, which cause environmental pollution (Guha, 2019).

As a tropical plant, rambutan (*Nephelium lappaceum* sp.) is often found in various regions in Indonesia. The flesh of the fruit is usually consumed by the community, while the skin of the rambutan is left out. Thus, the rambutan skin has not been used optimally and has become a wasted part (Anggara et al., 2020). Consequently, the enhancement of rambutan skin utilization is necessary. In addition, rambutan skin is abundantly available, especially during its harvest season, making the material accessible.

A study by Amalia and Akhtamimi (2016) reported that the skin of rambutan fruit contains anthocyanin pigments, a subtype of organic compounds from the flavonoid family. Reddish anthocyanin is found in plants, including in rambutan, which can potentially serve as a natural dye (Siahaan et al., 2014). A previous study also reported that rambutan skin produces a brown dye solution to be used as a natural dye with various color intensities influenced by the type of mordant solution (Oetopo et al., 2021). If the plant produces color, then the plant has the potential as a natural dye (Elsahida et al., 2019). Thus, rambutan skin has great potential as an environmentally friendly natural dye that can be used for creative processes in the arts.

Eco-printing or commonly called eco-print is one of the techniques used as a creative process in using natural dyes. According to Pressinawangi (2014), eco-print is a

technique of coloring using natural materials by transferring the colors and shapes of plant parts, such as leaves and flowers, on cloth media through direct contact. In the process of eco-prints, the coloring process is carried out as a background color using natural dyes, known as the eco-print dyed blanket technique (Ristiani et al., 2020). As a solution that can potentially be a natural dye, the rambutan skin solution can certainly be applied as a background color in the eco-print process using the eco-print dyed blanket technique. Therefore, the use of the eco-print dyed blanket technique with natural rambutan skin dye can certainly affect the results of the eco-print work. However, the resulting color will undoubtedly be different depending on several components, such as the type of fiber and the material's content. Therefore, using rambutan dye on leather material with protein fibers produces different results than in other materials. Leather is a material that contains protein fibers and is capable of absorbing and binding color, such as tanned leather (Ristiani & Isnaini, 2019).

In creative activities, tanned leather is one of the media used to make crafts in creative activities. Tanned leather has undergone a particular leather tanning process called leather or finished leather (Suardana et al., 2008). Leather that is commonly used in industry and crafts is tanned leather from a goat crust skin. Goat skin is one type of leather used in the tanning process (Mutiar et al., 2021). Meanwhile, crust-type leather has been through the tanning process but has not gone through the painting process and is easily re-wetted. Consequently, the crust-type leather from goat skin can be colored as it still has space for absorption.

Goat skin is a by-product of slaughtering animals, coming from slaughterhouses and other places (Ibrahim et al., 2005). Tanning is converting raw leather into finished leather to be used as an ingredient (Yuniyarti & Isbandi, 2020) with greater durability as the tanning process alters the raw leather into stable leather (Suparno et al., 2008). In addition, the tanned leather from cattle slaughter has a high economic value (Mustakim et al., 2010). Further, the growing trend of the creative economy has made leather craft centers increase (Elfena et al., 2020) since it offers a strong and flexible structure (Purnomo et al., 2014). Therefore, it is one of the raw materials used in the leather industry and works of art (Darmawan & Setiawan, 2020), resulting in bags, wallets, belts, and others.

The usage of natural dyes is one of the efforts to increase the utilization and development of environmentally friendly products. In addition, tanned leather from goat skin is an exclusive valuable material that can be colored using natural dyes (Lestari et al., 2022). Additionally, using leather as an artistic material is a form of utilization of by-products from livestock products. As described by Soekarto (2020), the use of livestock skin is part of optimizing livestock product technology. So the use of leather enables the development of sustainable works with high value.

From the aforementioned discussion, this study explores the application of natural hair dye as a natural dye for tanned leather from goat skin using the eco-print technique. Ristiani and Isnaini (2019) examined the eco-print process on tanned sheepskin, reporting relatively excellent results. Therefore, it is hoped that the application of natural rambutan skin dye is not only limited to cloth media but also to tanned leather media. This application of rambutan skin as a natural coloring agent on tanned leather

from goat skin attempts to optimize the use of raw materials as an alternative media for environmentally friendly products.

Method

This study used an experimental method with a pre-experimental one-shot case study by applying natural rambutan skin dye to crust-tanned leather from goat skin media, specifically using the eco-print dyed blanket technique. The experimental research method is used to find the effect of treatment on others with uncontrolled (Sugiyono, 2015). Further, this study used a one-shot case study because the sample was given treatment, and its results were analyzed in the post-test stage. In a one-shot case study, the experimental process does not go through a pre-test process. Our sample group was tanned leather from crust goat skin treated using natural rambutan skin dye as the base color. In particular, this study focused on implementing the color produced by the natural dye solution of rambutan skin on the medium of tanned leather from crust goat skin. The primary data was obtained from the exploration process. Then the secondary data sources came from literature studies involving books, journals, and previous research.

Design Research

The research procedures were carried out as follows. (1) The preparation stage was initially completed to collect literature reviews relevant to natural dyes from rambutan peels and eco-prints on skin media. In the next step, we prepared the tools and materials for the experiment; (2) The experiment process was carried out by coloring crust-tanned leather from goat skin using natural rambutan skin dye with a different number of dyeing on each sample, one, five, and ten times of dyeing. Then, each sample was fixed with a different mordant solution, using alum, ferro sulfate, and calcium oxide solutions; (3) After the coloring and fixating processes, the samples were subjected to a density test process based on the number of dyes. This test used an ash scale image to obtain the color intensity value produced by a solution of natural rambutan skin dye; (4) The natural rambutan skin dye was applied using the eco-print dyed blanket technique, where natural rambutan skin dye was used as the background color for the eco-print creative process; and (5) The visual analysis stage was also used to describe the results obtained from the exploration process.

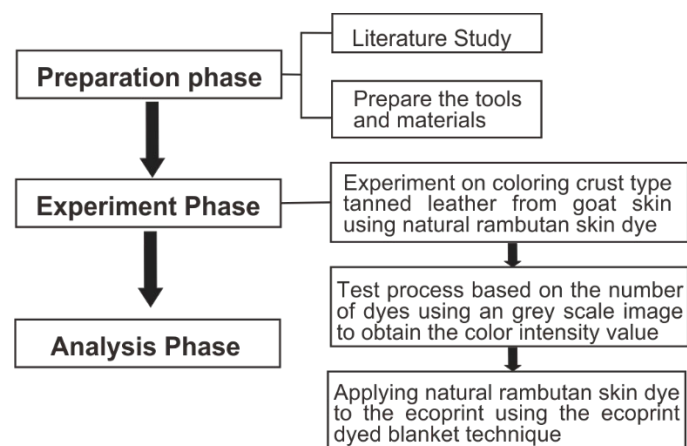


Figure 1. Research procedures

Tools and materials

Table 1. Exploration tools and materials

Tools	Material
a. Stove for heating in the making of natural dye solutions and steaming in the eco-print process.	a. Crust-type tanned leather from goat skin as a medium for implementing ZPA rambutan skin.
b. Steamed pot , as a container for boiling rambutan skin in making ZPA using the extraction and steaming process in the eco-print process	b. Cotton cloth , as a blanket covering the eco-print process
c. Bucket , as a container for the fixation process of leather.	c. Plastic base , as the base for the eco-print process
d. Measuring Jug to measure the amount of solution.	d. Rope/thread , to tie in the eco-print process
e. Scales to measure the weight of the materials	e. Rambutan skin as an ingredient for making natural dyes
f. Cutter to cut the leather	f. Cherry Leaf , to generate motif of the eco-print
	g. Mordant and treatment materials used were alum ($Al_2(SO_4)_3$), calcium oxide ($Ca(OH)_2$), and ferrous sulfate ($FeSO_4$).

Results

In this study, we conducted experiments using tanned leather from goat skin that had gone through the tanning process but had not gone through the coloring process, known as the crust type. Goat skin is commonly used for making leather craft products, such as bags, wallets, leather jackets, and others. The experiment was carried out in several stages, namely the preparation stage, the application stage of natural rambutan skin dye, the color density test using grayscale images, and the application of the eco-print.

Preparation phase

The preparatory stage was carried out to prepare a natural dye solution as a coloring agent and a crust-type tanned leather from goat skin. The rambutan skins were taken from the Suradita area, Cisauk Regency, Tangerang, Indonesia, while the tanned leather was from crust goat skin originating from Yogyakarta, Indonesia. Crust-type tanned leather from goat skin has a thin skin texture, slightly rough and supple with a slightly brown color. The detail of the preparation of dye solution and the pre-mordant of tanned leather from goat skin are described in the following.

(1) Preparation of natural dye solution from rambutan skin

The preparation of rambutan skin natural dye was completed by extraction through the boiling process. The fresh rambutan skin is reddish with a diameter of 5 cm. However, in the experimental process, we used one kilogram of dried rambutan skin, as shown in Figure 2. The extraction process was carried out by boiling.



Figure 2. Dry rambutan skin

The process of making a rambutan skin dye solution was carried out as follows: (1) after being collected, the rambutan skin was dried under the sun for three days and set aside until it turned into blackish color; (2) the one-kilogram rambutan skin was soaked in 8 liters of water; (3) the rambutan skin was boiled using water at a temperature of 950 Celsius for 120 minutes until only 4-5 liters of water were left to get a brown substance; and (4) after the boiling process was complete, the solution was set aside until it drained and could be used to color the tanned leather.

(2) Crust tanned leather pre-mordant process

The pre-mordant process is one of the essential processes in making natural dyes which enables the fabric to absorb correctly. Similar to cloth, a pre-mordant process also needs to be carried out on leather materials that will be colored using natural dyes to increase the absorption of leather in the coloring process. Besides, this process helps produce leather with high color evenness.



Figure 3. Crust type tanned leather from goat skin

Most natural dyes fade easily, so a pre-mordant process is needed. During the pre-mordant process, metal salts are added to the fibers, which will chemically bind the pigments in the natural dye solution. According to Ristiani and Isnaini (2019), the skin pre-mordant process is carried out by soaking the skin in a solution of 100 grams of alum with 6 liters of warm water for three days and then left draining. Based on this method, the pre-mordant process on crust-type tanned leather from goat skin was carried out as follows: (1) one kilogram of tanned leather was soaked in a solution of 100 grams of alum with 6 liters of warm water; (2) tanned leather that had been soaked

remained perfectly submerged for three days; and (3) after three days, the leather was drained and ready to be used as a creative medium with natural dyes.

Implementation phase


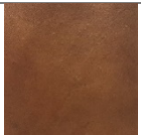
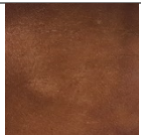
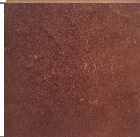
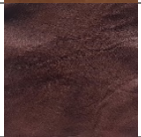
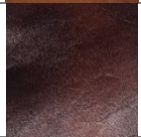
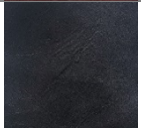
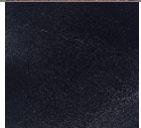
The implementation of natural rambutan skin dye was carried out after we obtained a solution of rambutan skin dye from the extraction. In this process, we tested the crust-type tanned leather from goat skin that had been mordanted and carried out a fixation process using different fixation to get the color. The types of fixation used in this study were alum ($\text{Al}_2(\text{SO}_4)_3$), calcium oxide ($\text{Ca}(\text{OH})_2$), and ferrous sulfate (FeSO_4).

At this stage, experiments were carried out with a different number of dyeing to get the best color density. The number of dyeing carried out was one, five, and ten dyeings. For the experimental process, we carried out the following processes.

- 1) The pre-mordanted tanned leather was cut with a size of 6 cm × 6 cm.
- 2) After cutting, the tanned leather was washed and drained.
- 3) The tanned leather was first dipped into the TRO solution (Turkish red oil) for 5 minutes, then left drained.
- 4) In a slightly damp state, the tanned leather was dipped in a solution of natural dye from rambutan skin. Dyeing was done until the color was evenly distributed and absorbed into the surface of the tanned leather.
- 5) The tanned leather was drained under direct sunlight.
- 6) If dyeing was still in process, then the drying process was carried out at 10 minutes intervals when the skin was still slightly damp. In a slightly damp state, the leather was dyed again. This process was repeated according to the desired number of dyeing.
- 7) After staining, the leather was left for one night to enable the color to seep into the leather.
- 8) Then the leather was fixed or mordanting with different solutions, namely alum ($\text{Al}_2(\text{SO}_4)_3$), calcium oxide ($\text{Ca}(\text{OH})_2$), and ferrous sulfate (FeSO_4) solutions. Each fixation solution was made using the following dosages, a) alum: 70 grams with a mixture of 1 liter of water; b) calcium oxide: 30 grams with 1 liter of water; and c) ferrous sulfate: 50 grams with a mixture of 1 liter of water.
- 9) After going through the process of staining and fixation, the skin was left for one night, then washed.

The staining results were then grouped into mordant types and given codes K (crust-tanned leather from goat skin), TA (alum), KA (calcium oxide), and TU (ferrous sulfate), while the number of dyeing was coded as C1 (1 dyeing), C5 (5 dyeings), and C10 (10 dyeings). The result of the crust goat skin coloring process using a natural rambutan skin dye solution are summarized in Table 2.

Table 2. Results of skin coloring using rambutan skin solution

	Dyeing	One dyeing (code C1)	Five dyeings (code C5)	Ten dyeings (code C10)
mordant				
Alum (Al ₂ (SO ₄) ₃) (code KTA)				
Calcium Oxide (Ca(OH) ₂) (code KKA)				
Ferro Sulfate (FeSO ₄) (code KTU)				

(1) Color density test

After staining the tanned leather, the color density test was carried out by identifying the color intensity using grayscale images. This process is carried out to see the intensity of color density from each sample with different types of fixation. In grayscale images, the index value for perfect white is represented by a value of 255, and perfect black with a value of 0. So the higher index value represents the lower intensity of color density. In contrast, the lower index value shows the higher intensity of color density. The results of the color density test are listed in Table 3.

Table 3. Results of density test through grayscale image

Sample	R.G.B	Index
KTA.C1	0.52	135
KTA.C5	0.40	97
KTA.C10	0.33	89
KKA.C1	0.36	92
KKA.C5	0.19	52
KKA.C10	0.12	31
KTU.C1	0.27	69
KTU.C5	0.15	47
KTU.C10	0.10	26

(2) Implementation phase at ecoprint



The eco-print process was carried out using a steaming technique with cherry leaves (*Muntingia calabura L.*) that had been treated on tanned leather from goat skin that had gone through a pre-mordant process. The treatment process was carried out by soaking cherry leaves in alum solution. Then, the eco-print process was carried out on tanned leather media at 15 × 20 cm. In this process, the eco-print dyed blanket technique was used with natural dyes from rambutan skin. The eco-print process was carried out in the following process:

- 1) crust-type tanned leather from goat skin that had been pre-mordanted was moistened with TRO solution, then colored with rambutan skin solution without mordant;

- 2) after the skin was colored in a slightly damp condition, the leaves were then arranged on top of the skin in random order, while at the bottom of the skin, plastic was given as a base following the size of the skin.
- 3) after the leaves were arranged on the skin, then the skin and leaves were covered with a blanket cloth and dyed with a solution of rambutan skin dye and a solution of mordant while the blanket cloth was wet and wrung out;
- 4) the skin that had been covered with a blanket was rolled up and tied tightly; then, the skin was steamed at a temperature of 80o Celsius for 1.5 hours;
- 5) after steaming, the skin was drained and slowly opened.

The results of the eco-print process on tanned leather with natural rambutan skin dye as an eco-print dyed are shown in Table 4.

Table 4. Results on eco-print

Ecoprint Results on Leather	Description
	<p>Work 1: eco-print leather from a blanket technique given a calcium oxide solution.</p>
	<p>Work 2: eco-print leather produced from blankets technique with ferrous sulfate solution.</p>

Discussion

The application of natural rambutan skin dye on crust-tanned leather from goat skin aims to increase the utilization of rambutan skin material that has not previously been used to its full potential. The results are categorized as sustainable work. In the field of art and design, sustainable principles can be applied to the creation of art products (Herlina et al., 2018). Rambutan skin was extracted by boiling process, producing a brown solution as reported by a previous study that natural dyes can be obtained by an extraction process using water as a solvent at high temperatures (Purnomo in Pujilestari, 2016). The resulting brown color indicates that the rambutan skin solution can be used as a natural dye. This is induced by the antacids within the rambutan skin, allowing its usage as natural dyes (Amalia & Akhtamimi, 2016).

The coloring process of crust-tanned leather was carried out using a solution of natural dye from rambutan skin with three types of fixation solutions or mordant,

namely alum ($\text{Al}_2(\text{SO}_4)_3$), calcium oxide ($\text{Ca}(\text{OH})_2$), and ferrous sulfate (FeSO_4). The three types of fixation are metal mordant commonly used in the fixation process for natural dyes in Indonesia (Darsih et al., 2019). Therefore, this study used the fixation materials that are abundantly available in Indonesia. As it has a slightly dense and thick fiber, the absorption of tanned leather from crust goat skin can absorb the color solution with a soaking time of 10 minutes to facilitate even coloring. However, for more than one dyeing with an interval of 10 minutes, the sample was only dipped into the solution, then removed and drained. Animal skin contains protein that can absorb color (Ristian & Isnaini, 2019). High protein in the skin enables good absorption for the coloring process using natural dyes (Lestari et al., 2022). Meanwhile, the fixation is used to preserve and lock the color so the paint is not faded easily. Singh R & Srivastava S (2015) described that natural dyes require a fixation or mordant process to increase color resistance. Dolca (2018) also contend that natural dyes applied to fiber materials require a fixation or mordant process to enhance and sustain the color. Apart from being a color binder, using alum and ferrous sulfate on leather is a color generator because these substances are safe for the environment (Ardinal & Sy, 2019).

The results of staining on crust leather from goat skin produce different colors following the type of mordant being used. Mordanting with a solution of calcium oxide and alum produces a brown color. Meanwhile, the mordant with ferrous sulfate solution produces a gray to dark black color. This is in line with the opinion of Handayani & Maulana (2013), uncovering that the colors produced by natural dyes are influenced by color-binding agents or mordant. Oetopo et al. (2021) also added that rambutan skin produces various colors influenced by the type of fixation solution. The fixation solution used also creates a more even color because the substance has alkaline-base properties (Ardinal & Sy, 2019), similar to our results. Visually, the more significant number of dyeing processes generates a more concentrated color. However, the natural rambutan skin dye produces not bright and slightly pale color. Basically, as reported in a previous study, the colors produced by natural dyes tend to be paler and have distinctive characteristics (Wulandari, 2011).

From the density test, the index value in each sample decreases, which indicates that the intensity of the color produced by natural dyes for rambutan skin is getting thicker. Accordingly, more dyeing generates more intense color. Then, the quality of the color produced from each fixation solution was identified from each number of dyeing. The sample with 1-time dyeing with alum (KTA.C1) showed an index value of 135, while the sample with calcium oxide (KKA.C1) showed an index value of 92, and the sample with ferrous sulfate (KTU.C1) showed an index value of 69. Further, in five dyeings, the samples used alum (KTA.C5) showed an index value of 97, while the model with calcium oxide (KKA.C5) showed an index value of 52, and the sample with ferrous sulfate (KTU.C5) showed an index value of 47. Then, with ten times of dyeing, the samples using alum (KTA.C10) showed an index value of 89, the sample with calcium oxide (KKA.C10) showed an index value of 31, and the sample with ferrous sulfate (KTU.C10) showed an index value of 26.

The concentration test results showed that all samples treated with ferrous sulfate fixation produced better concentration values than alum and calcium oxide fixation. Meanwhile, the lowest concentration value was shown by the sample fixated with alum

fixation. Thus, the calcium oxide fixation presented a higher concentration value than the solution with alum fixation. Crust-tanned leather from goat skin has a slightly uneven brown color. Therefore, with the correct process, the coloring with rambutan skin helps produce good color evenness.

Our finding indicated that, in crust-tanned leather from goat skin, rambutan skin dye produces good color density using a ferrous sulfate fixation solution. In contrast, in cotton fabrics, the natural dyes from rambutan skin produce good color concentrations with a calcium oxide fixation solution (Amalia & Akhtamimi, 2016). Thus, natural dyes for rambutan skin can be applied to textile products made from fabrics, as well as to crust-tanned leather from goat skin.

The application of eco-print resulted in two works with different visuals, influenced by the mordant solution used in the blanket. In work 1, eco-printing was done using a blanket technique and mordant from a calcium oxide solution, resulting in a brown background with good color evenness. Meanwhile, in work 2, the resulting background color is unevenly black. The color of the motif produced in the eco-print comes from cherry leaves which block the mordant substance from the blanket. The previously colored skin was then modified by a blanket technique given a mordant substance. Parts covered with leaves were not exposed to mordant. The eco-print process not only transfers color to the leaves but also transfers the shape of the leaves into motifs (Pressinawangi, 2014). Thus, the resulting motif forms a cherry leaf pattern but does not reveal the color and character of the leaf

Conclusions

As a material that has protein fiber, crust-tanned leather from goat skin can be colored using a solution of natural rambutan skin dye. The color produced by rambutan skin on leather materials varies according to the type of mordant solution. The mordant process with alum($Al_2(SO_4)_3$) solution produces a brown color, while mordant with calcium oxide($Ca(OH)_2$) solution has a darker brown color than the color produced by mordant with alum solution. Lastly, the mordant process with ferrous sulfate ($FeSO_4$) fixation produces a blackish color. Based on the visual analysis of the density with the greyscale image test, the color produced with mordant using a ferrous sulfate solution was more concentrated than with mordant using alum and calcium oxide solution. The application of a natural dye solution for rambutan skin to tanned leather from goat skin explored through eco-print resulted in two different works. The difference is influenced by the mordant solution used during the eco-print process. The blanket, as a leather cover, was dyed with calcium oxide, producing a brown color on the eco-print background with tanned leather color from goat skin which had previously been dyed with a solution of natural rambutan skin dye. Meanwhile, blankets dyed with ferrous sulfate solution produce a blackish color on the eco-print background.

References

- Amalia, R., & Akhtamimi, I. (2016). Studi pengaruh jenis dan konsentrasi zat fiksasi terhadap kualitas warna kain batik dengan pewarna alam limbah kulit buah rambutan (*Nephelium Lappaceum*). *Dinamika Kerajinan dan Batik: Majalah Ilmiah*, 33(2). <https://doi.org/10.22322/dkb.v33i2.1474>

- Anchana, A. (2014). Extraction of natural dyes from fungus – An alternate for textile dyeing. *Journal of Natural Sciences Research Wwv*, 4(7).
- Anggara, D., Harijanja, M. S., Musfitasari, A., Marselinha, M., Wahyudianto, F. X. A., & Fernandes, A. (2020). Potensi limbah kulit rambutan (*Nephelium Lappaceum*) sebagai minuman seduhan herbal. *Jurnal Agroteknologi*, 13(02). <https://doi.org/10.19184/j-agt.v13i02.11576>
- Ardinal, A., & Sy, S. (2019). Pengaruh konsentrasi tawas dan tunjung dalam limbah cair pengolahan gambir (*Uncaria gambir Roxb.*) untuk penyamakan kulit. *Jurnal Litbang Industri*, 9(2). <https://doi.org/10.24960/jli.v9i2.5751.141-149>
- Batool, F., Iqbal, N., Azeem, M., Adeel, S., & Ali, M. (2019). Sustainable dyeing of cotton fabric using black carrot (*Daucus carota L.*) plant residue as a source of natural colorant. *Polish Journal of Environmental Studies*, 28(5). <https://doi.org/10.15244/pjoes/93712>
- Darmawan, A., & Setiawan, T. (2020). sentra kerajinan kulit di Kemang. *Jurnal Sains, Teknologi, Urban, Perancangan, Arsitektur (Stupa)*, 1(2). <https://doi.org/10.24912/stupa.v1i2.4447>
- Darsih, C., Lestari, D. W., Pratiwi, D., Indrianingsih, A. W., Rosyida, V. T., Apriana, W., Nisa, K., Hayati, S. N., Handayani, S., & Wulanjati, M. P. (2019). Dyeing of cotton fabric with natural dye from *Cudrania Javanensis* using Soka leaves extract as biomordant. *Dinamika Kerajinan Dan Batik: Majalah Ilmiah*, 36(2). <https://doi.org/10.22322/dkb.v36i2.5446>
- Dolca, C. (2018). Textiles coloured with natural dyes of vegetal origin. *Scientific Bulletin Series D: Mining, Mineral Processing, Non-Ferrous Metallurgy, Geology and Environmental Engineering*, 32(2), 81–89. <https://doi.org/10.37193/SBSD.2018.2.09>
- Elfena, L., Nurhadi, N., & Nurcahyono, O. H. (2020). Arena produksi kultural kerajinan kulit di Surakarta dalam tren ekonomi kreatif. *Jurnal Socius: Journal of Sociology Research and Education*, 7(2). <https://doi.org/10.24036/scs.v7i2.244>
- Elsahida, K., Fauzi, A. M., Sailah, I., & Siregar, I. Z. (2019). Sustainability of the use of natural dyes in the textile industry. *IOP Conference Series: Earth and Environmental Science*, 399(1). <https://doi.org/10.1088/1755-1315/399/1/012065>
- Guha, A. K. (2019). A review on sources and application of natural dyes in textiles. *International Journal of Textile Science*, 8(2).
- Handayani, P. A., & Maulana, I. (2013). Pewarna alami batik dari kulit Soga Tingi (Ceriops Tagal) dengan metode ekstraksi prima. *Jurnal Bahan Alam Terbarukan*, 4(1).
- Herlina, M. S., Dartono, F. A., & Setyawan. (2018). Eksplorasi eco printing untuk produk sustainable fashion. *Ornamen: Jurnal Kriya*, 15(02).
- Ibrahim, L., & et al. (2005). *Ilmu dan teknologi pengolahan kulit*. Fakultas Peternakan Universitas Andalas.
- Lestari, F., Susanto, Moh. R., Susanto, D., Sugiyamin, S., & Qisti, B. I. (2022). Aplikasi Teknik Ecoprint Pada Media Kulit Dalam Pembuatan Tas Fashion Wanita Dalam Konteks Liminalitas. *JSRW (Jurnal Senirupa Warna)*, 10(1). <https://doi.org/10.36806/v10i1.146>
- Mayliana, E. (2016). Pengaruh lama waktu mordanting terhadap ketahanan warna dan kekuatan tarik kain mori dalam proses pewarnaan dengan. *Corak*, 5(1), 9-15 <https://doi.org/10.24821/corak.v5i1.2373>
- Mustakim, Aris, S. W., & Kurniawan, A. P. (2010). Perbedaan kualitas kulit kambing peranakan etawa (PE) dan peranakan boor (PB) yang disamak krom. *Jurnal Ternak Tropika*, 11(1).
- Mutiari, S., Kasim, A., Emriadi, E., & Asben, A. (2021). Analisis post mortem kulit kambing mentah yang diolah di UPTD penyamakan kulit Padang Panjang. *Majalah Kulit, Karet, Dan Plastik*, 37(1). <https://doi.org/10.20543/mkpk.v37i1.6699>
- Oetopo, RA. A., Suprabanindya, C. T., Despriliani, R., & Hazmi, F. al. (2021). Penerapan zat pewarna alami limbah organik kulit rambutan (*Nephelium Lappaceum*) pada bahan katun dengan teknik Shibori (*tie dyes*) dan batik. *Jurnal Imajinasi*, 5(1). <https://doi.org/10.26858/i.v5i1.20322>

- Pressinawangi. (2014). Jurnal tingkat sarjana bidang senirupa dan desain eksplorasi teknik ecoprint dengan menggunakan limbah besi dan pewarna alami untuk produk fashion. *Craft*, 3(1),
- Pujilestari, T. (2016). Review: Sumber dan pemanfaatan zat warna alam untuk keperluan industri. *Dinamika Kerajinan Dan Batik: Majalah Ilmiah*, 32(2). <https://doi.org/10.22322/dkb.v32i2.1365>
- Purnomo, E., Hermawan, P., & Abdullah, S. S. (2014). *Teknologi pengolahan kulit*. Puspita Komunikasi.
- Ristiani, S., & Isnaini. (2019). Eksplorasi teknik ecoprint pada media kulit/exploration of ecoprint techniques on leather media. *Prosiding Seminar Nasional Batik Dan Kerajinan*, 7.
- Ristiani, S., Salma, I., & Sulistyarningsih, T. (2020). Ecoprint dyed blanket dengan pewarna alami tingi (ceriops tagal) pada variasi pre-mordan dan jenis kain. *Prosiding Seminar Nasional*.
- Siahaan, L. O., Hutapea, E. R. F., & Tambun, R. (2014). Ekstraksi pigmen antosianin dari kulit rambutan (*Nephelium Lappaceum*) dengan pelarut etanol. *Jurnal Teknik Kimia USU*, 3(3). <https://doi.org/10.32734/jtk.v3i3.1640>
- Singh R, & Srivastava S. (2015). exploration of flower based natural dyes-a review. *Research Journal of Recent Sciences* (Vol. 4).
- Soekarto, S. T. (2020). *Teknologi hasil ternak*. Penerbit IPB Press.
- Suardana, I. W., Putra, I. M. S., & Rubiyanto. (2008). Kriya kulit. *Journal of Chemical Information and Modeling* (Vol. 53, Issue 9).
- Sugiyono. (2015). Metode penelitian dan pengembangan pendekatan kualitatif, kuantitatif, dan R&D.
- Suheryanto, D. (2017). *Natural dyes – Ensiklopedia zat warna alami dari tumbuhan untuk industri batik*. Penerbit Andi.
- Suparno, O., Covington, A. D., & Evans, C. S. (2008). Teknologi baru penyamakan kulit ramah lingkungan: Penyamakan kombinasi menggunakan penyamak nabati, natfold dan oksazolidin. *Jurnal Teknologi Industri Pertanian*, 18(2).
- Wulandari, A. (2011). Batik Nusantara: Makna filosofis, cara pembuatan dan industri batik. *Andi Yogyakarta*, 30(1).
- Yuniyarti, S., & Isbandi, T. (2020). Degradasi limbah khrom dan daur ulang untuk bahan proses penyamakan kulit dengan menggunakan koagulan Kapur Tohor. *Jurnal Rekayasa Lingkungan*, 18(1). <https://doi.org/10.37412/jrl.v18i1.18>