



Using Teak Leaves As Natural Dye And An Ecoprinting Material To Imprint Motifs On Silk Fabrics



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Keywords:
Teak leaves,
Natural dye,
Ecoprinting,
Silk fabrics.

ABSTRACT

Natural dyes are generally obtained from the extracts of plant parts. Teak leaves produce natural dyes and can be used to create *ecoprinted* works. This study aimed at utilizing teak leaves as natural dye and as an ecoprinting material imprinted on silk fabrics using alum mordant. **The state of the art of this research is the using of teak leaves as natural dye and ecoprint materials on a single piece of silk fabric.** The purpose of the study was to get natural colors, to create ecoprinted products, and to add aesthetic and economic value to the fabrics. The research method included the following stages: 1). Dyeing the cloth in TRO solution, 2). Extracting teak leaves, 3). Dyeing the cloth with the teak extract, 4). Ecoprinting with boiling technique, 5). Creating functional product out of the treated fabrics. The resulted extract dye created reddish orange color on the silk fabrics. The ecoprinting using teak

	<p>leaves on silk fabrics produced the same yet more intense color. After the mordanting process, the shade of the color remained the same. The functional products created were pillow cases.</p>
<p>Kata Kunci: Daun Jati, Pewarnaan Alami, <i>Ecoprint</i>, Kain Sutera.</p>	<p style="text-align: center;">ABSTRAK</p> <p>Zat pewarna alam dapat diperoleh dari bagian-bagian tumbuhan yang telah diekstrak terlebih dahulu. Proses penciptaan karya ini bertujuan untuk memanfaatkan zat warna alami dari daun jati dan sebagai bahan <i>ecoprint</i> pada kain sutera dengan menggunakan mordan tawas. Daun jati dapat menghasilkan zat warna alam dan dapat digunakan untuk menciptakan karya <i>ecoprint</i>. <i>State of the art</i> penelitian ini ialah penggunaan daun jati sebagai pewarna alam dan bahan <i>ecoprint</i> pada satu media kain sutera. Tujuan khusus dari penciptaan ini ialah untuk mendapatkan hasil warna alami, untuk memperoleh hasil <i>ecoprint</i> dan menambah nilai pada media kain sutera. Metode penciptaan meliputi tahapan berikut: 1). Merendam kain dengan <i>TRO</i>, 2). Mengekstrak daun jati, 3). Merendam kain dengan hasil ekstraksi, 4). <i>Ecoprint</i> dengan teknik rebus, 5). Pembuatan hasil akhir produk. Hasil dari pewarna ekstrak pada kain sutera adalah warna oranye kemerahan. <i>Ecoprint</i> daun jati pada kain sutera menghasilkan warna kain yang sama yaitu oranye kemerahan tetapi lebih pekat dibandingkan dengan pewarna ekstrak sebelumnya. Setelah melakukan <i>fiksator</i> arah warna yang dihasilkan tetap sama. Produk yang dihasilkan dari pewarna alami dan <i>ecoprint</i> daun jati ini dapat berupa sarung bantal.</p>

INTRODUCTION

Indonesia is rich with natural resources due to its geographical location along the equator line. This factor causes Indonesia to have a tropical climate, fertile land, and abundant natural resources. Unfortunately, those resources have not been optimally used yet. Indonesian people can make use of the existing biodiversity for numerous purposes. One among the other is to make natural dyes and then disseminate the knowledge about it. Rosyida & Achadi (2014) assert that natural dyes can be used for textile industries, especially when they are in the stage of developing products intended to exhibit primitive, exclusive, natural, and cultural vibes and have a high economic value.

One of the tropical plants that can be used is teak. This plant can easily be found in Java island. It also grows well in Southeast Asia area such as Laos, Myanmar (Burma), and Thailand. Teak is a huge potential in Indonesia. Kembaren, et al. (2013) states that teak leaves have not been used maximally and effectively. *Tectona grandis* L.f. (scientific name for teak) is grouped in Verbenaceae family. It can be used as a dye material because it has anthocyanin, a color pigment. Plants may carry this pigment in flowers, leaves, stems, roots, tubers, or fruits. Anthocyanin is a base of a number of colors, i.e. purple, blue, red, magenta, violet, and orange. It is not harmful and edible.

Colors have been the major attractions of many products, for instances food and textile. Coloring substances are needed to add artistic values and can be the bases to create variants for a certain product (Pujilestari, 2016).

To make plants leave their color, shapes, and marks on fabrics can be done through ecoprinting process (Saptutyingsih & Wardani, 2019). According to Sutianah and Siliwangi (2021) ecoprinting is a technique consisting of a number of steps to imprint colors and shapes on fabric by directly putting colorful plant parts on natural fiber fabrics (cloths) and then boiling them. Table 1 informs the state of the art of this practice-based research where a number of relevant and supporting prior researches are listed. Those researches put the base for the experiments carried out to produce ecoprinted silk cloth using teak leaves as the coloring and ecoprinting materials.

Based on the pre-mentioned information, the idea of this creation process was focused on the utilization of natural resources, i.e. teak leaves to fabricate products made of fabrics with leaf motifs. The used fabrics were created by employing natural coloring and ecoprinting techniques.

The purposes of the undertaken creation process were:

1. To find out the results of the application of teak leave dye on silk fabric.
2. To find out the result of ecoprinting on silk fabric.
3. To find out the best method in using the same material for natural dyeing and ecoprinting to create textile motifs with aesthetic and functional values.

METHOD

This textile making employed method proposed by Sedjati & Sari (2019) that are listed below:

Practice-based Research Method

This method was used to search the authenticity of an object. It was useful to gain and learn new knowledge by employing it in practical activities to design a motif on cloth.

Eksperiment and Improvisation Method

Experimenting aimed at identifying the progress and boundaries met at each stage. The experiment was run by putting parts of plant such as leaves or flowers on fabrics and assigning particular treatment to add motifs on them. When carrying out the coloring stage in which the

ecoprinting results appeared, the color scheme from teak leaves dye could be used (Masyitoh & Ernawati, 2019). Rosyida and Achadi (2014) improvised the ecoprinting they conducted to come up with new ideas in order to get better works.

Data Collection Method

Collecting data is a process to get the information needed in a research. There were two methods used, namely: 1) Literature study method that was employed to seek and compare the related theories from mostly research journals in order to formulate the theoretical framework that based the creation process; 2) Observation method was applied to collect data by directly observing, watching, and involving in the examined problem. The observation was undertaken to find out to which degree people already made use of teak leaves.

No	Writer/Year	Ecoprint Material	Natural Dye	Mordant	Media
1	Bayu Wirawan D. S. and M. Alvin (2019) Bayu Wirawan D. S. Dan M. Alvin	Sweet potato leaves	-	- Quick lime - alum - green vitriol	fabric
2	Yesica Stefany Simanungkalit and Rodia Syamwil (2020)	Rose petals	-	- alum - green vitriol - quick lime	Cotton fabric
3	Fitri Masyitoh and Ernawati (2019)	Teak leaves	-	-alum - vinegar	cotton
4	Cucu Sutionah (2021)	Leaves and flowers	-	vinegar	fabric
5	Hernani, Risfaheri and Tatang Hidayat (2017)	-	-sappan wood -yellow flamboyant tree bark	-alum -quick lime -green vitriol	Cotton fabric
6	Manuntun Manurung (2012)	-	Mangosteen peel	-quick lime	Cotton fabric
7	Dewa Gede Putra Prabawa (2015)	-	Betel nut	Quick lime	-cotton fabric -silk fabric -semi silk fabric
8	Ainur Rosyida, Didik Achadi W (2014)	-	Young teak leaves	-alum - green vitriol	Cotton fabric
9	Baby Ayu, et al.	Fresh teak leaves	Young teak leaves	alum	Silk fabrics

Table 1. *State of the Art* of the Research

a. Creative Concept

Description

It is a fact that Indonesia is gifted with supernumerary natural resources that have not been explored optimally. One of those potentials is teak. Teak leaves are potential to be used in textile industries.

There have been a number of researchers exploring teak leaves to be used in textile designs. Masyitoh and Ernawati (2019) used teak leaves as ecoprinting material that was printed on cotton cloth and fixed with alum and vinegar as the mordant substances. In another research, Rosyida and Achadi (2014) colored textile using young teak leaves and fixed with alum and green vitriol. However, there was no reasearch combining two teak leaves functions, as coloring substance and ecoprinting patterns.

Coloring substance types are grouped into two: synthetic and natural dye. Humans make the former ones by mixing particular chemical substances. Saati, et al. in Subiyanti, et al. (2021) said if the synthetic dyes were used carelessly, slowly but sure both humans' and environmental health would be affected because they contained heavy metals such as Cr, Pb, Cd, Zn, and Co. The more this type of dye is used, the higher the environment will be polluted because of their toxic characteristic. They are also harmful for human bodies if they are inhaled or swallowed. Natural dyes are certainly a wise alternative to prevent negative impacts of synthetic dyes from occurring

According to Sulistiawati et al. (2017), the anthocyanin carried by young teak leaves could be used to produce red color. Ecoprinting is a technique to produce patterns on cloth by setting parts of plants to leave their shapes, colors, and marks on it. Besides its eco-friendliness, it is easily conducted because there is no sophisticated tool needed.

Mayliana (2016) asserted that the duration of dye application and color fixing affected the resulted color. A fixing process is a method to lock colors resulted from the dyeing process in order to elevate its quality and to keep it from fading fast. (Kurnia, 2013). In this research, the media on which the patterns imprinted was silk that was defined by Santosa & Kusumastuti (2008) as a filament made of the cocoons of Bombyx Mori, a domestic silk moth.

Literature Review

Colors play a crucial role in forming the visual beauty of a product or an artwork. In order to have interesting product or artwork, natural dyes are of smart choice.

Natural coloring substances can be devided into: 1) chlorophyl, the green pigment produced by plant that is used in health products; 2) caramel, dark brown pigment come from cane sugar, lactose, etc. 3) Bixin, a pigment from where the yellow of butter or corn oil comes 4). Carotene produces a color range from orange until red and is used to give colors to products. 5) Anthocyanin can be obtained from flowers and fruits having red, orange, purple, blue, and yellow color. 6) Tanin is a brown pigment contained in sap. 7) Curcumin is a yellow pigment that is the main constituent of tumeric.

Silk characteristics are not shiny, stiff, and difficult to absorb dye liquid because of the sericin contained in it. To reduce the sericin in the filament and so to have soft and shiny fabric, silk is boiled in water with detergent base.

In a dyeing process using natural dyes, there are some substances that can be used to fix the resulted color called dye fixatives or mordants. Santosa & Kusumastuti (2008) defined a mordant as a special

substance used to increase the absorbancy of cloth so that high-quality color can be resulted. Mordants can be classified into two kinds: chemical mordants and natural mordants. The former comes from chrome, tin, copper, zinc, and iron while the latter from alum, rock sugar, citrons, copper sulfate, mollasses, vinegar, brown sugar, borax, saltpeter, limes, and green vitriol. Turkish Red Oil powder is a base detergent compound that function as a wetting agent to help the cloth in absorbing dyes. (Prapti & Trimeiningrum, 2007).

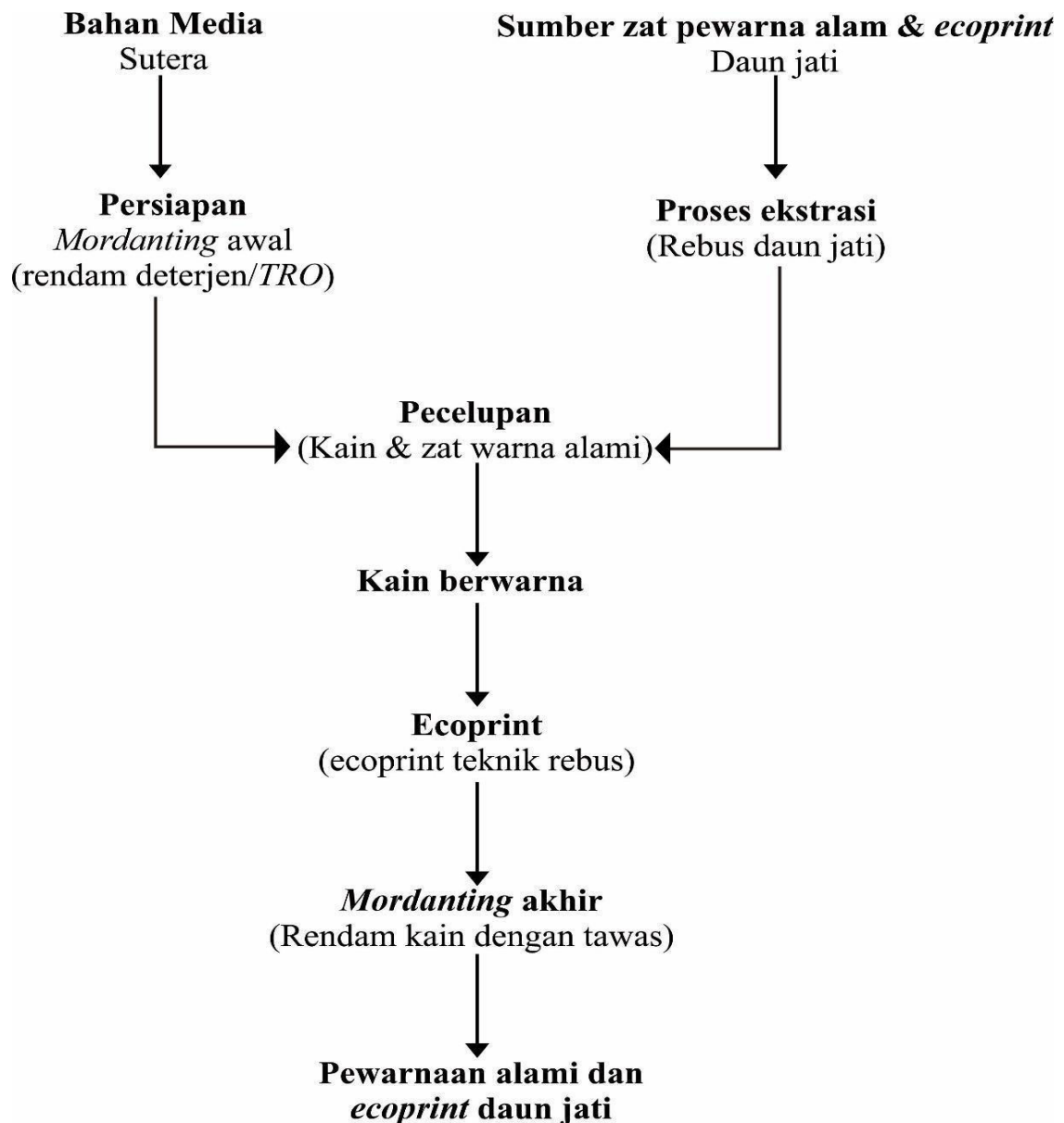


Table 2. Ecoprint natural dyes.

RESULT AND DISCUSSION

b. Creative Process

Design

The first step in this stage was sketching. Sketching on the cloth was done using a soft pencil so that it would not leave trace on the final result. Picture 2 and 3 are sketches of teak leaves. Picture 4 shows how sketch 1 and 2 will be arranged.



Picture 2. Sketch of Teak Leaf 1



Picture 3. Sketch of Teak Leaf 2



Picture 4. Arrangement of Sketch 1 and 2

Tools and Materials and Tool

The tool needed were: 1) scissors, 2) basin, 3) ropes, 4) steaming pot 5) plastic. The main material were teak leaves. Picture 5 exhibits young teak leaves as the main natural dye material. Picture 6 presents fresh teak leaves as the ecoprinting material.

The liquid used to soak the cloth is the mixture of water and Turkish Red Oil. The cloth used in this research was silk as can be seen in Picture 7. Picture 8 is a picture of alum used to fix the color.



Picture 5. Young Teak Leaves



Picture 6. Fresh Teak Leaves



Picture 7. Silk Fabric



Picture 8. Alum

The Making Techniques and Processes

a) Extracting Technique and Process

Picture 9 illustrates the extracting process of 25 young teak leaves. They were boiled for 15 minutes until the water became red. In doing the extraction, the temperature should be maintained at the ideal level in order to keep the quality of the anthocyanin contained in the leaves. Overheating might end in the damaged anthocyanin so that color would not appear.

b) Dyeing Technique and Process

Picture 10 illustrates the coloring process. Silk fabric was soaked in dye liquid containing teak leaf extract. This step was to ensure that the cloth would absorb the dye extract optimally.

c) Ecoprinting Technique and Process

Ecoprinted cloth can be created into some functional product such as outfits, bags, and bed covers.



Picture 9. Extraction Process



Picture 10. Dyeing Process



Picture 11. Steaming

d) Color Fixing using Alum

Picture 12 illustrates the first step of color fixing using alum. First of all, a block of alum was dissolved in 3 litres of water. After the alum was completely dissolved, the cloth was soaked in the solution for more or less 30 minutes as can be seen in Picture 13. During this process, cloth should be checked to ensure that there was no unwanted object stuck on the cloth and created an unwanted pattern on the cloth. This process resulted in a color with similar shade with the prior color, yet was more intense.



Picture 12. Alum Solution



Picture 13. Soaking Cloth in Alum Solution

c. Analysis of The Work

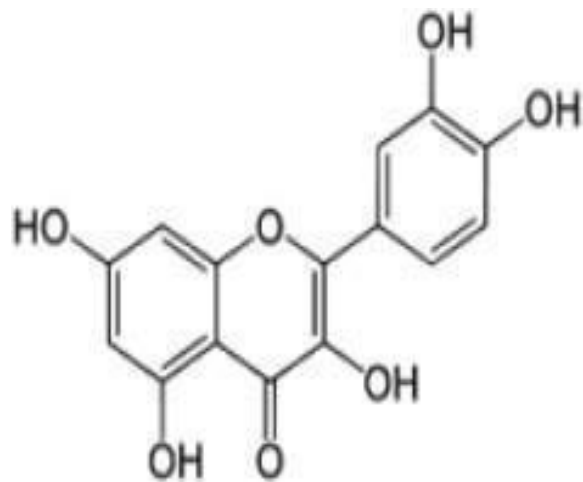
a) Output of Teak Leaves Extraction

In Picture 14, it is seen that the extraction process produced brownish red solution. The shade was caused by the anthocyanin contained in young teak leaves. The teak leaf extract that was dissolved in the water created the color. According to (Rosyida, A., & Achadi W, 2014), the brownish red was caused by the contained glycoside.

Anthocyanin is one of the flavonoid compounds often found in petunidin, cyanidin, peonodin, etc. It is also a part of polyphenol class. Picture 15 depicts the chemical structure of anthocyanin. (Sulistiawati et al., 2017)



Picture 14. The result of young teak leaves extraction



Picture 15. Anthocyanin's chemical structure
(Source: Endah Sulistiawati)

b) Output of The Dyeing Process

As can be observed in Picture 16, dyeing stage resulted in brownish orange cloth. Picture 17 illustrates the color change after the cloth was dyed from glossy white became glossy orange. Table 2 shows the output of the coloring and ecoprinting processes using the teak leaf samples.

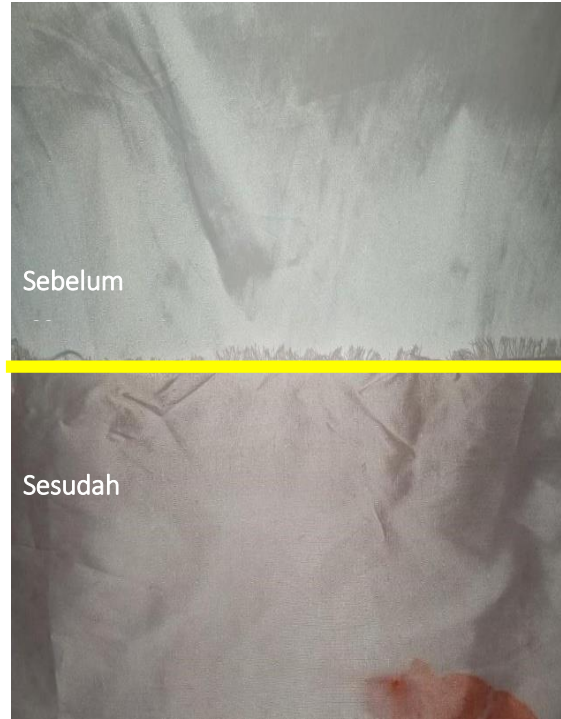
According to Santosa & Kusumastuti (2008), in plant taxonomy, teak can be classified as:

Kingdom	: Plantae
Division	: Spermatophyta
Class	: Angiospermae
Sub-class	: Dicotyledoneae
Ordo	: Verbenales
Family	: Verbenaceae
Genus	: Tectona
Species	: <i>Tectona grandis</i>

Table 2. Output of natural dyeing and ecoprinting



Picture 16. Dyeing Process Output



Picture 17. Color comparison before and after the dyeing process

c) Output of the *Ecoprinting Process*

Picture 18 shows the output of the cloth dyeing process using teak leaf extract and ecoprinting motif process using fresh teak leaves. The teak leaf motifs resulted from the ecoprinting process had the same shade as the cloth yet brighter.

Ecoprinting was chosen to be applied with the intention to bring up the leaf structure including its midrib and veins. The printed motifs added an artistic value to the cloth.



Picture 18. Ecoprinting output



Picture 19. Cloth color before fixed



Picture 20. Cloth color after being fixed

d) Output of Alum Fixing Process

Picture 19 illustrates the color fixing process using alum. Alum was applied since it could help to get clearer colors; green vitriol as a mordant agent resulted in a duller color (Wirawan & Alvin,

2019). Color fixing aims at locking the dye substance in the cloth and also functions in getting the desired shade. Picture 20 is the output of the color fixing process.

d. Output of Natural Dyeing and Ecoprinting

In this process, the silk fabric had been colored and ecoprinted with teak leaves. Out of this fabric, there were some functional goods produced. Picture 21 depicts the sewing process in producing the functional goods. The samples of the products can be seen in Picture 22 and 23.

Table 3 informs the color change happens to the silk cloth. The first row shows the color of original plain silk cloth. In row 2, after the treatment done to the cloth, it became light orange. The last row exhibits the final result after ecoprinting is done to it.



Plain silk cloth



Colored silk cloth



Ecoprinted colored cloth



Picture 21. Sewing process



Picture 22. End products of natural dyed and ecoprinted silk cloth



Picture 23. Pillowcases, one of the functional products fabricated

CONCLUSION

The conclusions of this research were: 1) Teak leaves could be used to create an artwork or artistic patterns imprint on silk fabric by processing it to get natural dye extract and exploiting its color, shapes, and marks on silk fabric, 2) From the result of this research, it was recommended to fabricate some functional items for the interior and furniture needs, for example: pillow cases.

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