Urang Aring (*Eclipta alba* (L.) Hassk) Leaf Extract as Natural Dyes for Making Pomade

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Abstract

Dyes have an important role in the industrial sector to increase consumer interest in a product. Urang aring is a plant with color pigments that can be used as natural dyes. This study aims to utilize urang aring leaf extract as a natural hair dye for the manufacture of pomade by producing the quality of pomade preparations according to standards. The research method was carried out experimentally including determining the water content and ash content of urang aring leaves and optimizing the time of dye extraction and storage of urang aring leaf extract using a UV-Vis spectrophotometer, then making pomade based on the formulation of urang aring leaf extract and beeswax; namely: formulation I (3:3), II (5:3), and III (10:3). Pomade quality test includes: organoleptic test, homogeneity test, pH test, freeze-thaw test, and color stability test against sunlight. Based on the results of the study, it was found that urang aring leaf extract can be used as a natural dye for the manufacture of pomade with formulation III which meets the standards in the pomade quality test because it has a soft dense texture, blackish green color, and has no odor with a pH of 6 which is ideal for hair. Pomade formulation III also has a texture that does not separate at extreme temperatures and good color stability under direct sunlight for 5 hours.

Keywords: *Eclipta alba*, natural dye, pomade

Introduction

Dyes have an important role in the industrial sector to increase consumer interest in a product. Dyes can be classified into three types, namely natural dyes, organic dyes, and synthetic dyes. The diverse tastes of consumers for a product make manufacturers create color variations for the products they make. More advanced technology can create synthetic dyes with various color variations (Pujilestari, 2015).

The use of synthetic dyes is the choice of many people to overcome problems with their hair. One of the problems they face is the appearance of gray hair. This change in hair color can be caused by a decrease in melanocyte function and tyrosine activity as well as the influence of other factors such as stress, the use of chemicals, and genetic factors (Zaky et al., 2020).

Synthetic dyes used not only hit the hair surface but also seep into the pores of the scalp so that the substances or chemicals in these synthetic products can affect health and provide very impactful risks, such as damage to the hair shaft to scalp allergies and also accelerate the occurrence of hair loss gray hair (Sinaga et al., 2013).

Dyes produced from natural ingredients are proven to be safer, judging from their use which has been carried out from generation to generation since the time of our ancestors. The resulting color and aroma also have characteristics that are not owned by synthetic dyes (Meilianti, 2018).

Urang aring (*Eclipta alba* (L.) Hassk) is a traditional plant whose all parts can be used as herbal medicine for various diseases. Urang aring leaves can be used as a medicine for headaches, toothaches, menstrual disorders, and as hair fertilizer (Yuliana, 2017).

Fitriani et al. (2013) explained that urang aring is a plant that contains black pigment. Urang aring is widely used as a natural hair dye and stimulant for hair growth in babies by utilizing its boiled water, and can also be used as natural tattoo ink.

Research on the use of plants as natural dyes has been carried out previously by Berlin et al., (2017) showed that one of the plants, namely urang aring, can give a thick black color effect on hair by adding burnt straw ash to the liquid from the leaves of urang aring. However, the traditional application of the urang aring plant is still relatively impractical so it becomes one of the shortcomings in the use of the urang aring plant.

Pomade is a cosmetic preparation in the category of wax-based cream which is used in hair styling and has a class B production permit from the Food and Drug Supervisory Agency (BPOM) of the...
Republic of Indonesia (Mujiono & Ismedsyah, 2020) However, using pomade for a long time can cause hair loss and dryness and dandruff. This is due to the concentration of chemicals contained in it. Therefore, making pomade with natural ingredients can be a safe and practical alternative to its use (Riyanta & Amanti, 2020).

This study aims to utilize urang aring leaf extract as a natural hair dye by determining the standard formulation for making pomade. Because urang aring leaf extract pomade is used as a natural hair dye, optimization of the extraction time and storage time of urang aring leaf extract was carried out to get good color results.

Methods

This research is experimental research conducted at 3 locations the chemical laboratory of Tadulako University FKIP for sample preparation, analysis of water content of urang aring leaves, optimization of extraction time of urang aring leaf dye, optimization of storage time of urang aring leaf extract, making of pomade, and quality test of pomade, Chemistry Laboratory of FMIPA Tadulako University for UV-Vis analysis of urang aring leaf extract and the Laboratory of the Faculty of Animal Husbandry and Fisheries, Tadulako University for the analysis of ash content of samples of urang aring leaves.

Tools and materials

The tools and materials used in this study were UV-Vis spectrophotometer, digital balance, blender, 10 mL measuring cup, 250 mL Erlenmeyer, shaker, test tube, spatula, dropper, evaporator, furnace, electric bath, desiccator, beaker, porcelain dish, universal pH, stirring rod, 70 mesh sieve, and oven. The ingredients used are urang aring leaves, beeswax, ethyl acetate, lanolin, glycerin, span 80, and olive oil.

Sampling technique

Sampling was done by selecting old urang aring plants with large stems and leaves. The urang aring plants were then washed thoroughly using running water and then drained. Then the leaves are separated from the stems and cut into small pieces. After that, the leaves were air-dried for 5 days.

Sample preparation

Samples of 300 grams of urang aring leaves were washed thoroughly, then drained and cut into small pieces, then air-dried for 5 days. Furthermore, the dried samples of urang aring leaves were mashed using a blender and sieved using a 70 mesh sieve.

Water content analysis

Analysis of the moisture content of samples of urang aring leaves was carried out by heating a porcelain dish in the oven at 105 °C for 30 minutes. Then the cup was put in a desiccator for 15 minutes and weighed. Then, a sample of 3 grams of urang aring leaves was put into a porcelain dish with a known weight and reheated in the oven at 105 °C for ± 30 minutes to remove the moisture content in the sample. Then the sample was put in a desiccator for 15 minutes and reweighed. The water content in the samples of urang aring leaves was calculated by the following equation.

\[
\text{Water content} = \frac{a-b}{a} \times 100\% 
\]

Where is the initial weight of the sample, and \( b \) is the final weight of the sample (Syafria et al., 2018).

Ash content analysis

Analysis of the ash content of urang aring leaves was carried out by preheating a porcelain dish in an oven at 105 °C for 30 minutes. Then the cup was put in a desiccator for 15 minutes and weighed. Then, a sample of 5 grams of urang aring leaves was put into a porcelain dish whose weight was known and then in a kiln with a temperature of 600 °C for ± 3 hours to form ash. After that, the sample was cooled in a desiccator for 15 minutes and the weight of the ash obtained was weighed.

The ash content in samples of urang aring leaves was calculated by the following equation.

\[
\text{Ash content} = \frac{\text{Berat abu (g)}}{\text{Berat sampel(g)}} \times 100\% 
\]

(Anggraeni, 2020).

Optimizing the extraction time of urang aring leaf dye

The mashed urang aring leaf samples were weighed as much as 1 gram each and put into 4 100 mL Erlenmeyer. Then 10 mL of ethyl acetate solvent was added to the four Erlenmeyer. After that, the mixture was stirred using a shaker for 10 hours and allowed to stand at 10, 12, 24, and 48 hours. Next, the filtrate and residue were separated using filter paper. The resulting filtrate is then evaporated. Then the absorbance of the filtrate was measured using a UV-Vis Spectrophotometer at a wavelength of 432 nm.

Optimization of storage time of urang aring leaf extract

Each 5 mL of urang aring leaf extract was put into 4 test tubes with each storage time label of 2, 4, 6, and 8 days. The absorbance of each filtrate was
then measured using a UV-Vis Spectrophotometer at a wavelength of 432 nm.

**Pomade making**

Making urang aring leaf extract pomade is done by extracting 25 grams of dried urang leaf sample that has been mashed and adding 250 mL of ethyl acetate then allowed to stand for 48 hours. Then the extracted filtrate was allowed to stand for 8 days. The resulting extract is then formulated with the mixture ratio in Table 1.

<table>
<thead>
<tr>
<th>Composition</th>
<th>Formulation I</th>
<th>Formulation II</th>
<th>Formulation III</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beeswax (grams)</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Dyes (extract) (mL)</td>
<td>3</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Lanolin (grams)</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Glycerin (mL)</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Span 80 (mL)</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Olive oil (mL)</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

**Pomade quality test**

**Organoleptic test**

An organoleptic test was carried out by observing the shape, color, and smell of the pomade for 3 days of storage (Rasyadi et al., 2020).

**Homogeneity test**

A sample of urang aring leaf extract pomade was smeared on a piece of glass to see a homogeneous arrangement and no coarse grains were seen in the pomade preparation (Mujiono & Ismedsyah, 2020).

**pH test**

The pH test was carried out at room temperature. Each of the three pomade formulations was heated as much as 0.5 grams and the pH was measured using universal pH paper (Mujiono & Ismedsyah, 2020).

**Freeze-thaw test**

Pomade samples of urang aring leaf extract were stored at ± 5 °C for 10 hours and transferred to a storage ± temperature of 40 °C for 10 hours. Then the physical changes that occur visually are observed (Auliasari et al., 2018).

**Color stability test against sunlight**

Urang aring leaf extract pomade was applied evenly to the gray hair sample that had been washed and dried. After that, it was left under direct sunlight for 5 hours and observed for color changes.

**Results and Discussion**

**Analysis of water content and ash content**

Moisture content is the ratio between the amount of water in the material and the weight of the dry matter. The water content contained in the material greatly affects the quality of the material. High water content can cause bacteria to easily multiply and result in changes in food ingredients (Afrida & Sanova, 2020).

The results of the analysis of the water content in the samples of urang aring leaves are based on Table 2 which is equal to 22.6330%. This shows that the samples of urang aring leaves have high water content. Afrida & Sanova (2020) explained that the water content requirement of simplicia according to the applicable standard parameters was not more than 10%.

The results of the analysis of the ash content of urang aring leaves based on Table 2 are 16.229%. The high ash content in simplicia indicates the high internal mineral content in the leaves of urang aring. The higher the ash content obtained, the higher the ash content of the minerals contained in the material (Utami et al., 2017).

<table>
<thead>
<tr>
<th>Sample grade level</th>
<th>Water (%)</th>
<th>Ash (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leaf urang aring</td>
<td>22.6330</td>
<td>16.299</td>
</tr>
</tbody>
</table>

The optimization of maceration time of urang aring leaf dye

The extraction method used is maceration. The optimization of maceration time is done by determining the maximum absorbance value produced based on the time difference (Wiraningingtyas et al., 2020). The results of spectrophotometer measurements for time optimization of urang aring leaf dye extraction can be seen in Figure 2.
The results above show that the absorbance absorption with a maceration time of 48 hours is 2.833 which is the highest absorbance value of the three other time variations. This can happen because the longer the extraction time, the more active substances in the extract will maximally come out and dissolve with the solvent (Fardhyanti & Riski, 2015).

The extraction time determines the amount of active substance that can diffuse out of the solid matrix or simplicia into the solvent. The longer the extraction process, the more active substances that can be extracted. In the maceration method, a saturation point can occur from the diffusion process so that the increase in extraction time cannot increase the amount of active substance extracted. Organoleptically, samples of urang aring leaves showed a blackish-green color, so that they could be absorbed by electromagnetic radiation over a long range. Maceration for 10 hours, 12 hours, and 24 hours, the absorbance values were 1.988, 2.464, and 1.599, respectively.

These data indicate a significant deviation where the absorbance value was low at 10 and 24 hours of maceration but increased at 12 hours of maceration. This happens because of the damage to the chromophore group of the pigment which can cause color damage. Damage can be caused by several factors including temperature, light, and air (Enaru et al., 2021).

Optimization of storage time of urang aring leaf extract

Time is one of the factors that can affect the color stability of secondary metabolites such as loss of color from natural materials (Dewi et al., 2020). Optimizing the storage time of the extract was carried out by varying the time of the 48-hour maceration which had the highest absorbance value. The extract in the form of dye produced from the maceration was stored for 2, 4, 6, and 8 days. After passing the storage period, each sample was then analyzed again using a UV-Vis spectrophotometer with a wavelength of 432 nm.

Absorbance measurements using a UV-Vis spectrophotometer were carried out to determine the level of color stability of urang aring leaves after being given variations in the length of time for storage (Wiraningtyas et al., 2020). The results of spectrophotometer measurements for time optimization of the storage of urang aring leaf extract can be seen in Figure 3.
The results of the measurement of absorbance for variations in the storage time of the extract for 2, 4, 6, and 8 days showed that the maximum length of time for urang aring leaf extract was on day 8.

The measurement results in Figure 3 show that the longer the storage time, the better the color produced. That is, the blackish-green dye extract obtained from urang aring leaves is stable with time. This is evident from day 2 to 8 storage, the resulting absorbance is increasing.

### Table 3. Pomade organoleptic test results

<table>
<thead>
<tr>
<th>Formulation</th>
<th>Organoleptic</th>
<th>Time (day)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>I</td>
<td>Coarse Solid</td>
<td>Coarse Solid</td>
</tr>
<tr>
<td>II</td>
<td>Soft Solid</td>
<td>Soft Solid</td>
</tr>
<tr>
<td>III</td>
<td>Blackish Green</td>
<td>Blackish Green</td>
</tr>
</tbody>
</table>

The results obtained from organoleptic testing on the three formulations, namely formulation I, obtained preparations with a coarse solid texture, light green in color, and odorless. While formulation II obtained a preparation with a soft solid texture, light green in color, and odorless, and formulation III obtained a preparation with a soft solid texture, blackish green in color, and odorless. Of the three formulations, the best formulation is formulation III.

### Homogeneity test

The homogeneity test is a dispersed phase that is evenly distributed in the dispersing material (Riyanta & Amanti, 2020). The following are the results of the homogeneity test of urang aring leaf extract pomade.

<table>
<thead>
<tr>
<th>Formulation</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Homogeneous</td>
</tr>
<tr>
<td>II</td>
<td>Homogeneous</td>
</tr>
<tr>
<td>III</td>
<td>Homogeneous</td>
</tr>
</tbody>
</table>

The homogeneity test results showed that all pomade formulations were homogeneous with no coarse particles or lumps in them. The preparation is evenly mixed and well distributed. Pomade preparations are said to be evenly distributed or homogeneous if there is an even color equation (Meinisasti et al., 2022).

### pH test

The pH test was carried out to see the level of acidity of the pomade preparation in ensuring that the pomade did not irritate the head. If the pomade is too acidic from the pH of the hair and the oil on the scalp (4.5 – 5.5) it is feared that it will irritate. If it’s too alkaline, the scalp will be dry (Mujiono & Ismedsyah, 2020). The neutral pH of the pomade preparation can avoid irritation in its use. The pH test results for the pomade of urang aring leaf extract can be seen in Table 5.

<table>
<thead>
<tr>
<th>Formulation</th>
<th>pH</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>5</td>
</tr>
<tr>
<td>II</td>
<td>5</td>
</tr>
<tr>
<td>III</td>
<td>6</td>
</tr>
</tbody>
</table>

The results of the pH test for pomade preparations based on the table above on formulation I and formulation II have a pH of 5, while formulation III has a pH of 6. This indicates that formulation I and formulation II of pomade preparations do not meet SNI because the pH is still acidic. While in formulation III the resulting pomade preparations have met the pH requirements. A pH value that exceeds 7 is feared to cause skin irritation (Auliasari et al., 2018). The results of the pH test of pomade preparations are based on Table 5. Formulation I and formulation II of urang aring leaf extract pomade had a pH of 5 and formulation III had a pH of 6. The test results showed that the formulations I and II of the pomade preparations did not meet the requirements because the pH was still too acidic. Meanwhile, in formulation III, the resulting pomade has met the pH requirements because it is close to a neutral pH value.

### Freeze-thaw test

The freeze-thaw test was carried out to see the stability of the pomade preparations, and whether extreme temperature changes could affect the stability of the pomade preparations that had been made (Shariful et al., 2018).
Table 6. Freeze-thaw pomade test results

<table>
<thead>
<tr>
<th>Formulation</th>
<th>Temperature</th>
<th>5 °C</th>
<th>40 °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Not Split</td>
<td>Not Split</td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>Not Split</td>
<td>Not Split</td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>Not Split</td>
<td>Not Split</td>
<td></td>
</tr>
</tbody>
</table>

The results of the freeze-thaw test based on the table above showed that all pomade formulations did not change and were included in preparations that were stable to extreme temperatures.

**Color stability test against sunlight**

The color stability test against sunlight was carried out to see the color stability of the pomade preparations when exposed to the sun directly. The result of the color stability test against the light sun for urang aring leaf extract pomade can be seen in the following image.

![Figure 4. Gray hair color before and after being given urang aring leaf extract pomade in formulation I](image)

![Figure 5. Gray hair color before and after being given pomade with urang aring leaf extract in formulation II](image)

![Figure 6. Gray hair color before and after being given urang aring leaf extract pomade in formulation III](image)

The results of the pomade preparation test after being left in the sun for 5 hours in formulation I and formulation II made the color fade. This is because the color that is absorbed in the hair undergoes decomposition against prolonged exposure to sunlight. While in formulation III the resulting color is still the same (black) without any changes indicating the color is stable against exposure to sunlight.

**Conclusion**

Urang aring leaf extract can be used as a natural hair dye for the manufacture of pomade in formulation III that meets the standard with a mixture of 3 grams of beeswax; coloring (urang aring leaf extract) 10 mL; lanolin 2 grams; glycerin 1 mL; span 80 1 mL; and 1 mL olive oil.

**Acknowledgment**

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