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Natural Dyes from Secang (*Biancaea sappan*) Wood in Sutera

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Abstract. Colour variations are needed to support the textile industry development to increase product attractiveness. Textile dyes can come from natural and synthetic materials. Natural dyes can be the best solution to replace synthetic which is harmful to the environment. One of the natural dyes is a secang plant. This study aims to determine the absorption of silk fabrics on the secang wood colour using fixator. The research procedure consisted of a literature review, observation, data verification, experimentation and processing using descriptive statistical analysis. The results showed that the ability to absorb silk fabric against the secang wood colour using fixators produced a very sharp and bright colour and very flat on the fabric surface. The alum fixator produces a Dark Red colour, quicklime fixator is Maroon which is included in hot colours on colour circle, while tunjung fixator is Black from other colour clumps.

1. Introduction

The textile industry which is growing rapidly causes demands for colours variations. Colour is an attractive component of textile products. Dyes are coloured organic compounds that are used to give colour to an object or cloth. Technological advances are able to create synthetic dyes of various colours but the waste from synthetic dyes is harmful to the environment. Petrochemicals as a source of almost all synthetic colourants through hazardous chemical processes pose a threat towards its eco-friendliness [1]. Dyes from natural sources are attractive and suitable alternatives to replace synthetic dyes because of their environmental benefits [2]

Since long ago natural dyes have been used in various fields such as textiles, handicrafts, food colouring and also a medicine [3]. Natural dyes come from natural resources. Colouring material obtained from natural resources of plants, animals, minerals, and microbial origin used for colouring various textile materials [4].

Indonesia is a country with abundant natural resources. Biodiversity is one of the most important things for the socio-economic life of even human culture. This potential can develop well if there is an effort to continue to innovate and be creative. Several types of plants have been widely used for traditional medicinal ingredients, handicraft raw materials, industries and natural dyes. One of the natural resources that can be utilized is natural dyes from a plant. Natural dyes for textile materials are generally obtained from extracts of various plant parts such as roots, leaf wood, seeds and flowers [5]. In plant tissues, there are different colour-bearing plant pigments depending on their chemical structure.

Natural colouring agent from secang (*Biancaea sappan*) can be obtained by boiling secang wood pieces [5]. Extract from secang wood produces a red pigment called brazilin which can be used as a substitute for natural dyes [6]. In an effort to revive the use of natural dyes in textile materials it is important to carry out an analysis of materials derived from natural fibres. The colouring process is done by dyeing the fabric on the dye



This research has used sutra (silk) material which aims to determine the absorption of silk fabrics on the wood colour using fixator. There are three types of fixators used, namely alum, quicklime and tunjung. The author chooses silk material as a fabric of South Sulawesi which has the potential to be developed.

2. Methods

2.1. Data collection technique

The researcher observes and records the data. The procedure of this research was carried out starting from a literature review, observation, data verification, experimentation, and processing of research results. The literature study was conducted to examine research that had been carried out by other researchers who examined natural dyes that had been published as reference material.

This research indicator focuses on natural dyes to be carried out on silk, divided into three stages:

1) Secang wood colouring extraction

Cutting the secang wood into small sizes, then put the pieces into a container (weighing 500 gr), adding water in a ratio of 1: 3. Cook until the water changes colour and shrinks to 1/3 of the original. As an indication that the colour pigments that exist in plants have come out indicated by water becoming coloured. Filtering the extract solution uses filter gauze to separate the pulp. This extract solution is called natural dye solution.

2) Fixation experiment

Fixation is a process of strengthening colours (avoiding fading). Fixation can be done with several ingredients such as alum, lime (CaCO₃) and tunjung (FeSO₄) [7, 10]. Each ingredient has different characteristics of colour. The fixation process is dissolved in water and left until the solution settles. The clear liquid is used for fixation processes.

3) Dyeing the silk

10 ml of the dye solution extracted from secang wood included in the colouring container. Add textile material that has been melted into natural dyes and soaked for 15-30 minutes. Next, the material is processed in a fixer solution for 15 minutes to determine the colour difference produced by each fixer solution. Rinse, wash and dry cloth. Observe the colours added by natural dyes to the fabric.

2.2. Data analysis technique

Processing data in this study was carried out by statistical analysis, for processing research data which included descriptive statistical analysis. To determine the colour resistance value of the fabric based on the questionnaire then the data that has been successfully collected using descriptive statistics to present the results of the assessment aspects using the following formula:

$$P = \frac{f}{N} \times 100 \%$$

P = percentage

f = frequency

N = number of samples

Furthermore, the success indicator of this descriptive analysis study is considered effective if all panellists get scores in the category of both aspects of the assessment. To measure the level of success of the study, categorization techniques were used on the aspects assessed in this study. The measurement scale that can be used is the Likert scale. The value of the results of the observations is stated by:

SB: Very Good

B: OK

C: Good enough

K: Not good

To find out the interpretation of the score based on the interval used the formula:

$$I = \frac{100}{\text{Number of Likert scale}}$$

$$I = \frac{100}{4}$$

$$I = 25$$

Criteria for interpretation of scores based on intervals

0% - 24.99%	Poor
25% - 49.99%	Good enough
50% - 74.99%	Good
75% - 100%	Very Good

Panellist test related to the results of colouring to 46 respondents consisting of 6 lecturers (expert panellists), 35 Fashion Department students (trained panellists), and 5 community people (consumers).

3. Result and Discussion

Secang can be used as a source of natural dyes because it contains Brazilian compounds. Brazilin is a yellow crystal, but if oxidized it will produce brazilin compounds which are brownish red and can dissolve in water, therefore it can be used for colour creation in the textile industry [8]. Brazilin will quickly form red when exposed to sunlight. Brazilian compounds have the characteristics of being slightly soluble in cold water, easily soluble in hot water, soluble in alcohol, ether and hydroxy alkali [9].

Table 1. The colour sharpness of silk fabrics with secang wood colouring

Option	Answer Category	Before Washing		After Washing	
		F	%	F	%
A	Very sharp (+)	24	53,33	3	6,67
B	Very sharp	9	20,00	11	24,44
C	Sharp	10	2,22	21	46.67
D	Less sharp	0	-	8	17,78
E	Not sharp	2	4,44	2	4,44
Total		45	100	45	100

Table 1 shows that respondents generally stated that the colour before being washed which was produced on silk cloth was very sharp due to the extract of wood colouring which was absorbed in many white silk fabrics that were attached to the outer surface of the fabric. The results of the Likert scale show that 83.55% belong to the very sharp category.

Generally, respondents stated that the colour after being washed which was produced on silk cloth that had been stained showed sharp colour because not all of the wood colouring substances were absorbed in the silk yarn. There is no lumen on silk fibres so the colour is rather faded. The results of the Likert scale show that 62.22% belongs to the sharp category.

Table 2. The colour flatness of silk fabrics with secang wood colouring

Option	Answer Category	Before Washing		After Washing	
		F	%	F	%
A	Very flat (+)	9	20,00	5	11,11
B	Very flat	16	35,56	9	20,00
C	Flat	16	35,56	15	33,33
D	Less flat	4	8,89	16	35,56
E	Not flat	0	-	0	-
Total		45	100	45	100

Table 2 shows that respondents generally stated that the colour before being washed which was produced on silk cloth was very flat due to the extract of wood colouring which was absorbed in many white silk fabrics that were attached to the outer surface of the fabric. The results of the Likert scale indicate that 73.33% belong to the flat colour category.

Generally, respondents stated that the colour after being washed which was produced on silk cloth that had been stained showed flat colour because not all of the wood colouring substances were absorbed in the silk yarn and comes out after flushing. The results of the Likert scale show that 61.33% belongs to the flat category.




Based on the calculation results, the respondents generally states that the colour produced on silk with alum fixator was sharp due to the dyes produced by this fixator, the absorbency of the original colour of the secang wood extract absorbed in white silk was less than perfect. The results of the Likert scale show that 56.89% belongs to the less sharp category. Generally, the respondents stated that the colour produced on silk with quicklime fixator is very sharp due to the dyes produced by this fixator was darker than the alum fixator. The results of the Likert scale indicate that 65.78% is included in the less sharp category. Based on the calculation results, it was shown that respondents generally said that the colour produced on silk with tunjung fixator was very sharp (+) due to dyes which were produced with this fixator higher than the quicklime fixator absorbed in white silk. The results of the Likert scale show that 76% is included in the sharp category.

The length of time used does not affect the colour sharpness absorbed but this is influenced by various types of fixators, the fixator effect on the colour results is very large so that different colours are produced on the same type of fabric [1]. The alum fixator will basically produce the actual colour, the quicklime fixator will produce a colour that is older or even several levels of the colour clump, while the tunjung fixator will produce dark colour from another colour cluster.

Based on the calculation results, the respondents generally states that the colour produced on silk with alum fixator was flat due to the dyes produced by this fixator, the absorbency of the original colour of the secang wood extract absorbed in white silk was less than perfect. The results of the Likert scale show that 57.33% belongs to the less flat category. Generally, the respondents stated that the colour produced on silk with quicklime fixator is very flat due to the dyes produced by this fixator one level higher than the original colour of secang wood extract which is absorbed in white silk. The results of the Likert scale indicate that 60% is included in the flat category. Based on the calculation results, it was shown that respondents generally said that the colour produced on silk with tunjung fixator was very flat due to dyes which were produced with this fixator higher than the quicklime fixator absorbed in white silk. The results of the Likert scale show that 72.89% is included in the flat category.

Silk fabrics with alum and quicklime fixator produce almost the same colour unless the tunjung fixator produces an older/darker colour several levels from the quicklime fixator. The colours obtained are Dark Red, Maroon and Black (Table 3), this colour is very strong (sharp) because the innate nature of protein fibres are shining and easily absorb colouring [5].

Table 3. The colour results using a fixator

	Colour Results using A Fixator		
	alum	Quicklime	Tunjung
Sutra/Silk	 Dark Red	 Maroon	 Black

4. Conclusion

The ability to absorb silk fabric against the secang wood colour using fixators produced a very sharp and bright colour and very flat on the fabric surface. The alum fixator produces a Dark Red colour, quicklime fixator is Maroon which is included in hot colours on colour circle, while tunjung fixator is Black.

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Acknowledgments

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