Innovating Contemporary Betawi Batik: A Study of Rust Dyeing Techniques Using Steam

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Abstract. Rumah Batik Palbatu is a batik craftsman that innovates in the field of contemporary batik. The problem that arises is the use of expensive remasol dyes, which necessitates the need for more efficient and unique dyes, specifically through the Rust Dyeing technique. This research aims to develop contemporary Betawi Batik using steam-based rust dyeing techniques, by optimizing the rust dyeing process in batik fabric production. This not only saves on remasol dyeing but also strengthens the batik colors. Additionally, metals are more readily available and cheaper, and the resulting motifs are unique and attractive. This qualitative research uses an exploratory method with a design thinking approach through five stages: empathize, define, ideate, prototype, and evaluation/test. The research results show that using staples as a metal source for motifs creates aesthetic patterns and saves synthetic dyes by up to 50%. This offers a sustainable solution for the modern batik industry.

Keywords: Rust Dyeing, Batik Betawi Kontemporer, Steam Techniques

1 Introduction

Batik is one of Indonesia's cultural heritages that holds deep artistic and historical value, especially in the context of Betawi culture. Betawi batik has its own distinctive characteristics that reflect the life of the Betawi people, as well as the values contained within it. In its development, Betawi batik has undergone significant transformation, especially with the emergence of contemporary batik that combines traditional elements with modern innovation. Rumah Batik Palbatu (RBP) is a type of Usaha Mikro, Kecil dan Menengah (UMKM) in the Creative Industry, specifically in fashion, that focuses on the development of Contemporary Betawi Batik with the aim of preserving batik culture as a heritage of the nation's ancestors, in addition to being a place to learn the process and techniques of batik-making that are interesting and enjoyable for young people and local residents, as well as providing opportunities for friends with disabilities to create unique and beautiful batik products. Betawi culture is expressed in batik fabric with Betawi motifs, referencing the characteristics of the city of Jakarta, such as decorative elements from skyscrapers, traditional houses, street food or culinary delights, community entertainment icons, tourist attractions, and more.

The results of the empathize phase through interviews and observations conducted with Budi Dwi Hariyanto, the owner of Rumah Batik Palbatu (RBP), show that the batik cloth produced uses the colet technique with high-quality synthetic remasol dyes. In addition to being easier to use and practical, it requires less water, the dyeing process can be paused, the

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resulting colors are solid, and it has good wash fastness, making it less prone to fading. [1]. However, the price of high-quality remasol dye is quite expensive, ranging from Rp300,000 to Rp 900,000 per kilogram, where the use of 1 kg of remasol can only dye a maximum of 7 fabrics. Therefore, there is a need for a solid, unique dyeing alternative with good wash fastness. Based on these issues, the researcher attempts to combine batik colet with the rust dyeing technique to reduce the use of remasol, as it serves as an alternative to natural dyes due to its ease of use, ability to produce unique visualizations, and the generation of different patterns, designs, and color effects in each production. Additionally, it is processed using environmentally friendly and safe dyeing technology [2]. From the literature review, the researchers found that there are entrepreneurs using batik and rust dyeing techniques in the city of Surabaya. However, the rust dyeing process requires a considerable amount of time for metal oxidation, and the availability of rusted metal is somewhat difficult to find. Additionally, the rust content can vary, resulting in inadequate colors and patterns for large-scale production. Therefore, this research aims to develop the rust dyeing technique using the steam method on contemporary batik as an effort to enhance contemporary Betawi batik by utilizing easily obtainable metals to improve effectiveness and efficiency (time savings) in the rust dyeing process.

2 Method

This study uses an exploratory qualitative approach that is in line with the design mindset. The qualitative method was chosen because it views truth as something dynamic, which is discovered through social interaction to understand individual experiences [3]. The exploratory approaputrich aims to find new knowledge and identify unresolved problems, especially in a visual context, not through mathematical calculations. Data were collected through observation, documentation of the coloring process, and interviews with batik craftsmen. In this study, the researcher adopted Hasso Plattner's Design Thinking approach which includes five stages: Empathize (understanding users), Define (structuring problems), Ideate (developing solution ideas), Prototype (creating prototypes), and Test (testing and getting feedback).

3 Result and Discussion

The purpose of the research on Contemporary Betawi Batik Innovation: Study of Rust Dyeing Technique with Steam is to reduce the use of remasol as a dye for batik at Rumah Batik Palbatu. The results of the application of the rust dyeing technique with the steam method are expected to show the uniqueness and beauty of the colors produced. The description of the coloring results will include the variations in color obtained, as well as a comparison with traditional coloring techniques. This study will also explore how the final results of this technique can affect the visual appeal of contemporary Betawi batik. The stages carried out in this study are based on the Design Thinking stages consisting of Empathize, Define, Ideate, Prototype, and Test/Evaluation with the following details:

3.1 Empathize and Define

From online research conducted by researchers on 9 competing batik makers in Jakarta, namely Batik Danar Hadi, Batik Marunda, Jauh Mata Memandang, Batik Betawi Terogong, Batik Pohon, Narabe, Bin House, Iwan Tirta, and Batik Wolter, there are no batik

makers who combine contemporary batik motifs with rust dyeing techniques. This could be a good opportunity for Rumah Batik Palbatu to create a collection of batik fabrics and clothing by combining contemporary batik motifs and rust dyeing techniques. Based on interviews, partners have the challenge of expanding the target market among early adults aged 30-35 years who want modest wear that can be worn by both women and men.

3.2 Ideate

The Ideate stage carried out by researchers is to find sources of inspiration as the development of contemporary batik motifs and rust dyeing techniques that will be created. Researchers take the beauty of Jakarta at night by depicting the night sky of Jakarta, the depiction of the twinkling street lights is made into a monochrome brown color that is adjusted to the natural color of rust/rust dyeing.

3.3 Prototype

The initial prototype stage is to make fabric explorations according to the initial idea concept, namely exploring the combination of rust dyeing and batik techniques as follows:

Table 1. Stage of Exploration Batik and Rust Dyeing

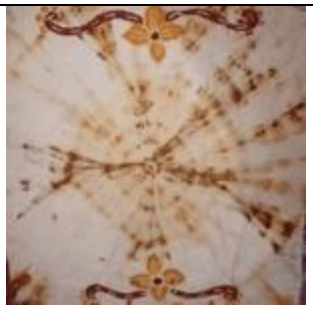
No	Stages of Exploration	Documentation
1.	Scouring, which is the stage of cleaning primisima cloth from starch and other attached dirt. Using soap, it is enough to soak for 5-10 minutes and then lightly rubbed, rinsed and dried in the sun.	
2.	Making batik: The batik stage starts from making a motif on the cloth using a 2B pencil, then the motif is given malam using canting, stamp and brush, then given color by dicolet using a sponge brush, dried (air-dried) then fixed using waterglass, dried in the sun and then rinsed with clean water. Then the fabric is melorod into boiling water to which soda ash and starch are added. Rinse thoroughly and dry again until dry. At this stage it takes +- 9 hours in fairly hot weather conditions.	

3. Making rust dyeing:
The stage of making rust dyeing generally starts from giving a mordant solution by soaking it in a solution of salt and vinegar. Then the rusty iron is placed or tied as desired, then left for a day so that the fabric can absorb the color from the rust.
At the stage of making rust dyeing using the steam technique, the fabric that has been given metal streples is mordanted using salt and vinegar, then in a humid condition wrapped in plastic and neatly folded and tied. Then steamed for 60 minutes and allowed to stand for 12 hours in conditions still wrapped in plastic earlier. Then steamed again for 60 minutes and the package can be opened if the rust results are clearly visible. Then fix by soaking in salt water solution for 1 hour, set aside the metal, rinse and oxidize.

4. Oxidation, which is the drying stage by drying the fabric by aerating it after the above 2 stages have been carried out, in order to bind the color that has been given to the fabric.

Of the several techniques explored, there are at least 4 exploration results made, namely 1) rust dyeing then batik with long iron ties, wire, and nails; 2) rust dyeing then batik with rusty metal baths with shibori ties; 3) Batik then rust dyeing using staples; 4) Batik then rust dyeing using staples. Batik then rust dyeing using item placement; 4) Batik then rust dyeing using staples.

Table 2. Analysis of exploration results

No.	Technique	Analysis	Motive result
1.	Rust Dyeing and then in Batik	- Using long iron, wire, and nails, it is difficult to get materials with stable rust levels. - Making the fabric takes at least 2 days including 1 day for rust dyeing, and 1 day for batik making. - The rust dyeing motif produced by the elongated abstract produced from the nails is uneven and influenced by the bonding. - Batik motifs are affected by rust dyeing so that the colors are less clear. - More thought is needed in placing the right position of the batik motif to minimize the shortcomings of rust dyeing and the resulting batik color is harmonious.	 
2.	Rust Dyeing and then in Batik	- The resulting rust dyeing motif is regular with a circular pattern, but looks like shibori. - It took 2 days to complete. - The batik motif needs to be adjusted to the position of the rust dyeing, so it is a bit difficult to apply the idea concept. - The color is dominated by rust dyeing so that the batik motif is less visible..	

3.	Batik then rust dyeing with item placement technique	- The results of rust dyeing fill the fabric so that it looks like a basic batik dye. - One-time steaming and one-time oxidation, so the rust dyeing color is less clear and saves 3-4 hours. - The use of the item placement technique so that the rust dyeing motif can adjust the batik motif that has been made beforehand and does not damage the existing batik motif.	
4.	Batik then rust dyeing using staple technique	- Rust dyeing forms a dotted pattern resembling Jakarta's street signs - Double steaming and double oxidation so that the color produced is very clear and real, and saves 1.5 hours faster. - Giving wax night with a brush is faster than with canting for thicker (bold) results. - The use of steples can be customized with existing batik motifs.	

From the exploration carried out, the cloth made by rust dyeing first and then batik, the coloring results on the batik cloth are not good, the colors and motifs look less unified and the batik colors become less assertive. Meanwhile, rust dyeing which is done after batik, produces good batik motifs and the placement of rust dyeing is also getting better adjusted to the existing batik motif. Rust Dyeing techniques that are carried out can also use staples because they are easy to apply and easy to organize according to the batik motif that has been made before. The color of the batik is also not affected by the rust dyeing made so this technique is good to use. Steaming and oxidation are done twice to maximize the color and motif of the rust dyeing done. From the results of this exploration, it is found that the use of remasol from around 140-145 gr for 1 cloth can be reduced to 65-80 gr only, or 50% more efficient than usual use.

FIG *1*. Development results of batik and rust dyeing

The final prototype was done to produce the fabric into ready-to-wear clothes that can be applied by Rumah Batik Palbatu with a target market of early adult men and women aged 30-35 years who live in Jakarta and like contemporary ethnic clothing and can be used in various formal and semi-formal occasions. At this stage, the clothes produced are outer and pants combined with plain material in matching colors.

(a) (b)

FIG .2. Product Development Results Of Batik and Rust Dyeing, (a) Design 1, (b) Design 2

3.1. Evaluation

The Test/Evaluation stage is carried out to find out the opinions and suggestions of the owner of Rumah Batik Palbatu regarding the products produced so that they can then be applied in these MSMEs. The results of interviews conducted on fabrics and clothing that the

product is very good and can reduce the use of textile dyes, namely remasol up to 50% and the type of clothing can be applied at Rumah Batik Palbatu for further product development.

Analysis of research results on the rust dyeing technique with steam on Betawi batik shows that this innovation brings various benefits compared to traditional dyeing methods using remasol.

1. Time and Cost Efficiency

The use of the rust dyeing technique with steam cuts production time because it requires a faster dyeing process. Based on the exploration results, this technique saves about 1.5 to 4 hours compared to conventional methods. In addition, the use of remasol is reduced from 140-145 grams per cloth to 65-80 grams, which means material efficiency reaches around 50%. These savings not only reduce production costs but also reduce dependence on synthetic chemicals.

Table 3. comparison of methods

Parameters	**Old Method (Remasol)**	**Rust Dyeing (Steam Method)**
Working Time	± 2 hari	± 1,5 hari
Use of Remasol	140-145 gram	65-80 gram
Time Savings	-	1,5 - 4 jam

2. Environmental Impact

The rust dyeing technique based on iron oxidation is more environmentally friendly because it reduces the use of synthetic dyes, which often produce hazardous waste. Reduction of remasol by up to 50% reduces the potential for water and soil pollution, which is very relevant for environmental conservation in the textile industry. Rust dyeing also uses natural ingredients such as salt and vinegar, which are more easily decomposed naturally.

3. Quality and Visual Appeal

Rust dyeing produces unique colors and motifs with a monochrome appearance that emphasizes a natural and rustic impression, suitable for contemporary motifs. The results of the analysis show that the rust dyeing technique applied after the batik process produces more harmonious motifs and more prominent batik colors. This technique also allows the use of materials such as staples to create regular patterns, providing freedom in designs that match the batik motif.

Table 4. Comparison Of Results And Challenges

Techniques	Visual Results and Color	Challenges
Rust Dyeing then Batik	Batik color is less clear, motifs are not harmonious	Need to arrange motif placement
Batik then Rust Dyeing	Batik color is more assertive, motifs are harmonious	Rust technique arrangement is needed

4. Impact on the Contemporary Fashion Industry

The combination of batik motifs with rust dyeing techniques has great potential in the contemporary fashion market, especially for consumers looking for an ethnic look with a modern approach. This collection appeals to young adults who like "modest wear" clothing that is elegant but still rich in culture. In terms of commercial, clothing with rust dyeing techniques and batik has the potential to be marketed as sustainable fashion products that reflect local identity and reduce environmental impact.

5. Cultural Preservation Efforts

By introducing the rust dyeing technique, this innovation opens up opportunities to enrich Betawi batik motifs with new aesthetics without losing their traditional values. This technique also encourages craftsmen to adopt alternative coloring methods that are not only relevant to current fashion trends but also support the sustainability of cultural heritage. The use of motifs inspired by elements of the city of Jakarta at night strengthens local identity, while offering added value to batik as a product that can compete in the international market.

Conclusion

In conclusion, the rust dyeing technique with the steam method offers a sustainable solution for the batik industry by saving production time, reducing the use of synthetic dyes, and producing unique motifs that suit contemporary visual preferences. This technique allows for efficiency of up to 1.5 hours per production with two steaming and oxidation processes, and reduces the use of remasol by up to 50%, thus reducing environmental impact. The use of staples as a rusty metal motif provides its own uniqueness that can be adjusted to traditional batik motifs, resulting in distinctive Betawi batik cloth, interpreting Jakarta's night view with a modern ethnic style.

The broader implications of this innovation include significant opportunities for the batik industry to attract the contemporary fashion market looking for sustainable products with cultural value. The incorporation of the rust dyeing technique into Betawi batik has the potential to expand market reach, especially in the ready-to-wear clothing line for young adults, such as outerwear and pants that can be used for various events. For future research, it is recommended to develop more variations of motifs that utilize local cultural icons, as well as optimize the production flow that supports the development of regional-based batik and the uniqueness of the culture of each region. Further research can also explore the use of other environmentally friendly materials that strengthen the sustainability aspect, while maintaining the characteristics of batik as a cultural heritage.

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