Quality of motif, colors and fastness of Sekar Ayu ecoprint products in terms of mordant type, natural dyes, and types of leaves on silk fabrics

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Abstract. The purpose of this study was to describe the ecoprint quality of silk fabrics with different natural dyes in terms of the aesthetics of the motif, and the color and fastness of washing and rubbing. This research method is experimental research with descriptive percentage analysis. Experiments using tunjung and alum mordant as well as teak leaf ecoprints, Japanese papaya (Cnidoculus aconitifolius), cherry leaves (Muntingia calabura), and Jatropha wulung leaves as well as natural colors tegeran, jelawe, and indigovera. Methods of collecting data by experiment, observation and from the test results in the textile laboratory. The results showed that the Aesthetic Quality of the silk fabric ecoprint motif was very good, and the use of natural dyes of jelawe and tunjung mordant produced the best motifs. The results of laboratory tests showed the color direction of the ecoprint fabric was the best with alum mordant and natural dye tegeran with the highest L* 80.90 value. The results of the fastness of ecoprint fabrics against soap washing on silk fabrics using natural dyes of jelawe, mordant alum showed the best because it resulted in a score of 4 in the 'Good' category and the others obtained 3-4 so that the category was sufficient. The value of fastness to wet cloth rubbing on ecoprint silk fabrics overall shows good because it produces a score of 4-5 in the 'Good' category.

1. Introduction
Home Economics Department of the Faculty of Engineering, especially the Fashion Design Education Study Program, has a production unit called "Sekar Ayu" which is located on the UNNES Faculty of Engineering campus. Not only within the Faculty of Engineering, but the Production Unit "Sekar Ayu" also has a Gallery in the Entrepreneurship Building, State University of Semarang. The production unit "Sekar Ayu" functions as a facility provided by the PKK UNNES Department to introduce superior products for lecturers and students so that they can be known by the surrounding community. Due to the COVID-19 pandemic which requires people to start switching to the New-Normal era, it has a significant loss impact. This also has an impact on the "Sekar Ayu" Production Unit, During the New-Normal era, it is necessary to carry out a new innovation in making superior products that can support the "Sekar Ayu" production unit to be re-recognized by the public. One of the product innovations that will be made is a product with an ecoprint technique that has a unique characteristic in its motif. In addition, ecoprint also uses natural dyes that are environmentally friendly so as to provide added value to the fabric [1].
Ecoprint is a fabric dyeing technique that is done by moving a natural motif such as leaves, flowers, seeds, stalks, roots, etc. on a cloth so as to form a unique new motif. Irianingsih [2] in Pressinawangi and Widiawati, ecoprint is transferring the pattern (shape) of leaves and flowers onto the surface of the fabric that has been processed to remove the coating, wax and dirt on the fabric so that the plant color absorbs easily. Teak leaves can be obtained easily on campus and have high color potential for both ecoprint and natural dyes. The reddish color obtained is produced by immersing ecoprint materials and motifs. The types of leaves used were taken from the environment around the campus, al, teak leaves, cherry leaves, papaya wulung leaves, weeds and wulung distance.

There are 3 techniques used to produce ecoprint motifs, including pounding/hapazome techniques, boiling (boil), and steaming (steam). The ecoprint technique by steaming produces a clearer color on the fabric besides the colors produced are in great demand. Pounding technique, the leaves that have been collected are beaten on a sheet of white cloth, so that the leaves will give off a natural color. Meanwhile, both boiled and steamed techniques require a heat conductor to transfer color. One of the most frequently used methods in the industry is the steam technique, which is the transfer of plant colors to fabrics through hot steam or steaming so that the pigment pigments appear on the fabric. The ecoprint technique by steaming is used with the iron blanket method. The Iron blanket method is an ecoprint technique that uses 2 sheets of cloth at once. One of the fabrics can be given a basic color with natural dyes first.

Hamidin [3] states that natural dyes are obtained from nature, namely from animals (lac dyes) and also from plants in the form of ofakar, stem, leaf, fruit, skin and flower. Natural dyes used in this study were tegeran wood, jelawe fruit and indigofera flowers. All three have useful content. The main flavonoid in Tegeran wood is morin which gives it a yellow color [4]. Jelawe peel extract is reported to contain glycosides, flavonoids, tannins [5]. The use of natural dyes in their application in textile materials must be with the help of a mordant. Mordant is one of the important processes that allows the printed dye to adhere more to the fabric fiber [6]. There are various types of mordant, so far, based on the observations of 10 ecoprint and batik craftsmen in Semarang, most of them use alum and tunjung mordant. This agrees with Ado, A et al [7] stated that commonly used mordant, including alum and tunjung. Alum has the characteristics of a dark white crystal, translucent, usually for water purification. Tunjung greenish. The type and length of time the fabric is soaked in the mordant also affects the ecoprint result.

In Japan, the mordanting process on the fabric to be dyed is pre-soaked in a soy bean solution for one year, in order to get a quality product [8]. Purwaningrum's research [9] showed that the length of time for alum mordant to produce optimal color aging was at least 12 hours.

The creation of ecoprint motifs is one of the qualities of ecoprint results in addition to fastness and color. Decorative motifs are modern motifs whose organization is more free, according to personal desires. Modern motifs have characteristics including: free decoration; the pattern has no symbolic meaning; colors used more freely; usually not a characteristic of an area [10].

Therefore, empirical research is needed on product innovations that can support the "Sekar Ayu" production unit. The problems in the research are as follows: 1) how is the quality of the motifs and colors of ecoprint silk fabric with teak leaves without natural dyes with alum and tunjung mordant, 2) how is the quality of ecoprint silk fabrics with teak leaves, jatropha leaves, Japanese papaya leaves, cherry leaves and ferns use natural dyes tegeran, indigo, and jelawe, mordant alum and tunjung.

2. Method
The method used in this research is an experimental research method. Sugiyono [11] Experimental research is a research method used to find the effect of certain treatments on others under controlled conditions. The object of leaf research for ecoprints is: young teak leaves, jatropha leaves, Japanese papaya leaves, cherry leaves and ferns, mordant alum and tunjung, silk fabrics, natural dyes tegeran, jelawe and indigovera. The research design described by Sugiyono [11] This research is included in experimental design research in the form of One-Shot Case Study, product quality is measured from the results of observations and laboratory testing Anonymous Testing (2005: 1), organoleptic/sensory is a way of testing using the human senses as main tool for assessing product quality. AnalysisDescriptive
percentage is used to describe or provide an overview of the object under study through sample or population data without analyzing and making conclusions that apply to the public [11]. The dependent variable is ecoprint leaf type and the dependent variable is motif, color direction and fading. The control variables were silk cloth, alum mordant and tunjung mordant, 2 hours steaming technique, no blangket and blangket iron, natural dyes tegeran, jolawe, and indigofera, 3x dyeing, 30 minutes of immersion.

3. Result and discussion

3.1 Result

The results of ecoprint research on teak leaves on silk fabrics without natural dyes, with alum and tunjung mordant and steam techniques produce leaf shapes and motifs that are clearer and more beautiful because teak leaves have unique fibers and leaf bones and have strong tannins so that they produce color better and more interesting. Young teak leaves produce a better color and however, the color produced from each teak leaf will not be the same depending on the pigment contained in it. Table 1 is an illustration of the results of the silk fabric ecoprint with teak leaves.

Table 1. The results of the ecoprint of teak leaves on silk fabric without natural dyes

| No. | Experiment result | Method used | Information |
|-----|-------------------|-------------|-------------|
| 1   | Material: Silk 56 | Mordan: Alum 15 gr/liter | Technique: Steam with a duration of 1 hour 30 minutes with fixation for 15 minutes using 5gr/liter alum | The color of the teak leaves is clearly visible, but there are still many parts of the folded leaves that are visible and there are many visible lines because when rolling the technique used is not good. So for further experiments, assistance such as a hose is needed to help when rolling the cloth. |
| 2   | Material: Silk 56 | Mordan: Tunjung 15 gr/liter | Technique: Steam with a duration of 1 hour 30 minutes with fixation for 15 minutes using 5 gr/liter alum | The color of the teak leaves produced is good and beautiful, but there are still many parts of the color that are bloated because the leaves are still wet and the background color is uneven because when soaking in the tunjung solution, it has not been precipitated first, so there are still many colors that block |
3. Material: Silk 56
Mordan: Alum 15 gr/liter
Technique: Steam with a duration of 1 hour 60 minutes with fixation for 15 minutes using alum 5gr/liter

The color of the teak leaves is visible, the leaf bone motif is clear. the winding is given assistance like a hose.

4. Material: Silk 56
Mordan: Tunjung 15 gr/liter
Technique: Steam with a duration of 1 hour 60 minutes with fixation for 15 minutes using 5 gr/liter alum

The color of the teak leaves produced is good and beautiful because the leaves have been dried with a dry cloth and the background color and nothing is blocking.

3.1.1. Results of analysis of the quality of ecoprint motifs based on aspects of motifs and colors on silk fabrics. The quality of the teak leaf ecoprint motif on the color aspect of the average percentage of the ecoprint results using alum mordant is 81.67% in the very good category, while the ecoprint results using Tunjung mordant 81.87% in the very good category. the average percentage of ecoprint results using alum mordant is 84.79% in the very good category, while the ecoprint results using tunjung mordant are 84.38% in the very good category.

Result motive assessment ecoprint teak leaves on the aesthetic aspect of the motif in terms of (1) the arrangement of motifs that can give the impression of being unified, rhythmic, balanced in proportion, and has a point of interest; and (2) the firmness and clarity of the shape of the leaves and the bones of the teak leaves. The following is a diagram of the results of the panelist's assessment of the quality of the teak leaf ecoprint motif using alum and tunjung mordant on silk fabric for the aesthetic aspect of the motif. Figure 1 shows description of the aesthetic quality of the motif.
The evaluation of the quality of the ecoprint motif on the color aspect is viewed from (1) the color combination produced by teak leaves that can give a harmonious, harmonious, unique, and attractive impression; and (2) the cleanliness of the background color, which means that there are no stains or blocking parts and the level of color leakage is low. Figure 2 is a diagram of the results of panelists' assessment of the quality of the teak leaf ecoprint motif using alum and tunjung mordant on silk fabric in color aspects.

The histogram above shows that the color combination produced by ecoprint teak leaves using tunjung mordant is more favored by panelists than using alum mordant. As for the cleanliness of the background color of the teak leaf ecoprint product using alum mordant, it is cleaner and more evenly distributed than the ecoprint product that uses tunjung mordant. The color combination in ecoprint
products using alum mordant obtained an average percentage of 81.67% (Very Good) and on the cleanliness of the background color it obtained a percentage of 81.67% (Very Good). While the color combination in ecoprint products using tunjung mordant obtained an average percentage of 82.50% (Very Good) and on the cleanliness of the background color obtained an average percentage of 80.25% (Good). The results of the organoleptic test for color direction by 15 panelists showed that the ecoprint results with tunjung premordant and postmordant (fixation) tunjung produced pebble-wood colors which were colors that were in the range of gray and dark brown. The background or base of the fabric is a cream color which is classified as a warm color. Ecoprint results with alum premordant and alum postmordant (fixation) resulted in boysenberry-orchid-biscolli colors which were in the purple and yellow range. The background or base of the fabric is a pearl color which belongs to the neutral color direction. Ecoprint results with alum premordant and alum postmordant (fixation) resulted in boysenberry-orchid-biscolli colors which were in the purple and yellow range. The background or base of the fabric is a pearl color which belongs to the neutral color direction.

3.1.2 Description of the Quality of Ecoprint Results from various types of leaves, using natural dyes tegeran, indigo and jelawe on silk fabrics. The results showed that the quality of the ecoprint motifs was very good with Jolawe natural dyes for teak leaves, Jatropha leaves, Japanese papaya leaves, cherry leaves and weeds. The outer shape of the leaves, the motif of the fibers and the bones of the leaves and the colors are clearly visible so that the ecoprint results are the most attractive from the aspect of the overall motif. The teak leaf motif is visible throughout the fabric, with alum and tunjung modes, natural dyes of tegeran, indigo and jelawe. The teak leaf ecoprint motif on the whole silk fabric with alum mordant, with natural dyes tegeran, indigo and jelawe shows that all the teak leaf motifs are clearly visible and emit a purplish red color. The ecoprint motif of Jatropha wulung leaves on silk fabric with tunjung mordant and tegeran natural dye on both blengket and cover fabrics produces a clearer motif, and a greenish color, with tunjung mordant and natural dye indigo the motif is clear and produces a moss green color, and with tunjung mordant with jelawe the motif is visible even though it is less clear. The ecoprint motifs of Japanese papaya leaves, cherry and weeds are only clearly visible on silk fabrics with tunjung mode and natural dyes of jelawe. Weed motifs do not appear on all fine silk fabrics. A more complete description of the ecoprint results can be seen in Figure 3.

| NATURAL COLOR | BLANGKET SILK FABRIC | COVER FABRIC |
|--------------|----------------------|-------------|
|              | Alum  | Tunjung | Alum  | Tunjung |
| TEGERAN      | ![Image] | ![Image] | ![Image] | ![Image] |
3.1.3. The results of the analysis of the color difference test for ecoprint fabrics, the fading of ecoprint fabrics against soap washing, the fading of ecoprint fabrics on wet cloth rubbing. The results of this experimental study were obtained from laboratory tests at the Textile Evaluation Laboratory, Faculty of Industrial Engineering, Islamic University of Indonesia, Yogyakarta. The data regarding the quality are as follows:

3.1.3.1 Result of Color Difference Analysis

| NO | Sample Code       | Color Difference Value | L’  | A’  | B’  | dE’ab |
|----|-------------------|------------------------|-----|-----|-----|-------|
| -  | STD-SILK FABRIC   |                        | 101.65 | 0.14 | 0.03 | 0.00  |
| 1  | Alum, JELAWE      |                        | 70.74  | 16.24 | 20.52 | 41.71 |
| 2  | Alum, TEGERAN     |                        | 80.90  | 10.77 | 52.10 | 57.05 |
| 3  | Alum, INDIGO      |                        | 78.84  | 18.19 | 11.27 | 31.19 |
| 4  | TUNJUNG, JELAWE   |                        | 79.84  | 10.87 | 31.93 | 40.10 |

Table 2 shows that the treatment with alum mordant with natural dye jelawe resulted in a value of 70.74. Then the alum mordant with natural dyestuffs resulted in a value of L’ 80.90. Furthermore, alum mordant with indigo natural dye resulted in a value of L’ 78.84. Tunjung mordant with natural dye jelawe resulted in a value of L’ 79.84.
3.1.3.2 Analysis Result of Ecoprint Fabric Test against soap washing using the standard gray scale.

Gray scale is used to assess color changes in the color fastness test. The gray scale value determines the level of difference or color contrast from the lowest level to the highest level. The standard gray scale consists of nine pairs of gray standards, each pair representing an appropriate color contrast or contrast from the standard set of color changes described by the gray scale standard. The results of the ecoprint fabric test against soap washing can be seen in table 3.

Table 3. Ecoprint fabric test value against soap washing

| Sample Code       | Score | Gray Category | Category |
|-------------------|-------|---------------|----------|
| Alum, JELAWE      | 4     | 1.5           | Good     |
| Alum, TEGERAN     | 3-4   | 2.1           | Pretty good |
| Alum, INDIGO      | 4-5   | 0.8           | Good     |
| TUNJUNG, JELAWE   | 3-4   | 2.1           | Pretty good |

Based on table 3, it shows that the resistance value of ecoprint fabrics to soap washing on silk fabrics using natural dyes jelawe mordan alum produces a value of 4 with the 'Good' category. Meanwhile, those using natural dyes tegeran with alum mordant resulted in a score of 3-4 with the category "Pretty good". Furthermore, the natural dye indigo with alum mordant resulted in a score of 4-5 with the "Good" category. Then those using natural dyes of jelawe with tunjung mordant resulted in a score of 3-4 with the category "Good Enough".

3.1.3.3 Analysis Results Ecoprint fabric test against wet cloth rubbing

Table 4. Ecoprint Fabric test against wet cloth rubbing

| Sample Code       | Score | Staining Scale | Category |
|-------------------|-------|----------------|----------|
| Alum, JELAWE      | 4-5   | 0.8            | Good     |
| Alum, TEGERAN     | 4-5   | 0.8            | Good     |
| Alum, INDIGO      | 4-5   | 0.8            | Good     |
| TUNJUNG, JELAWE   | 4-5   | 0.8            | Good     |

Based on table 3.3 shows that the resistance value of ecoprint fabrics against wet cloth rubbing on silk fabrics using natural dyes jelawe mordan alum produces a value of 4-5 with the 'Good' category. Meanwhile, the use of natural dyes tegeran with alum mordant resulted in a score of 4-5 in the "Good" category. Furthermore, the natural dye indigo with alum mordant resulted in a score of 4-5 with the "Good" category. Then those using natural dyes of jelawe with tunjung mordant resulted in a score of 4-5 in the "Good" category.

3.2 Discussion

Based on the results of the study, it was found that silk fabric with the ecoprint technique produced a very good motif aesthetic of 81.67% because the motif was clearly visible, the outer shape of the leaf and the unique leaf bone. Ecoprint with teak leaves produces the best clear motifs compared to cherry leaves, Japanese papaya leaves and Jatropha leaves. The ecoprint motifs and colors on silk fabrics are very good because silk is more absorbing natural dyes from leaves either through dyeing and ecoprint techniques. The color combination in ecoprint products using alum mordant obtained an average percentage of 81.67% (Very Good) and on the cleanliness of the background color it obtained a percentage of 81.67% (Very Good). While the color combination in ecoprint products using tunjung mordant obtained an average percentage of 82.50% (Very Good) and on the cleanliness of the background color obtained an average percentage of 80.25% (Good). The results of the organoleptic test for color direction by 15 panelists showed that the ecoprint results with tunjung premordant and postmordant (fixation) tunjung produced pebble-wood colors which were colors that were in the range of gray and dark brown. The background or base of the fabric is a cream color which is classified as a warm color. Ecoprint results with alum premordant and alum postmordant (fixation) resulted in
boysenberry-orchid-biscolli colors which were in the purple and yellow range. The background or base of the fabric is a pearl color which belongs to a neutral color direction. Nurwati [10] stated that young teak leaves contain several pigment compounds, especially anthocyanins that can be used as natural dyes. Pigments (coloring matter) are organic compounds that determine the color direction of natural dyes (contained in the dye source itself) and pigments are chemical compounds that change the color of visible light as a result of selective absorption of wavelengths in a certain range. The red color produced from the filtrate of young teak leaves comes from the anthocyanin dye contained in young teak leaves [5]. One of the anthocyanin dyes contained in teak leaf extract is cyanidin. Teak leaves (Tectona Grandis) have leaf bones and leaf surfaces that can be used as textile motifs in the ecoprint technique [13].

The color results of ecoprint silk fabric with alum mordant with tegeran natural dyes produce an L* 80.90 value, the results are very good. The quality of the fastness of soap and rubbing of silk ecoprint fabrics also showed good results for the use of natural dyes of jelawe and tegeran, as well as fixation of alum mordant. Kumaresan [12] stated that silk fabrics have good color strength when dyed with natural dyes and using iron mordant sulfate and aluminum sulfate. The type of mordant affects the ecoprint results both in terms of motifs and colors. This is in accordance with research. Quality of the results of the color value of the fabric can be changed by using various metal salts as modern. The iron sulphate mordant gave the best staining results but showed a darker color. The use of mordant also produces different pattern motifs on the fabric [12,19]. Teak leaves have more potential to give color and motifs to the whole silk fabric, both with tunjung and alum modes. Natural dyes of jelawe and tunjung mordant on silk fabrics are more absorbent, giving rise to motifs with ecoprint techniques both with teak leaves, jatropha wulung, Japanese papaya and cherry. Maharani [17] also argues that the ecoprint motif derived from teak leaves on the fabric, looks similar to the original leaf. Aesthetic value, the protrusion of the teak leaf motif is more dominant, and has a distinctive color compared to other types of leaves. Agrawal & Pal [18] stated that plants are the main source of natural dyes, parts such as stems, wood, bark, roots, leaves, fruit, can be used to extract color components to produce various hues. The type of mordant has an influence on the strength of the color and hue of the fabric [9].

4. Conclusion
Based on the results of research and discussion, it can be concluded that 1) the ecoprint quality of silk fabric with teak leaves with alum and tunjung mordant and without natural dyes produces very good motifs and colors, 2) the results of silk fabric ecoprints with teak leaves, castor-wulung leaves, leaf Japanese papaya, cherry leaves showed the best aesthetic results with jelawe dye using tunjung mode. The results of the study the use of teak leaves, Jatropha leaves, papaya leaves and cherry leaves, using Jelawe Mordan Tunjung dyes can be developed for clothing products of the Sekar Ayu production unit as the basic material for making men's shirts.

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