

# The Utilization of Waste Shallot Skin (*Allium Cepa* L) as Natural Dyeing Material for Textile Product

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## Abstract

Previous studies on the onion skin as a natural dye by Made Diah Angendari showing the colour of each mordant used a *Jumputan* and suggested using a different concentration of mordant in the next research. Based on it, interviews were conducted to three different speakers: KLP Nusantara, Mrs Kuswati, and Dapur Alifa. According to the interviewers, all can produce  $\pm 64$  kg of onion skin per month and most of the onion skin were thrown or burned.

Based on it, a research was done by using a variation of colouring matter, mordant measurement, dyeing technique, dyeing duration, and technique of textile to use plenty onion skin and develop technique on the natural dye of onion skin. To obtain the required data, the student collects the data with experimental methods, such as by observation, interview, literature study, and experimentation. The results of the elected experiment show that the used of iron post-mordanting and an hour cold dyeing technique have a good result based on the endurance of wear-off in Balai Besar Tekstil Bandung and it was applied to a textile product in the form of long cloth with different measurement.

**Keywords** Shallot skin, natural dye, textile product.

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## 1. Introduction

Shallots are spices from Indonesia which have a high selling price. But, the utilization of shallot is only for its flesh while the skin was not being used (Atmadi, et al., 2013), this causes the skin onion to being discarded as waste. There has been researched about this concern by Made Diah Angendari (2015) that brings up utilization of onion skin for textile and it shows the colour of each mordant (alum, lime, iron) used a *Jumputan* and suggested using a different concentration of mordant in the next research.

Based on it, data collection was done by interviewing three speakers who work in the field of trade and food processing of shallot to see the potential number of shallot skin output. KLP Nusantara, a seller of shallot at Caringin Bandung market, sells the amount  $\pm 60$  quintal of shallot per month and produce about  $\pm 60$  kg of shallot skin per month. Mrs. Kuswati, as a smaller trader than the first speaker who works as a vegetable seller at Telkom University Sunday market,

can sell an amount 40 kg of shallot per month and produce 2 kg of shallot skin per month. Meanwhile at Dapur Alifa, as a culinary brand, they can use the amount 20 kg of shallot per month and waste 2 kg of shallot skin per month. According to this data, they can produce up to  $\pm 64$  kg of shallot skin per month and most were thrown or burned without any further usage.

The data imply the subsequently potential in the use of waste shallot skin and according to the previous study, there is potential for developing natural dyeing that has been previously carried out. This research will conduct the utilization of shallot skin in natural dyeing for textile by using a different concentration of natural dyeing material, mordant measurement, dyeing technique, dyeing duration, and application of textile technique. Those are to reveal the potential of shallot skin in producing any colour variation on the textile. The elected experiment will be tested on the endurance of wear off to strengthen the impact of this study which was conducted before this dyeing experiment being applied to the textile products in the form of long clothing

with several different sizes. This study uses experimental methods through observation, interviews, and literature studies. Expected results from the study can help in recognizing the potential of waste shallot skin especially in natural dyeing for textiles and can become a reference for the next research.

## 2. Metodology

This research used experimental methods by collecting data with observation and interviews to current speakers about shallot skin and natural dye; literature studies from journals, books, and final tasks; and with experiment to gain the final result of this research.

## 3. Experiment

### 3.1. Natural Dyeing Experiment

The word 'natural dye' covers all the dyes derived from the natural sources like plants, animal and minerals. Natural dyes are mostly non-substantive and must be applied on textiles by the help of mordants, usually a metallic salt, having an affinity for both the colouring matter and the fiber (Samantha & Konar, 2011). In natural dyeing, there are several steps in producing some colour on fabric, there are:

#### A. Materials and Tools

There are some materials and tools that were used in this research; fabric, shallot skin, water, pot, stove, gripper, filter tool (fabric), digital scale, measuring cup, pH meter and Thermometer.

#### B. Shallot Skin Extraction

According to the market supplies, there are two conditions of natural dye materials that used in this research; shallot skin fresh and shallot skin withered that have been dried. Those followings are steps in extracting shallot skin:

- prepare materials with a concentration of shallot skin 50 gram: 1 litre of water.
- after preparing the materials, mix it into a pot and boil within 1-3 hours to extract the pigment of shallot skin, this step was signed by the browning colour of the water.

#### C. Dyeing Process

A step before dyeing, soak the fabric to natural dye be spread evenly on the fabric, and this following are steps after:

- in the heat-dye technique, soak the fabric into the natural dye for a while and in the cold dye, cold the solution before finally cooled in advance of cloth inserted in the solution.
- after a while, take away the fabric from the solution and wash off.

#### D. Mordanting

Mordanting can be achieved by pre-mordanting (before dyeing) simultaneously mordanting and dyeing or it may be a post mordanting system (after dyeing). Different types of mordants can be applied on the textile to increase the dye uptake of natural dyes (Samantha & Konar, 2011).

This research uses a different kind of metallic mordant, there are Alum ( $\text{Al}_2\text{SO}_4$ ), Iron ( $\text{FeSO}_4$ ), and Lime, and also used a different concentration of mordant. It aims to see the results of each concentration used. Those are the following steps in this research:

- Alum solution: Alum 2/4/6/8/10 gr being fused in 200 mL of water
- Iron solution: Iron 2/4/6/8/10 gr being fused in 200 mL of water. Precipitate the solution, take the sediment and use the water
- Lime solution: Lime 2/4/6/8/10 gr being fused in 200 mL of water. Precipitate the solution, take the sediment and use the water

### 3.2. Experiment Result

#### 1<sup>st</sup> experiment

Using four different kinds of fabric; Linen (L), Primisima (P), Silk Cotton (S), Cotton 100% (C) to shows the colour of each fabric.

Table 1. Experiment results

Technique	Mordant	Colour Result			
		L	P	S	C
• shallot skin withered • post-mordanting • cold dye  Concentration : • Natural dye= 50 gr : 1 L • Mordant= 10 gr : 200 mL  Duration: • Extraction 1 hour • Dyeing 1.5 hour • Mordanting 15 minute	Non Mordant				
	Lime				
	Alum				
	Iron				

#### Analysis

The 100% cotton shows the bolder colour on the fabric than the other fabric and thus it is for the next experiment.

#### 2<sup>nd</sup> experiment

This experiment used shallot skin withered with cold dye and 1 hour of extract duration.

Table 2. Experiment Results

Mordant	Duration of Dyeing	Colour Result				
		2gr	4gr	6gr	8gr	10gr
Lime	0.5 Hour					
	1 Hour					

	1.5 Hour					
Alum	0.5 Hour					
	1 Hour					
	1.5 Hour					
Iron	0.5 Hour					
	1 Hour					
	1.5 Hour					

### Analysis

- The use of shallot skin withered with one-hour extract duration show a soft colour on the fabric. This can be caused by the colour of water extraction that not be so dark.
- Different concentrate application of mordant did not affect too much to the colour on fabric, but the duration of dyeing gave more affection to the colour on fabric.

### 3<sup>rd</sup> experiment

Extracting duration in this experiment was 3-hour using shallot skin withered with a post-mordanting technique to see the potential colour on the fabric.

**Table 3.** Experiment Results – Heat Dye

Mordant	Duration of Dyeing	Colour Result		
		2gr	6gr	10gr
Lime	0.5 Hour			
	1 Hour			
	1.5 Hour			
Alum	0.5 Hour			
	1 Hour			
	1.5 Hour			
Iron	0.5 Hour			
	1 Hour			

1.5 Hour			
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**Table 4.** Experiment Results – Cold Dye

Mordant	Duration of Dyeing	Colour Result		
		2gr	6gr	10gr
Lime	0.5 Hour			
	1 Hour			
	1.5 Hour			
Alum	0.5 Hour			
	1 Hour			
	1.5 Hour			
Iron	0.5 Hour			
	1 Hour			
	1.5 Hour			

### Analysis

















- The use of extract duration in this experiment can produce a darker colour of the solution than the duration before (1 hour).
- By using various mordant concentration, several colours on fabric gave a bit different colour in the same tone, but not the rest.
- The dyeing duration still gave affection to the colour.
- The use of iron produces colour on fabric with the same tone constantly.
















### 4<sup>th</sup> experiment

This experiment will use pre-mordanting and simultaneous method to show the potential of other colours on fabric and to see the differences between these three mordanting techniques using 10 gram of mordant : 200 mL of water.

**Table 5.** Experiment Results

Mordant	Duration of Dyeing	Colour Result			
		Heat Dye		Cold Dye	
		Pre	Simultaneous	Pre	Simultaneous
Lime	0.5 Hour				
	1 Hour				
	1.5 Hour				
Alum	0.5 Hour				

	1 Hour				
	1.5 Hour				
Iron	0.5 Hour				
	1 Hour				
	1.5 Hour				

	1 Hour			
	1.5 Hour			
Iron	0.5 Hour			
	1 Hour			
	1.5 Hour			




























### Analysis

The use post-mordanting technique produces a darker colour than the pre-mordanting and simultaneous technique.













### 5<sup>th</sup> experiment

This experiment used heat-dye and cold dye using shallot fresh to show the colour on fabric. The extract duration was 1 hour with 10 gram of mordant concentration : 200 mL of water.

**Table 6.** Experiment Results – Heat Dye

Mordant	Duration of Dyeing	Colour Result		
		Pre	Post	Simultaneous
Lime	0.5 Hour			
	1 Hour			
	1.5 Hour			
Alum	0.5 Hour			
	1 Hour			
	1.5 Hour			
Iron	0.5 Hour			
	1 Hour			
	1.5 Hour			

**Table 7.** Experiment Results – Cold Dye

Mordant	Duration of Dyeing	Colour Result		
		Pre	Post	Simultaneous
Lime	0.5 Hour			
	1 Hour			
	1.5 Hour			
Alum	0.5 Hour			

### Analysis

- The use of shallot skin fresh produced a bold colour on the fabric.
- The use of post-mordanting technique produced more concentrated colour than others.
- The use of cold dye technique produced a soft colour on fabric but more concentrated than others.

### 3.3. Textile Technique

According to the mapping of textiles by Evelyn e. Stout based on processing techniques, textile design is divided into two categories, namely structural design (design derived from the structure of a cross-section that forms the textile) and surface/ applied design ( design coming from the surface fabric was). (Sawitri, 2007)

#### A. Surface Design

Surface/ applied design composed of different sorts including printing, embossing, moire, embroidery, applique design, quilting, tie and dye, etc. In this research, the natural dye will be applied by using two techniques of textile, which are Jumputan dan Shibori.

##### • Jumputan

Jumputan is known as tie and dye technique, whereas the process is to tie and to colour. (Amalia, 2017)

##### • Shibori

According to Wada (2002) Shibori is a form of Japanese art in manipulating fabric to create a pattern by using a dye technique to create two dimensions pattern. The word 'shibori' was from the word 'shibaru' which means to fasten, squeeze, and pressed. (Kautsar, 2017)

### 6<sup>th</sup> experiment

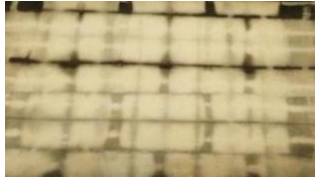
This step is the next experiment by using a textile technique to apply the natural dye on the fabric. Several barrier tools



used to apply this technique into fabric; pipe, acrylic, clip binder, and rubber. These are the results of this experiment:



**Figure 1.** Jumputan Technique



**Figure 2.** Shibori Technique



**Figure 3.** Jumputan and Shibori Technique

#### Analysis

The use of two different kinds of textile technique (Jumputan and Shibori) gives a new variant pattern on the fabric.

### 4. Test Result

The number of experiments done in this research show the colour of the fabric. Based on the experiments, iron post-mordanting technique with an hour cold dye was being elected and being tested at Balai Besar Tekstil Bandung with the result as shown below:

**Table 1.** Test Results

Test	Result*
Washing of 40°C	
a) Colourchanging	3 (Enough)
b) Desecration on cotton	4-5 (Good)
c) Desecration on wool	4-5 (Good)
Moist Iron	
a) Colourchanging	4-5 (Good)
b) Desecration on cotton	4-5 (Good)
c) Desecration on wool	4-5 (Good)
Sunlight	4 (Good)

\*point range 1-5

The table shows that three categories being tested in the laboratory which commonly the way of treating a fabric, and

the result shows that the elected experiment is good for being natural dye for the textile products.

### 5. Final Product

The final step of this research is to apply the selected experiment to the textile product in the form of cloth long with several different sizes.



**Figure 4.** Visualisation of Final Product

### 6. Conclusion

According to this research, it can be concluded that:

- A huge amount of waste shallot skin from consumers shows the potential subsequently of using the shallot skin as the material of natural dye for product textile. The utilization done by extracting the shallot skin become natural dye solution, and it can be used for dyeing with the helped by using mordant that used to increase traction dyestuff nature against textile and produce variant colour on textile.
- Developing on natural dyeing used different concentration of materials (shallot skin 50gr : 1 L of water and mordant concentration of 2 gram, 4 gram, 6 gram, 8 gram, 10 gram : 200 mL of water), dyeing technique (heat-dye or cold dye, and pre-mordanting, simultaneous, post-mordanting), dyeing duration (0,5 hour, 1 hour, 1.5 hour), and technique of textile (Jumputan and Shibori), show several colours and patterns on fabric, and surface size has an affection to the patterns on fabric. Based on those applications, the use of iron post-mordanting with an hour cold dye technique becomes the elected experiment and applied

to the textile products in the form of long clothing with several different sizes.

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