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EFFECT OF SUGAR CANE MORDANT ON THE DYEING OF TEXTILE COLORS USING EXTRACT OF THE SENSITIVE PLANT *(Mimosa Pudica)*

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ABSTRACT

This study explores the use of natural color sources from the sensitive plant *(Mimosa Pudica)* with different sugar cane mordants to reduce pollution caused by synthetic dyes. The research aims to examine the color evenness and the impact of different mordants on cotton material dyeing using sensitive plant extracts and black, red, and yellow sugar cane mordants. The study adopts an experimental approach and collects primary data from 15 panelists. The results show that the use of black, red, and yellow sugar cane mordants leads to very flat color flatness. The evenness of color is also significant, with a data value of 0.011 <0.05, suggesting a significant effect on the dyeing process of sensitive plant *(Mimosa Pudica)* extract using black, red, and yellow sugar cane mordants on cotton material.

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INTRODUCTION

Textile dyes from nature are one of the alternatives that can be done in anticipation of environmental pollution. Seeing the impact on the environment that occurs due to the coloring of synthetic textile substances. Thus, it has been recommended that dyes that are friendly to the environment and health are dyes of natural origin because their natural content has a relatively low pollution load value that is easily biodegradable and non-toxic. Natural dyes can also be used to color textile materials obtained from extracts of various plant parts. Effort to animate the use of pure dyes by exploring the genesis of natural dyes [1]. Exploration of natural resources as an effort to utilize the environment is an option to overcome the problem of environmental pollution. Natural dyes are obtained directly or indirectly from nature such as animals, minerals, and plants [2]. Materials from nature derived from animals, plants and minerals obtained directly or indirectly can be used as a source of textile dyes through processes and stages to produce color. The above opinion concludes that natural dyes can be developed for exploration by using natural dye resources and materials from nature, which can be derived from plants, animals and minerals. Natural dyes for textile materials are generally obtained from extracts of various parts of plants, such as roots, wood, leaves, seeds, or flowers [3]. Morphological parts of plants such as plant roots, stems, leaves, seeds and flowers can be used for natural dyeing of textiles. Meanwhile, the main sources of natural dyes are plants and microorganisms, the colors produced are diverse such as: red, orange, yellow, blue, and brown [4]. In color producing

natural dyeing, the thing that becomes a main source is in plants and microorganisms contained in these natural substances, so that colors can be obtained that can stick to textile.

Lack of optimal utilization of wild plants, where these plants can be used as natural textile dyes. This natural dye can be an alternative form that can be done in anticipation of environmental impact pollution and has been proposed as an environmentally friendly textile colorant. So that we can maintain environmental stability [5]. Coloring using natural materials that are easily integrated and environmentally friendly in the form of plants [6]. The sensitive plant is a plant that lives in the wild and is easily found, such as on the side of the road, on the edge of the river. Sensitive plant can be used as natural dyes because in addition to chlorophyll and carotene which can produce green color, sensitive plant also contains flavonoids, alkaloids, phenolics, saponins and tannins which can adhere to textile materials. Flavonoids and tannins can be used as organic dyes [7]. Tannin from the stems and leaves of the plant Putri malu produces a tannin purity of 3.65% [8] [9]. Sensitive plant s has a tannin content of 10%, tannin compounds in the form of yellow to brown pigments. This content causes the pigment to easily release the substance on the fabric material.

In soaking natural dyes, to get better results in dyeing natural substances, this textile requires a mordant. Mordant is a special substance that can increase the attachment of color and shape to the fabric [6]. Mordant substances aim to increase the absorption of natural dyes to textile materials, in dyeing natural dyes, a mordant liquid of natural origin is needed. The provision of mordant aims to increase the absorbency of the fabric to the dye. Mordant becomes a dye binder in dyeing [10]. Mordant as a reinforcing agent and color generator can affect the final color in the dyeing process [11]. In this study, the mordants used were black sugar cane, red sugar cane and yellow sugar cane. Sugar cane plants are included in the grass plant species, so it is easy to find. The main contents of sugar cane sap are sugars and organic acid components (amino acids and fatty acids), flavonoids, phenolics and sterols". Sugar cane contains wood extractives that can adhere to textiles. The pH contained in sugarcane produces light colors and flat colors [12]. The pH range of sugarcane is 4.5-5.7 [13]. Black sugarcane has long stem segments with smaller size and brownish liver red stem color, while red sugarcane has a short stem segment shape and purple red sugarcane stem color [18]. Each of the varieties of black sugarcane and red sugarcane has physical differences in each sugarcane, resulting in different contents. And in yellow sugarcane has high internodes yellowish in color, with a larger stem diameter than black sugarcane. This sugarcane plant is not only easy to find, but also environmentally friendly because it can be used. From these two opinions, it can be concluded that the shape of internodes of each sugarcane is a physical characteristic of sugarcane varieties, black sugarcane has a smaller internode shape with a brownish liver red color, red sugarcane has a short internode shape with a purple red color, and yellow sugarcane has a tall yellowish internode. Based on the different content of the three types of sugar cane, it can be seen the difference in the water produced. Therefore, the author is interested in making black sugar cane water, red sugar cane and yellow sugar cane as a mordant to find out the effect of the three types of sugar cane on the evenness of color and light darkness of color produced on cotton material with sensitive plant extract.

The material used in this dyeing is cotton because it is a material from nature, sellulose fiber is divided into seed fiber, stem fiber, leaf fiber and fruit fiber [14]. Materials from nature are very well used for dyeing. Cotton fibers in a wet state increase in strength by about 25%, and the strength of cotton can be increased by soaking in caustic soda, this also adds to the luster and suction power when dyed [14]. Therefore, in this study, cotton material was selected to be used in the dyeing process. Textile materials dyed with natural dyes are materials made of natural fibers such as silk, wool, and cotton (cotton), materials made of synthetic fibers such as polyester, nylon, and others have no affinity or attraction to natural dyes [1]. Materials made of silk generally have the best affinity for natural dyes

compared to cotton. Based on the above opinion, the textile material used has a great influence on dyeing. Textile materials of natural origin are very good against natural dyes. In this study, the authors used cotton material because there is no research with sensitive plant extract using cotton material, and cotton material is a material derived from natural fibers, especially plants (cellulose), and can absorb water very well.

The process of dyeing textile materials is done through the soaking process. Dyeing is an effort to increase the commercial value of textile goods [15], Dyeing is the process of giving color to fibers, yarns, or fabrics evenly with dyes carried out by immersion with the help of water, water vapor, or dry heating so that the material has fastness properties [16]. Dyeing (immersion) in textile dyeing is the process of imparting color to textile materials. There are factors that influence the immersion process including; the influence of electrolytes, the influence of temperature, the influence of the ratio of immersion, and the influence of pH. The influence of pH can give the results of influence on dyeing coloring. To obtain a dark color, the use of higher pH is sought, and for lighter colors with the use of lower pH. Mordanting can be done in three ways: (a) the way of preliminary mordanting (pre-mordanting), that is, dyeing, (b) the way of simultaneous mordanting (meta-chrom, mono-chrom), that is, mordanting is done at the beginning and at the end of natural dyeing, (c) the way of final mordanting (post-mordanting), that is, mordanting is done after dyeing natural dye extracts [17]. The mordanting technique in this research is the post-mordanting technique by dyeing cotton material in natural dye extracts with mordant. The mordant used greatly affects the dyeing of textiles to the color produced. According to the discussion above, the purpose of the research by the author is to describe the name of the color, describe the darkness of the color of the use of black sugar cane mordant, red sugar cane and yellow sugar cane against cotton material dyeing using shy daughter plant extract *(Mimosa Pudica)*.

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METHOD

This kind of research is experimental research. The production process for dyeing cotton materials with black sugarcane, red sugarcane and yellow sugarcane mordant, using the extract of the putrimalu (*Mimosa Pudica*) plant, will go through several stages, namely the preparation stage, implementation stage, adjustment stage and assessment stage. The extract of the putrimalu plant (*Mimosa Pudica*) is obtained from wild plants that live around people's fields in the surrounding area. Using cotton material with post-mordanting technique, and the recipe used is 1:30. The research instrument, which is a rating scale questionnaire, includes a score of color evenness indicators evaluated by three panelists who are lecturers who teach textile and 12 female students who have passed the textile course. The data analysis technique used is the Friedman k-related sample test to describe the results of dyeing on color names, color lightness, color evenness, the effect of lightness and the effect of color evenness produced on the dyeing of sensitive plant extract *(Mimosa Pudica)* using black sugar cane mordant, red sugar cane and yellow sugar cane, data processing using the SPSS (Statistical Product and Service Solutions) program version 29.0.

RESULTS AND DISCUSSION

Results

Descriptive statistics of data on color uniformity of dyeing cotton material of sensitive plant extract *(Mimosa Pudica)* without mordant, with black cane mordant, with red cane mordant, with yellow cane mordant.

Table1. Descriptive statistics of data on color uniformity of dyeing cotton material of sensitive plant extract (Mimosa Pudica)

	N	Mean	Std. Deviation	Minimum	Maximum
Without mordant	15	3.07	799	2	4
Black cane mordant	15	3.60	507	3	4
Red cane mordant	15	3.47	516	3	4
Yellow cane mordant	15	3.73	458	3	4

Based on the above table, it can be explained that from the research data of 15 panelists, the mean values are obtained as follows: without using mordant got an average of 3.07, using black sugar cane mordant with an average of 3.60, using red sugar cane mordant got an average of 3.47, and yellow sugar cane mordant average of 3.73.

Friedman test results k-related sample data color evenness (value) dyeing cotton material using sensitive plant extract *(Mimosa Pudica)* without mordant, using black sugar cane mordant, using red sugar cane mordant, using yellow sugar cane.

Table 2. Friedman test results

N	15
Chi- Square	11.068
Df	3
Asymp. Sig	.011
a. Friedman Test	

In the above table, it can be explained that the Friedman's k test related sample dark light color (value) on cotton material dyeing using sensitive plant extract *(Mimosa Pudica)* without mordant, using black sugar cane mordant, using red sugar cane mordant, using yellow sugar cane obtained a significant value of 0.011, which is smaller than the significance level of 0.05 or 0.000 <0.05. It can be interpreted that there is an effect of using black sugar cane mordant, red sugar cane mordant, and yellow sugar cane mordant on the darkness of color in dyeing cotton materials using sensitive plant extract *(Mimosa Pudica)*.

Discussion

1. Color uniformity obtained by dyeing cotton material with sensitive plant extract *(Mimosa Pudica)* without mordant, with black sugarcane mordant, red sugarcane mordant, and yellow sugarcane mordant.

Figure 1. Evenness of color without mordant

Figure 2. Evenness of red sugar cane mordant color

Figure 3. Evenness of black cane mordan

Figure 4. Evenness of yellow cane mordan

Based on the results of research and data obtained from questionnaires filled in directly by 15 panelists with four indicators of color flatness, namely the categories of very flat, flat, uneven and uneven from the results of dyeing the effect of different mordants of black sugar cane, red sugar cane and yellow sugar cane on the dyeing of cotton materials using natural dyes of sensitive plant extracts *(Mimosa Pudica)*, namely without mordant with a score of 40% or 6 of 15 panelists stated the flat category, dyeing with black sugar cane mordant the score obtained was 60% or 9 of the panelists stated that the category was very flat, in red sugar cane mordant dyeing a score of 53. 3% or 8 out of 15

panelists stated that the category was flat, and in yellow sugar cane mordant dyeing a score of 73.3% or 11 out of 15 panelists stated that the category was very flat.

Color flatness is a process of water-soluble dye pigments and will be absorbed into fabric fibers, the balance occurs when the water-soluble dye pigments are very easily absorbed by and can be observed from the vision of a fabric, appearing more or less color on the fabric, the results of different color flatness in this study may be due to the content of the three types of sugarcane mordants, namely black sugarcane, red sugarcane and yellow sugarcane are different. This is in line with the research of [7] entitled The Effect of Different Mordants on Dyeing with Innai Leaf Dyestuff (*Lawsonia Inermis L*) Against Cotton Fabric, which states that there is a big difference in the equality of varieties on the results of color evenness.

From this opinion, one of the different contents is the pH content, the flatness of the color produced by the three types of sugar cane is different Based on the results of the study, it can be explained that the flatness of the color produced by dyeing on cotton using sensitive plant extract *(Mimosa Pudica)* using black sugar cane mordant produces a very flat 60% color flatness, the results of color flatness using red sugar cane mordant 53.3% flat, and the results of color flatness using yellow sugar cane mordant 73.3% very flat. It can be interpreted that the use of black cane mordant and yellow cane mordant has a flatter color evenness than red cane mordant.

In accordance with the results of previous research with red sugar cane mordant and black sugar cane in [18] it is said that the color evenness produced by dyeing cotton material with kesumba seed extract with red sugarcane mordant produces a color evenness of 26.7% and the results of color evenness with black sugarcane mordant have a color evenness of 46.7% flat. It is concluded that black sugar cane mordant has a flatter color flatness, which is consistent with what is said in Andriani's research (2016: 11) that when the acid pH contained is higher, the resulting color is flat.

While in [19] about the research of sensitive plant extract with post-mordanting technique produces a very flat color because the material is first dipped in dye solution and then dipped in a mordant, then there is a balance of absorption of dye pigments which produces a very flat color. According to the research of [20] stated that the dyeing of shallot extract with tawas mordant on cotton material obtained very flat color evenness results, it is influenced by the Ph content in each different mordant. Thus, it can be concluded that the dyeing of natural dye extracts, in the use of different mordants with pH contained in each mordant is also different, so it can affect the flatness of the color produced in dyeing.

The discussion is focused on linking the data and the analysis results to the problems or research objectives. The discussion also links research results or findings with relevant research results and theories. The discussion also answers the question of why such facts are found in the data.

The discussion also outlines the contribution of research results or findings to relevant fields, especially educational administration/management, consisting of educational leadership, policy and planning, academic economics, and educational politics. The discussion also outlines the limitations of the research and its implications for practice and research opportunities in the future. We recommend that the words in the discussion are at least 70% of the words in the results.

2. The effect of different mordants of black sugarcane, red sugarcane and yellow sugarcane on the results of dyeing cotton materials with sensitive plant extract *(Mimosa Pudica)* on color evenness.

The analysis obtained from Friedman's k-related sample t-test for color evenness of the obtained data is 0.011, which is smaller than the significance level of 0.05, or 0.011 <0.05 = Ho is rejected. From the results of these data, it can be concluded that there is a significant effect due to the use of black sugarcane stain, red sugarcane stain and yellow sugarcane stain on the color evenness in dyeing cotton

using shy-flower plant extract. The results of color evenness from the use of the three mordants are different, one of which is the pH content. The pH content contained in black sugarcane mordant is higher than that of red sugarcane and yellow sugarcane. The color uniformity results show that the color uniformity using black sugarcane mordant is very flat. This is in line with [18] research that there is a bright dark influence and evenness of color produced on the dyeing of cotton materials using kesumba seed extract (*Bixa Orellana L*) with red sugar cane mordant and black sugar cane. it is caused by the influence of pH contained in each mordant. So that it produces a bright color and an even color.

In [21] states that there is a significant difference in color intensity (chroma) and color evenness due to the effect of nipah skin extract with shallot skin using arbor, alum and whiting mordant on cotton material. Supported by the research of [11], it is stated that each difference in pH mordant produces a significant difference in the color evenness of cotton material. Good color uniformity is found at pH mordant less than 6%.

It can be concluded that natural dye extracts, certain mordants and materials affect the results of dark light and evenness of colors produced in the dyeing process.

CONCLUSION

Color uniformity based on the results of dyeing cotton with natural dyes from the extract of the sensitive plant *(Mimosa Pudica)* without the use of mordant, a uniform color is obtained. Dyeing of cotton using natural dye of sensitive plant extract *(Mimosa Pudica)* with black sugarcane mordant produces a very even color, dyeing of cotton using natural dye of sensitive plant extract *(Mimosa Pudica)* with red sugarcane mordant produces an even color, and dyeing of cotton using natural dye of sensitive plant extract *(Mimosa Pudica)* with yellow sugarcane mordant produces a very even color. Effect of flatness of the color produced based on the analysis obtained from the Friedman K-related sample test for color evenness is 0.011, which is smaller than the significance level of 0.05 or 0.001 <0.05. Therefore, Ho is rejected, which means that there is a significant effect on the color evenness (value) due to the different mordants used in dyeing cotton with sensitive plant extract *(Mimosa Pudica)*. The prospect of developing the results of this research is that it can provide knowledge that there is an influence and evenness of color produced in making textile colors using natural extracts from the sensitive plant. Prospect of applying further research into the future can provide new influences that can result from the exploration of new daughter plant colors for dyeing textiles.

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