

UTILIZATION OF SURIAN WOOD SHAVINGS WASTE EXTRACT ON PRIMA MORI COTTON DYEING RESULTS WITH TUNJUNG MORDANT

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Abstract

This research is motivated as an effort made to obtain environmentally friendly textile dyes by utilizing surian wood shavings waste extract. The purpose of this study is to describe the color name (hue), color evenness, and color fastness to washing of surian wood shavings waste dyeing results on prime cotton. Experimental research uses primary data. Data collection using questionnaires from 15 panelists. Data were analyzed using the Mann Whitney Test using SPSS version 26. The results of the color name of the dyeing without mordant 87% Dark Salmon Pink code #D78D68 color evenness is very even, the results of color fastness without mordant 1 wash 73% color slightly changed, 2 washes 53% color slightly changed, and 3 washes 47% color slightly changed. The results of the tunjung mordant color 80% Gray code #574F4C color evenness is even, the results of the tunjung mordant color fastness 1 wash 80% the color changes slightly, 2 washes 67% the color changes slightly, 3 washes 60% the color changes slightly. The results of the Mann Whitney Test for color evenness were obtained $.389 > 0.05$, H_0 was accepted indicating that there was no significant difference in color evenness in the results of dyeing surian wood shavings waste extract on prima cotton mori. While color fastness obtained $.547 > 0.05$, H_0 is accepted indicating that there is no significant difference in color fastness.

Keywords : Utilization of Waste, Mordant, Surian Wood Shavings.

Abstrak

Penelitian ini dilatarbelakangi sebagai suatu upaya yang dilakukan untuk memperoleh pewarna tekstil yang ramah lingkungan dengan pemanfaatan ekstrak limbah serutan kayu surian. Tujuan penelitian ini mendeskripsikan nama warna (hue), kerataan warna, dan ketahanan luntur warna terhadap pencucian hasil pencelupan limbah serutan kayu surian pada katun mori prima. Penelitian eksperimen memakai data primer. Pengumpulan data menggunakan angket dari 15 panelis. Data dianalisis menggunakan Uji Mann Whitney menggunakan SPSS versi 26. Hasil nama warna pencelupan tanpa mordan 87% Dark Salmon Pink kode #D78D68 kerataan warna sangat rata, hasil ketahanan luntur warna tanpa mordan 1 kali cuci 73% warna sedikit berubah, 2 kali cuci 53% warna sedikit berubah, dan 3 kali cuci 47% warna sedikit berubah. Hasil warna mordan tunjung 80% Grey kode #574F4C kerataan warna rata, hasil ketahanan luntur warna mordan tunjung 1 kali cuci 80% warna sedikit berubah, 2 kali cuci 67% warna sedikit berubah, 3 kali cuci 60% warna sedikit berubah. Hasil Uji Mann Whitney untuk kerataan warna diperoleh $.389 > 0,05$, H_0 diterima menunjukkan tidak terdapat perbedaan kerataan warna yang signifikan pada hasil pencelupan ekstrak limbah serutan kayu surian pada katun mori prima. Sedangkan ketahanan luntur warna diperoleh $.547 > 0,05$, H_0 diterima menunjukkan tidak terdapat perbedaan ketahanan luntur yang signifikan.

Kata Kunci : Pewarna alam, Tunjung, Serutan Kayu Surian.

INTRODUCTION

Utilization of waste as textile dyes is one of the innovation steps and creative solutions in producing natural dyes that support environmental sustainability. To minimize the adverse effects caused by the use of synthetic dyes, safer dyes are needed that come from environmentally friendly natural sources.(Anugrah & Novrita, 2023). Waste is one of the problems faced and is increasing day by day.(Utami et al., 2022). Wood shavings waste is waste produced from industrial processes that have no use value in the main production process. The author found many wood shavings waste and it is not utilized in one of the wood processing industries, efforts made to manage wood shavings waste have not been carried out optimally, only used as organic fertilizer or open burning. In this study, the author utilized surian wood shavings waste extract as a natural dye.

To produce color, plants must contain color-forming pigments that can be used as natural dyes. Plant parts such as stems, leaves, bark, flowers, root bark, fruit skin, and the fruit itself can all contain natural dyes.(Fredecia & Adriani 2024). Tannins and flavonoids are examples of color-producing pigments found in plants that can be used as natural pigments or dyes.(Aliffianti 2020: 20).

Surian wood contains pigments that cause color. Based on the results of phytochemical analysis of the group of compounds contained in the ethanol extract of surian wood, it shows that surian wood contains tannins, flavonoids, triterpenoids, and steroids.(Sari et al., 2013). The color produced from the extraction of surian wood shavings is reddish brown, an expression of the tannin compound content that is abundant in wood. While flavonoids function to provide color, plants containing flavonoids can play a role in producing yellow, red, orange, blue, and purple (Susila et al., 2023:127)

In the process of dyeing textiles with natural dyes, additional compounds known as mordants must be added as producing agents to help control the final color. Mordants are special additives used to fix the color to the fabric.(Diva & Novrita, 2023:191). In the context of natural dyeing, mordants are often needed to increase the efficiency and success of the dyeing process with natural dyes. Mordants can be used to bind and produce a variety of colors.(Wahyuni & Novrita 2024). There are two sources of mordants based on their type: natural and synthetic. Natural mordants such as alum, palm sugar, water, rock sugar, tunjung, klutuk banana, lime and others, and

synthetic mordants such as chromium salts, diazonium salts, and caustic soda. (Coal & Adriani, 2022).

Mordants that are commonly used as natural color enhancers include chalk, alum, tunjung, waterglass. (Nilamsari, 2018). Here the author uses tunjung as a mordant. Tunjung contains iron, sulfur, and oxygen with the molecular formula $FeSO_4$ (Yuled & Adriani, 2021:25). Tunjung is in the form of crystals, grains or dark green powder, easily soluble in boiling water, tunjung gives a dark or old dyeing color. (Cahaya & Novrita, 2023). The use of tunjung as a mordant in textile coloring has a role in producing sharp colors because the pH content contained in tunjung is quite low. The resulting color will be brighter if the pH of the acid contained is higher (Adriani, 2006). The pH content of alum is 9, the pH content of betel lime is 11-12.5, while the pH content of tunjung is 8 (Wahyuni & Novrita, 2024).

The absorption of natural dyes is also influenced by the type of textile used. Textile materials that are colored with natural dyes are materials that come from natural fibers such as silk, wool, and cotton. (Fitrihana, 2018: 2). In this study, the author uses prima cotton mori material as the material to be used in dyeing because prima cotton mori material is able to absorb color well and has a smooth and soft quality. Prima mori cloth is a cotton woven fabric that has a plain weave with tight threads, has the right grammage, is not too thick but not too thin, has the right thread density and has high absorption so it is suitable for use as dyeing (Rumiyati et al. 2023). One of the prime mori fabrics has the property of easily absorbing natural and chemical dyes (Wahyuni & Novrita 2024).

Based on the discussion above, the objectives of this study are: 1) To describe various color names; 2) To describe color evenness; 3) To describe color fastness to the washing process; 3) To describe the results of dyeing without mordant and using tunjung mordant using surian wood shavings waste extract

LITERATURE REVIEW

Dyes are defined as materials or substances that have the ability to color textile materials through a dyeing process or other applications. Basically, the process of coloring textiles with dyes is obtained from natural materials. (Gusti & Novrita, 2021). Natural dyes come from the extraction of animals, minerals, and plants (such as parts of leaves, flowers, seeds, wood) to produce color pigments (Jeki, 2022:917). Natural dyes are obtained by boiling (extracting) parts of plants that have or contain color-

producing pigments (Lestari,2023:55). The use of natural dyes not only produces beautiful colors, but is also more environmentally friendly.

Plants such as wood have the ability to produce natural color pigments. Surian wood is one type of wood that is easily found in the community and is widely used in plantation activities in Indonesia, with various uses.(Yusuf et al., 2014). The shape of the wood is long and large, so it is used by many wood processing industries to meet various needs, such as buildings, furniture, crafts, and others. The results of research conducted by(Sari et al. 2013)with the title "Antioxidant Activity and Toxicity of Surian Ethanol Extract" states that flavonoids, quinones, triterpenoids, steroids, and tannins are groups of compounds found in ethanol extracts from various parts of the surian tree.

In this study, natural dyes are used as extracts by utilizing waste shavings of surian wood. Sawdust is solid waste from unused wood pieces used by household furniture companies and factories. Sawdust is produced from sawing wood carried out with sophisticated technology or by human hands (Dewantara & Arif 2022:5).



Figure 1. Surian wood shavings waste

Dyeing is a process of evenly coloring textiles which involves three main components, namely dye, water and additional materials (Fitrihana, 2018:84). Dyeing textiles is an important step in the coloring process. In order for dyes to penetrate textile fibers, dyeing usually requires dissolving or dispersing the dye in water or another medium and then adding the textile material to the mixture.(Fatihaturahmi & Novrita 2019). In dyeing, vlot or dye solution is a recipe that is needed for, vlot is very important because it is the initial stage of the dyeing process is the making of the dyeing solution.(Delmasari & Novrita, 2024).

Fabric dyeing is expected to produce fabric color and attractiveness. During the dyeing process, the fabric reacts with the substances used, be it mordant, dye or

binder.(Naini & Hasmah, 2016). The properties of each dye contained in natural materials also influence the coloring results produced by the use of mordant (Nada 2020:124). Mordants commonly found in use in fabric dyeing are alum, chalk, and tunjung (Matussilmi,2023)

The dyeing process involves the application of certain dyes that are appropriate to the type of material to be dyed to apply color to textile materials, such as textiles, yarns, and fibers, consistently. Natural fibers, such as cotton, silk, and wool, are sources of natural dyes that are applied in the process of dyeing textile materials. (Fitrihana 2018: 2). Cotton, wool, and other natural fibers are sources of natural dyes used to color textile products. 94% of the components in cotton are cellulose so it has a high absorption capacity, therefore cotton fiber is suitable for dyeing (Fitriana & Adriani 2019:156). Research result(Rumiyati et al. 2023)shows that prima cotton has a weight of (85 to 100) g/m², plain weave, number of threads Tex 12.3 - Tex 15.5, number of warp threads Ne (36.83-46.57), number of weft threads Ne (39.17-44. 36), tensile strength of warp threads not less than 20.36 g and tear strength of warp threads 725 g and weft threads 701 g. In addition, prima cotton can be reached at a cheaper price.

Color fastness to washing is an important aspect in the daily use of textile materials. Color fading occurs when the dye in the fabric experiences a reduction, caused by physical or chemical processes, causing the color to become reduced, change, or fade (Ramadhan,2021:38).

METHOD

This type of research is an experimental research. Prima cotton mori material is the object of this research which is dipped by utilizing surian wood shavings waste extract as a dye using tunjung mordant to determine the location of the difference in the use of color generating agents, namely tunjung mordant with the same tools, techniques, and treatment duration. This study has two variables, namely:

1. Independent Variable (X)

Variable X is the difference in the dyeing results of cotton mori material using surian wood shavings waste extract with tunjung mordant.

2. Dependent Variable (Y)

The dependent variable (Y) is a variable that is affected or influenced by other variables, namely the results of dyeing prime cotton mori material using surian wood extract on the color name (hue), color evenness, and color fastness to washing.







Primary data is the type of data used. Data obtained directly from the research subjects is primary data. This information was obtained from 15 panelists consisting of 12 students of the PKK (fashion design) study program who met the requirements and 3 fashion design lecturers. The research instrument was in the form of a questionnaire with answers in the form of scores for color names, color evenness, and color resistance to the washing process. This questionnaire was compiled using a rating scale. This instrument was assessed directly by giving a score to the instrument given, then the data was processed and then arranged into a table and analyzed using the Mann Whitney Test using SPSS (Statistic Product and Solution) version 26.

RESULTS

1. Description of the color name (hue) results

In the study of the direction of the color name, the results of the coloring were obtained using the colorblind assitand application, this application displays the color name (hue) along with the RGB code of each color. Through this application, three colors were obtained which will be selected by the panelists to be assessed on the questionnaire. Each indicator on each questionnaire filled out by the panelists was scored, and this method was used to collect data..

Table 1 The name of the color produced from without mordant and mordant tunjung

No	Dyeing	Color	Color name	RGB	Color code	F	%F	Total
1	Without mordant		Light Brown	R236 G182 B126	#ECB67E	0	0%	100%
			Sandy Brown	R232 G165 B110	#E8A56E	2	13%	
			Dark Salmon Pink	R215 G141 B104	#D78D68	13	87%	
1.	Visit		Dark Grey	R050 G050 B043	#32322B	1	7%	100%
			Grey	R087 G079 B076	#574F4C	12	80%	
			Dark Red	R056 G050 B050	#383232	2	13%	

From the table above, the following color names are grouped with color codes. Based on the color description in the table above, it can be concluded that the dyeing of prima cotton mori material with surian wood shavings waste extract without mordant 13 panelists chose the color name Dark Salmon Pink with a frequency of 87% color code #D78D6 with R (Red) 215, G (Green) 141, and B (Blue) 104, 2 Panelists chose the color Sandy Brown with a frequency of 13% with the color code #E8A56E with R (Red) 232, G (Green) 165, B (Blue) 110.

OnDyeing prime mori cotton material with surian wood shavings waste extract with tunjung mordant, 12 panelists stated that the color (Hue) Gray was 80% with the color code #574F4C having a value of R (Red) 087, G (Green) 079, B (Blue) 076 2 panelists stated that the color (Hue) Dark Murky Red was 13% with the color code #383232 having an R (Red) 056, G (Green) 050, B (Blue) 050. 1 panelist stated the color (Hue) Dark Gray was 7. % with color code #32322B has a value of R (Red) 050, G (Green) 050, B (Blue) 043.

2. Color evenness

The results of the evenness of color produced from the use of surian wood shavings waste extract with tunjung mordant and without mordant in dyeing prima cotton mori material.:

Table 2 Color uniformity without mordant

Score	Color Flatness	Frequency	0%
5	Very Flat	8	53%
4	Flat	6	40%
3	Fairly Average	1	7%
2	Less than Average	0	0%
1	Uneven	0	0%
Amount	15	100%	

The table above shows the evenness of color in dyeing prima cotton mori material with natural dyes extracted from surian wood shavings waste without mordant. 8 panelists (53%) stated that it was very even, 6 panelists (40%) stated that it was even, 1 (7%) panelist stated that it was quite even.

With a frequency percentage of 53% of the total number of panelists, it can be stated that the color evenness in dyeing prime cotton mori material with surian wood shavings waste extract without mordant is very even.

Table 3 Evenness of the color of the tunjung mordant

Score	Color Flatness	Frequency	0%
5	Very Flat	5	33%
4	Flat	9	60%
3	Fairly Average	1	7%
2	Less than Average	0	0%
1	Uneven	0	0%
Amount		15	100%

The evenness of color on the prima cotton mori material dyed with natural dyes made from surian wood shavings waste extract with punjung mordant can be seen in the table above. From the panelists, 5 people (33%) stated very even, 9 people (60%) stated even, and 1 person (7%) stated quite even.

By using a frequency percentage of 60% of the total number of panelists, it can be stated that the color evenness in dyeing prime cotton mori material using surian wood shavings extract and tunjung mordant is classified as even.

3. Color fastness to washing

Description of fastness to washing was obtained through panelist assessment after 1, 2, and 3 washings. This assessment was carried out on the results of dyeing prima cotton mori material using surian wood shavings waste extract with the addition of tunjung mordant:

Table 4 Color fastness to washing

No	Dyeing	Was h	Color Fastness		Caption
			Frequency	%	
1	Without Mordant	1 time	11	73%	Color slightly changed or reduced
		2 times	8	53%	Color slightly changed or reduced
		3 times	7	47%	Color slightly changed or reduced
2	Mordan Tunjung	1 time	12	80%	Color slightly changed or reduced
		2 times	13	87%	Color slightly changed or reduced
		3 times	9	60%	Color slightly changed or reduced

Based on the table of research results on color fastness to washing produced from dyeing without mordant, it is known that in the first wash, 73% of panelists stated that the color experienced a slight change or decrease in intensity. In the second wash, 53% of panelists stated the same thing, and in the third wash, 47% of panelists reported that the color changed or decreased slightly.

In dyeing with tunjung mordant, 80% stated that the color changed slightly or decreased in one wash, 87% stated that the color changed slightly or decreased in two washes and 56% stated that the color changed slightly or decreased in three washes.

The color fastness of prime cotton mori material dyed with alum mordant after being washed with soapberry fruit was proven to be slightly reduced or changed, based on the findings of the research that had been carried out and the analysis of the data obtained.

4. Difference Analysis

Table 5 Mann Whitney color evenness test results
Test Statistics

Color evenness results	
Mann-Whitney U	91,500

Wilcoxon W	211,500
Z	-.977
Asymp. Sig. (2-tailed)	.328
Exact Sig. [2*(1-tailed Sig.)]	.389b

a. Grouping Variable: Mordan

b. Not corrected for ties.

5.

Based on the results obtained from the Mann Whitney test analysis for color evenness, it produces a significant value of .389b which is greater than the significance level = 0.05 with Ha rejected and Ho accepted. So there is no difference in color evenness of the results of dyeing prima cotton mori material with tunjung mordant using surian wood shavings waste extract.

Table 6 Mann Whitney color fastness test results

Test Statistics

	Color fastness results
Mann-Whitney U	946,500
Wilcoxon W	1981,500
Z	-.602
Asymp. Sig. (2-tailed)	.547

a. Grouping Variable: Mordan

Based on the results of the Mann-Whitney test for color fastness to washing, it produces a significant value of .547b which is higher than the significance level of 0.05, so Ha is rejected and Ho is accepted. Where Ha produces no significant difference in color fastness resulting from washing produced with tunjung mordant.

DISCUSSION

1. The color name (Hue) obtained from dyeing variations using tunjung mordant, and without mordant on prima cotton mori material with surian wood shavings waste extract.

In the dyeing of surian wood shavings waste extract without mordant, the color produced was Dark Salmon Pink with R215 G141 B104 with color code #D78D68 and a percentage of 87% of the number of panelists, in the dyeing with tunjung

mordant, the color obtained was Grey with R087 G079 B076 with color code #574F4C and a percentage of 80% of the number of panelists.

According to the results of the study, the direction of the color name obtained from dyeing prima cotton mori material using surian wood shavings extract with tunjung mordant, is in line with the results of the study (Wahyuni & Novrita, 2023) that the use of tunjung mordant obtains a darker color compared to not using a mordant. And also in line with the results of the study (Ramantika & Novrita, 2020) stating that dyeing using rejected palm oil extract on cotton material with varying mordants obtains different levels of color. Furthermore, in line with the results of the study (Hendrika & Novrita, 2020). In the results of dyeing cotton material with nipah fruit skin and red onion skin using alum, tunjung, and betel lime, each of which has a different pH, the tunjung mordant is basic with a pH of 8, alum with a pH of 9 and betel lime with a pH of 11-11.5, showing that the material dyed at a different pH will affect the color aging results obtained.

2. The evenness of color obtained in dyeing with and without mordant on cotton material using surian wood shavings waste extract.

In the difference in the types of mordants produced without mordant is very even with tunjung mordant in the color evenness category is even, this is in line with research (Wahyuni & Novrita, 2024) on "The Effect of Tunjung Mordant on Cotton Fabric Dyeing Results Using Jackfruit Leaf Extract (*Artocarpus Heterophyllus L*)" states that the color evenness category with tunjung mordant is even. Also in line with the results of the study (Cahya & Novrita 2023) that the use of tunjung dye for coloring using red onion skin extract and mangosteen skin produces even color.

In line with research (Saputri & Novrita 2021) about the difference in mordant tunjung, alum and lime betel on the results of dyeing avocado skin on cotton material produces even color. However, it is inversely proportional to the research

3. Color fastness to washing obtained from dyeing using the influence of mordant types of alum, tunjung, betel lime and without mordant on cotton material using surian wood shavings waste extract.

In dyeing without mordant 1 wash 73% of panelists said the color changed slightly or decreased, in washing 2 times 53% of panelists said the color changed slightly or decreased, and in washing 3 times 47% of panelists said the color changed slightly or decreased. in dyeing with tunjung mordant 1 wash 80% of

panelists said the color changed slightly or decreased, in washing 2 times 87% of panelists said the color changed slightly or decreased, and in washing 3 times 60% of panelists said the color changed slightly or decreased.

The requirements for dyes are that they must be able to adhere to textile fibers and have good fastness properties (Syafitri & Adriani, 2015:10). The results of this study are in line with (Rohmawati, 2019) shows that the results of the quality of color fastness to washing show that the results of the alum mordant treatment have better quality compared to the quicklime and tunjung mordants, meaning that washing with tunjung mordant produces good washing fastness. However, the results of this study are inversely proportional to the results of the study (Gustiani & Novrita 2024) shows that dyeing with gambir leaf extract after washing 3 times shows that 100% of panelists said the color did not change at all. Meanwhile, according to (Pradana et al., 2021:23) The strength of the bond between the fiber and the dye is the main factor influencing resistance to color fastness.

CONCLUSION

Based on the findings of the research and analysis that has been carried out, the conclusions that can be drawn include:

1. Color name

The name of the color obtained from dyeing with surian wood shavings waste extract without mordant is Dark Salmon Pink with R215 G141 B104 with a frequency of 87%, in dyeing with tunjung mordant the color obtained is Grey with R087 G079 B076 of 80.

2. Fastness

The color fastness to washing obtained from the influence of variations in the type of mordant and conditions without mordant on the dyeing results on prima cotton mori material with surian wood shavings waste extract, namely the color fastness in dyeing without mordant 1 wash 73% of panelists said the color changed slightly or decreased, in washing 2 times 53% of panelists said the color changed slightly or decreased, and in washing 3 times 47% of panelists said the color changed slightly or decreased.

In dyeing with tunjung mordant, 80% of panelists said that the color changed slightly or decreased after 1 wash, 87% of panelists said that the color changed slightly or decreased after 2 washes, and 60% of panelists said that the color changed slightly or decreased after 3 washes.

3. Color evenness

The color evenness obtained from the influence of dyeing without mordant on the prima cotton mori material using wood shavings waste extract produces a very even color evenness. The color evenness obtained from the influence of dyeing using tunjung mordant on the prima cotton mori material using surian wood shavings waste extract produces a very even color.

4. Difference Analysis

The difference between the mordant and the tunjung mordant on the prima cotton mori material with the extract of surian wood shavings waste on the color fastness to washing on the results of dyeing the prima cotton mori material according to the data analysis obtained from the Mann Whitney test on the prima cotton mori material, a significance value of 547b, where it is greater than the significance level of 0.05, so that H_0 is accepted, which means "There is no difference in the tunjung mordant on the prima cotton mori material with the surian wood shavings waste extract on the color fastness of the dyeing results.

The difference in the type of mordant and without mordant on the prima cotton mori material with surian wood shavings waste extract on the evenness of the color in the dyeing results of the cotton material according to the data analysis obtained from the Mann Whitney test on the cotton material obtained a significance value of .389b which is greater than the significance level of 0.05, so that H_0 is accepted which means "There is no difference in the tunjung mordant on the prima cotton mori material with surian wood shavings waste extract on the evenness of the color in the dyeing results.

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