

## Batik Coloring with Gambir Waste: Reduction of Quantity and Soaking Length on Color Intensity

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### Abstract

*Natural dyes are increasingly important as an alternative to synthetic dyes because they are more environmentally friendly and not harmful to health. Gambir liquid waste, a by-product of gambir production, has potential as a natural dye for batik. This research aims to test the effect of quantity and duration of soaking mori in gambir waste solution on color intensity and the application of gambir waste in making batik crafts. The research uses a creative experimental method with a design process approach. The quantity of gambir waste, soaking time, and use of fixator (alum, tunjung, whitening) were tested to assess their effect on color intensity. Procedures include mori dipping, color fixation, and color streaking. The results showed that the quantity of gambir waste and the soaking time significantly influenced the color intensity of the mori. A more intense color is produced with a higher solution concentration and longer soaking until it reaches the saturation point. The use of a fixator produces different color variations, strengthening the color's resistance to fading. Gambir liquid waste has been proven to be effective as a natural dye with variations in color intensity based on quantity, time and fixator settings. Factors such as pH, temperature, and dyeing technique also influence the results. This research contributes to efforts to sustain and innovate environmentally friendly batik art.*

**Keywords:** *Batik Coloring, Gambir Waste, Natural Dyes, Color Intensity, Eco-Friendly Textile.*

### Introduction

Coloring on textiles has been known since humans discovered civilization. Humans have used natural dyes extracted from vegetables, fruits, flowers and insects (Kant, 2012); (Sugiyono, 2019); (Salim, 2012). Natural dyes are dyes whose ingredients are mostly taken from plants. Natural dyes are dyes (pigments) that come from plants or animals, for example rubberenoids, chlorophyll, tannins (Nugraheni, 2014). Along with the increasing need for color, discoveries of new dyes are increasing, especially discoveries of synthetic dyes. Synthetic dyes are easy to get and easy to use.

The development of synthetic dyes has caused many batik craftsmen to switch from natural dyeing to synthetic dyeing, because it is more practical than natural dyeing (Efi, 2012); (Efi, 2017); (Harwiki, 2018). However, on the other hand, synthetic colors are uncomfortable for the body and not environmentally friendly. So it is hoped that the industrial community and craftspeople can return to using natural dyes that do not harm health and do not damage the environment. Natural coloring is a coloring substance obtained from nature (Djufri & Rasjid, 1973); (Efi, 2016). Most natural colors come from plants because they are easier to obtain, such as stems, leaves, bark, fruit, flowers, roots, and others. It can be interpreted that natural dyes are good dyes to use because they do not use chemicals and do not damage the environment

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(Roziqin & Fajrina, 2020); (Paramita, 2021). Because this natural coloring material is obtained from nature, it is very environmentally friendly (Yuliana & Adriani, 2022).

Of the various plants and plants that can be used as natural dyes, one of them is the gambirr plant, the Latin name *Uncaria gambirr* Roxb, even the waste can still be used as a dye. The gambirr production waste produced is in the form of liquid waste. This liquid waste is produced from the processing of twigs and leaves from the gambirr plant. Gambirr liquid waste is a by-product of the settling and draining process when processing gambirr plants into gambirr products. Usually the resulting liquid waste is simply thrown away and not used even though it can still be used as a textile dye (Failisnur, 2017); (Efi, 2019).

This research aims to test the suitability of gambirr waste as a dye, by testing the quantity and soaking time for color intensity and its implementation in dyeing batik crafts. So this research is formulated as follows:

Does the quantity of soaking mori with gambirr waste affect the color intensity?

Does the length of soaking mori in gambirr waste affect the color intensity?

How to create batik crafts using liquid gambirr waste as the coloring material?

## Research Method

The method in this research is the creation method. Experiments are needed to create. The creative process of creation leads to adaptive new products, which have the following characteristics: sensitivity to problems, capacity to generate many ideas, ability to change one's mental set (flexibility), ability to

Reorganizing, the ability to deal with complexity, and the ability to evaluate (Lubart, 2021). One of the goals of creation is to be a creative problem solver. The thought process requires creativity so that creators must face challenges to produce new products that are suitable for future needs (Bornnardell, 2018); (Novaliendry et al., 2023); (Candra et al., 2022). The design process is very important to use in coloring and product creation in general as well as in the field of developing batik craft art.

The process explored in textile crafts (batik) directs thoughts and actions towards new, adaptive production. In craft exploration there needs to be the following sensitivity: sensitivity to problems, the ability to generate many ideas, the ability to change one's mental set (flexibility), the ability to reorganize handling complexity, and the ability to evaluate (Rondi, 2017). Creators clearly face challenges in producing products that are new and appropriate to their function in the future (future users), so the thought process requires creativity (Hendri & Wulandari, 2013); (Murdaningtyas et al., 2021). The design process in this research is used in coloring to create batik craft product designs. The design process method has developed over time, therefore researchers also use methods in accordance with the concepts and developments in creation techniques,

The creation of batik crafts is a creative process that leads to new, adaptive production, which has the following characteristics: sensitivity to problems, capacity to generate many ideas, ability to change one's mental set (flexibility), ability to rearrange, ability to handle complexity, and the ability to assess work results (Rondi, 2017); (Fitriawati & Lestari, 2020). Art is the result of human work or the result of expression and expression of the human spirit, but in the process not all works of art can be made and said to be works of art (LaBat & Sokolowski, 1999). A work of fine art is an aesthetic object that is built and shaped based on art elements and art principles, such as line, shape, direction, color, texture, value and several other elements (LaBat & Sokolowski, 1999); (Ahyanuardi et al., 2023).

According to Rupiani, Suteja and Wimbaruspati, in creating a work of art, the processes of imagining can make it easier and helpful in creating a work of art (Hendri & Wulandari, 2013). However, the creation process cannot be done freely without any basis, the creation of batik art is closely tied to culture, religion and various ethnicities which are integrated with the emotions of the creator. Especially in creating batik

works of art based on Mentawai culture, it is necessary to understand the cosmology that lives in Mentawai society as a basis for developing batik based on Mentawai culture.

When creating a batik art craft, the processes involved in the creation should not be ignored, because they can simplify and help the creation process. So in this research the stages of creating batik art include; problem identification, preliminary ideas, design refinement, prototype development, evaluation and implementation

## Results and Discussion

The creation of crafts refers to the guidelines for creating work, especially batik art, which are as follows:

- Preparation, prepare the tools and materials needed for batik making
- Design batik motifs according to needs (for clothing/fashion objects, clothing accessories and interior objects, designed on drawing paper using a pencil.
- Transferring the motif to the cloth or mori
- Make batik with wax using a writing canting and stamping canting on the material (mori) that has been painted.
- Dabbing, giving color to the motif that has been canted according to the design concept.
- Walling, covering motifs that have been smeared/colored with wax or wax.
- Dyeing, giving the batik the basic color. You can give a base color when it has been walled or after being dyed or after removing the wax.
- Melorod or throw away the wax on the cloth with hot water.
- Finishing, cleaning the stuck wax so that there are no remaining wax residues and drying the cloth in a place that is not exposed to direct sunlight

The results of this research are the creation of batik by using gambirr waste as a dye. To make gambirr waste as a dye, a feasibility test was carried out by experimenting with gambirr waste with tunjung mordant, whiting and alum. So experiments were carried out repeatedly so that we could get a variety of batik colors from gambirr waste. 1) Test the effect of the quantity of soaking mori (batik material) with gambirr waste and the length of soaking on the intensity of the color produced. 2) The effect of the length of soaking the mori with gambirr waste has an effect on the color intensity and 3) The creation of batik crafts by implementing liquid gambirr waste coloring as the coloring material. So the research results are described as follows:

### *Effect of Quantity of Gambir Waste Dyes on Color Intensity in Mori*

Gambirr waste contains a natural coloring substance known as gambirr tannin or tannin. This substance has the ability to bind fibers and provide color to textile materials. When mori is soaked in a solution containing gambirr waste, the dye from the gambirr waste is absorbed by the mori fibers. The color intensity of the mori depends on how much dye can be absorbed by the mori. The more gambirr waste used in the solution, the higher the concentration of dye in the solution. This allows the mori to absorb more dye, which in turn increases the color intensity of the mori. In addition, there is a limit to the amount of dye that can be absorbed by mori. Once the mori reaches the saturation point, increasing the quantity of gambirr waste may not provide a significant change in color intensity. The concentration of gambirr waste in the solution directly affects the amount of dye available to be absorbed by the mori. The more concentrated

solution in this study produced a more intense color. In this research, dyes were soaked, namely tunjung, alum and whiting. The following is an illustration of the results of research on the quantity of gambirr waste dye.

**Table 1.** Effect of Quantity of Natural Dyes on Color Intensity in Mori

No	Dyer	Color	Color Name	Quantity
1	Tunjung Mordan		<i>Warm Brown</i>	50 gram of Mordan : 4 Liters of Water
2	Tunjung Mordan		<i>Wheat Light Brown</i>	50 gram of Mordan : 3 Liters of Water
3	Tunjung Mordan		<i>Off-Whiten Snow</i>	50 Gram of Mordan : 2 Liters of Water
4	Alum Mordan		<i>Wheat Light Brown</i>	50 gram of Moran : 4 Liters of Water
5	Alum Mordan		<i>Dark Salmon Pink</i>	50 gram of Mordan : 3 Liters of Water
6	Alum Mordan		<i>Light Brown</i>	50 Gram of Mordan : 2 Liters of Water
7	Betel Lime Mordan		Tawny Brown	50 gram of Moran : 4 Liters of Water
8	Betel Lime Mordan		<i>Sepia Brown</i>	50 gram of Mordan : 3 Liters of Water
9	Betel Lime Mordan		<i>Sepia Brown</i>	50 Gram of Mordan : 2 Liters of Water

Based on research, it was found that the quantity of dye from gambirr waste affects the color intensity of mori. By increasing the concentration of gambirr waste in the coloring solution and extending the soaking time. However, in research it was found that other factors that might influence it, such as temperature, pH and dyeing technique, also played an important role.

*The Effect of Long Soaking the Mori in Gambir Waste Affects the Color Intensity*

The longer the mori is soaked in the gambirr waste solution, the more dye is absorbed by the mori. This means that the color intensity will increase as the soaking time increases. It should also be noted that there is a limit to how much mori dye can absorb. Once the saturation point is reached, increasing the soaking time may not result in a significant increase in color intensity. In determining the practical effect of soaking time, experiments were carried out by testing various soaking durations and measuring the intensity of the resulting color. Methods such as spectrophotometry can be used for more accurate quantification. The following is an illustration of the differences in color intensity based on the length of soaking mori and gambirr waste.

**Table 2.** Effect of Soaking Time in Mori with Gambir Waste on Color Intensity

No	Dyer	Color	Color Name	Soaking Time
1	Tunjung Mordan		<i>Warm Brown</i>	30 menit
2	Tunjung Mordan		<i>Mendallion</i>	60 menit
3	Tunjung Mordan		<i>Dijon</i>	90 menit
4	Mordan Alum		<i>Dafdodil</i>	30 menit
5	Mordan Alum		<i>dandelion</i>	60 menit
6	Mordan Alum		<i>peanut</i>	90 menit

7	Betel Mordan	Lime		<i>caramel</i>	30 menit
8	Betel Mordan	Lime		<i>tawny</i>	60 menit
9	Betel Mordan	Lime		<i>Gingerbread</i>	90 menit

The length of immersion of the mori in gambirr waste solution affects the color intensity in a significant way. The longer the mori is soaked, the more dye is absorbed, and this tends to increase the intensity of the color. However, after reaching the saturation point, increasing soaking time will not provide a significant increase in color intensity. This can be seen in staining with tunjung dye where there is no significant difference between soaking for 60 minutes and 90 minutes. Other factors such as solution concentration, temperature, and pH must also be considered for optimal results.

#### *Creation Of Batik Crafts Using Gambir Liquid Waste Coloring As The Coloring Ingredient*

Creating batik works with gambirr waste is generally done through dyeing using the following steps.

The mori coloring process consists of washing the mori, dyeing the mori with gambirr liquid waste, fixation, and color striping. The mori washing process is carried out to clean the mori from dirt and starch attached to the mori. Mori is washed using detergent that has been dissolved in 20 liters of water, then the mori is boiled in a detergent solution for 30 minutes, in this process 5 kg of mori are washed.

After finishing washing the mori, we can then dip the mori into the heated gambirr liquid waste. Dipping the mori is done by turning the mori upside down with the aim that the liquid waste can penetrate well throughout the mori so that the color of the resulting mori is even throughout the mori. In the dyeing process, 5 kg of mori is used with 150-250 liters of liquid waste amounting to approx. To produce the desired color, mori dyeing is usually done 2 times. After that, the mori is dried in the sun until dry. After the mori is dry, the mori is dipped again in gambirr liquid waste and this dyeing is done two to three times to produce a thick mori color.

Next is the process of fixation or fixing the color on the mori. This fixation stage of the mori is very important because this fixation aims to ensure that the color of the mori which has been colored with gambirr liquid waste does not fade easily. The fixators used are alum, tunjung and whiting.

Based on the results of interviews with the two informants above, it can be concluded that this process determines the color produced based on the binder used. In this study, there were three fixators used, namely alum, tunjung and lime, each of which produced a different type of color. This fixation also aims to ensure that the mori color does not fade easily. Color locking or color fixation process in mori, by first preparing the fixator namely alum, tunjung and lime, 600 grams each then dissolving the alum, tunjung and lime with 20 liters of water, but for lime and alum after dissolving we precipitate it first, then we let it sit for about 1 hour, then we filter it, after that we can start locking or binding the color on the mori, dip the mori in alum, Tunjung and lime that have been filtered earlier by rotating them so that the mori doesn't wrinkle. Locking or tying the color on the mori is done by dipping the mori in the filtered alum, tunjung and lime by rotating it so that the mori does not wrinkle.



After mori fixation, next is the final stage of washing the mori after color locking or fixation is carried out, namely the washing mori stage. This stage is carried out by boiling with the aim of removing the color that is not attached to the mori from the remaining dyeing that has been carried out. The purpose of washing or stripping is to remove remaining color that is not attached to the mori. Washing is done by dipping the mori in hot water at a temperature of 40 degrees. Dip the mori until the remaining color that is not attached to the mori fades.

Based on the research results, it was concluded that the steps for mori coloring are as follows:

- Washing mori with detergent
- Dipping mori into gambirr liquid waste
- Color binding to mori or fixation
- Final washing of mori after fixation or color discoloration.

## Conclusion

Based on the research conducted, it can be concluded that gambirr liquid waste has great potential as a natural dye for batik cloth with the following results:

- The quantity of gambirr waste in the dye solution significantly influences the color intensity of the mori cloth. The higher the concentration of gambirr waste, the more intense the color produced until the maximum limit of absorption capacity is reached. These results show the importance of adjusting the solution concentration to achieve optimal color without wasting material.
- The length of time the fabric is soaked in the gambirr waste dye solution also influences the color intensity. Longer soaking allows more of the dye to be absorbed, resulting in a deeper color. However, after the mori reached the saturation point, increasing the soaking time did not provide a significant increase in color.
- The fixation process using alum, tunjung and lime affects color stability and produces unique color variations. This fixation also helps increase the color's resistance to fading, making coloring with gambirr waste more durable.
- Gambir waste can be used as a natural coloring material in batik art through repeated dyeing, fixation and peeling processes. This process produces diverse and environmentally friendly colors, supporting innovation in the art of batik crafts based on local wisdom.

The results of this research show that gambirr liquid waste is an alternative natural dye that is not only environmentally friendly but also has aesthetic and economic value. With good management, the use of this waste can support environmental sustainability and the revitalization of traditional batik art. The next recommendation is the development of more efficient staining methods and exploration of additional factors such as pH and temperature for more optimal results.

## *Declarations*

## *Availability of Data and Materials*

*This study did not involve experiments on humans, animals, or sensitive data requiring formal ethical approval. All research activities adhered to established guidelines and regulations.*

## Competing Interests

*The authors declare that they have no competing interests.*

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## Authors' Contributions

*All authors contributed equally to the conceptualization, analysis, interpretation, drafting, and final approval of the manuscript. Each author played a significant role in ensuring the quality and accuracy of the research and manuscript preparation.*

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