



## UTILIZATION OF HINDU RELIGIOUS CEREMONIAL GARBAGE IN BALI AS FABRIC DYE

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### Abstract

This study aims to determine the ceremonial waste of the Hindu community in Bali which can be used as an environmentally friendly textile dye. In carrying out religious ceremonies, the Hindu community in Bali makes offerings such as offerings that cannot be utilized optimally after the ceremony takes place so most of it becomes organic waste. In this study, the waste of Hindu ceremonies in Bali in the form of organic waste will be tested to produce a solution of natural dyes using a pre-experimental method. The pre-experimental method explores the extraction technique of several samples of organic waste with water as a solvent on textile materials, namely cotton cloth. The process of making this natural dye solution goes through three main processes, namely pre-mordant, extraction of dye raw materials, and fixation. Some samples of organic waste found in Hindu religious ceremonies in Bali have plant color pigments such as *balsamina* purple, red, hydrangea, marigold, pandan leaves, shallot skin, turmeric, and areca nut was extracted to produce a natural color solution. The extraction of the color solution is able to bring out several color tones on textile materials, namely cotton fabrics. Through this research, it is hoped that it can be one of the people's choices in producing natural color as textile materials that can be produced simply as well as an effort to reduce organic waste produced in Hindu community ceremonies in Bali.

**Keywords :** Hindu ceremonies, natural dying, water ecosystem

### INTRODUCTION

The Hindu religious community on the island of Bali is a social religious community that has a high intensity of religious ceremonies. Hindu religious ceremonies in Bali are slightly different from the origin of Hinduism itself in India. Hinduism in Bali has experienced cultural acculturation in which the ritual facilities of Hindus in Bali are more complex because they merge with local Balinese customs. The use of ceremonial facilities in every Hindu religious ritual in Bali leaves piles of garbage that are difficult to recycle and increase on a special days like the full moon, Galungan, and Kuningan day. Waste production in Denpasar during religious holidays in Bali is always increasing. The garbage discourse was quoted from the Bali Post daily newspaper, which was confirmed by the Denpasar City DLHK Head of Waste & B3 Waste Management, I Ketut Adi Wiguna, who was contacted on Thursday (9/6). It is said that this increase is dominated by ex-ceremonies. "Currently there is an increase in the volume of waste by 30 percent. Most of the waste comes from rituals or offerings," said Adi Wiguna [1].

Ceremonial facilities derived from natural materials that exist around the Balinese Hindu community often end up as household waste without being sorted and mixed with other waste. This causes the pile of garbage mountains in the final disposal site to be higher because the waste is not utilized. Most ceremonial materials are natural and can be found



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around the Balinese residences. Of course, these natural materials are easily biodegradable, but many Hindus throw ceremonial waste into the river or dump it near the river. This causes the contamination of river water with the garbage that is also polluted by chemical substances such as ammonia and pesticides.

The phenomenon of the contamination of river water in Bali by ceremonial waste gave rise to the idea of processing ceremonial waste into natural dyes. This is related to the high level of river pollution other than ceremonial waste but also textile industry waste. River water pollution occurs because the textile industry workers often choose work locations on the banks of the river. Quoted from Detik Bali [2] Dewa Rai explained that the Task Force together with the Denpasar City Forestry and Environment Service (DLHK) carried out an investigation into the incident when the river water turned red. After being traced, finally, DLHK Denpasar City found the source of the waste that came from the screen printing business and admitted that the waste disposal occurred because there was a WWTP leak. Despite admitting that, the investigators still made the official report for the person concerned. Investigators suspect that the person concerned violated the Denpasar City Regulation Number 1 of 2015 concerning the Public Hygiene and Order [2]. The location was chosen to facilitate the disposal of waste from these industrial products.

Textile industries consume huge quantities of synthetic dyes such as reactive dyes for different types of fabric dyeing especially cotton fabric. It requires a huge amount of water resulting large quantity of effluent which creates serious environmental pollution. In many cases, it was found that synthetic dyes have hazardous characteristics. To get rid of this environment as well as health hazards it is essential to think about alternatives to synthetic dyes which can make a safe environment and human health. From this viewpoint natural dyes could be a good solution for the textile sector. There are many natural dyes available in different plants and vegetables in the Universe which may be used as supplementary to synthetic dyes [3]. Using ceremonial waste for textile dyeing to reduce river pollution from ceremonial waste and provide environmentally friendly dye options that can be developed in the Balinese textile industry.

## RESEARCH METHOD

This study uses a pre-experimental method to explore the extraction of natural dyes from several samples of organic waste with water as a solvent on cotton fabric textiles. Waste samples were selected based on their potential to produce natural dyes which are generally found in leaves, flowers, and fruit skins. Natural dyes in plants are usually produced from pigments in the form of chlorophyll (green), anthocyanins (red-purple), curcumin (turmeric yellow), carotenoids (yellow), and flavonoids (yellow). The determination of natural dyes begins with a simple color extraction experiment by pounding a sample of waste and dipping a cotton cloth in the colored water. The more concentrated the color residue, the greater the possibility that color pigments can be used as natural dyes. The selected types of religious ceremonial waste are then extracted to produce natural dyes. Color processing techniques for textiles (cotton fabrics) utilize mordant as a binder for natural dyes in fabrics. Exploration of household organic waste into a dye solution consists of several stages, namely: 1) fabric preparation stage with pre-mordant alum (alum), 2) color extraction stage with water solvent, 3) fabric coloring stage with natural dye extract, 4) fixation stage (post-mordant) to lock the color in whitening solution ( $\text{CaCO}_3$ ).

## DISCUSSION

### A. Sustainability Color Dyes

Natural dyes are compounds that are abundant in nature with their eco-friendly characteristics. These dyes are recyclable, biodegradable, or decomposable in nature. They are easily composed in the soil after the end user due to their sustainability [4].

1. Insignificant Ecological Influence: As these dyes come from natural sources; they are not harmful to the environment, which makes it so attractive to customers. Natural dyes are eco-friendly; biodegradable and disposing of them don't cause pollution [5]
2. Sustainability: Natural dyes are renewable, obtained in nature and they are sustainable too. These dyes are eco-friendly and do not damage human health [6].
3. Cheap: Natural dyes are cheap, easily obtained in nature, and can be dyed without any hazards. Some natural dyes are cheaper than synthetic dyes [7]
4. Renewable: Natural dyes are got from renewable sources that can be connected without daunting harm to the environment. They are also recyclable [8].
5. Mild shades: Natural dyes are materials that provide mild shades to the textile materials like fabrics, yarns, fibers, etc. they produce shades that are shooting to human eyes [9].
6. Nonhazardous: Natural dyes are obtained from natural sources and they are non-hazardous and do not do any harm to the body's skin. Some dyes like carmine are got in lipsticks and don't origin harm or health problems when consumed [10].
7. Availability: Natural dyes are available in nature plenty. It is possible to collect them easily when needed. These dyes are plenty in nature and can easily be obtained from the surroundings [11].
8. Vibrant: Natural dyes are vibrant. They are not only recyclable but also harmless. They are much healthier for the environment and use everywhere in creatures. It is not tough to remove the natural color from plants, vegetables, fruits, or flowers,,, etc [12].
9. Antimicrobial Properties: Natural dyes have the characteristics of antimicrobial that make them safer for children in specific. Fabrics dyeing with natural dyes can be used in hospital beds due to their excellent antibacterial capabilities [13].
10. Non-Toxic: Natural dyes are nontoxic, non-allergenic and non-hazardous. They do less harm to human beings compared to synthetic dyes [14].
11. Harmless Component: Natural dyes do not contain many harmful chemicals or carcinogenic components like artificial dyes [15].
12. Safe Production: The production of natural dyes is safe, ecological, cheap, and decomposable. Destroying them after use, they are easily decomposable [16].
13. Waste-free: The production procedure of synthetic dyes is unhealthy, whereas natural dyes can be produced safely. These dyes do not contain any toxic chemicals or waste [17].

## B. Ceremonial Materials Used

Balinese people who are dominated by Hindus always carry out obligations called "yadnya" in everyday life. Yadnya is a sincere sacrifice or an activity carried out with a sincere heart without any strings attached. According to the teachings of Hinduism there are five yadnya called Panca meaning there are five sincere sacrifices. The parts of the Panca Yadnya: 1. Dewa Yadnya, 2. Pitra Yadnya, 3. Manusa Yadnya, 4. Resi Yadnya, 5. Bhuta Yadnya.








Dewa Yadnya: is a sincere sacrifice offered to Sang Hyang Widhi and his manifestations. Dewa Yadnya can be done in two ways, namely by Nitya Karma and Naimitika Karma. Nitya Karma is Yadnya that is done every day, among others, making offerings every day or banten saiban (banten jotan done after cooking) is also called yadnya sesa. While Naimitika Karma is a ceremony that is carried out periodically, namely when Purnama, Tilem, Kajeng Kliwon, Buda Wage, Buda Kliwon, Tumpek, Galungan, Kuningan and others [18].





According to Arwati (2002) offerings or also called offerings are a medium for visualizing Hindu teachings. As a medium to convey devotion to the Almighty Sang Hyang Widhi Wasa [18]. Banten is a form of sacred Hindu religious culture that has a local form, but in it there are global universal values. Banten in a ceremony as a representative to relate to the revered or glorified.

Flowers, leaves, fruit are very important elements in making offerings to complete the yadnya ceremony. According to Wiana (2001) this is due to the fact that Bhagavadgita IX Sloka 26 states that: Pattram (leaf), Puspam (Flower), Phalam (Fruit), Toyam (Holy Water), as long as the offering is based on love and with a pure heart, then I accept [18]. Meanwhile, in the Yadnya Prakerti ejection, it is stated that the meaning of flowers is as a symbol of sincerity and purity of mind for the ritual.

Banten offered through nitya karma such as saiban and canang and banten offered through naimitika karma such as pejati and purification. After offering the offerings, most of the components of the offerings will become an organic waste because the main ingredients for making offerings come from plants. Organic wastes that are commonly encountered after religious ceremonies in Bali are 1) purple pacah (*Impatiens balsamina* L), 2) red pacah (*Impatiens balsamina* L), 3) thousand flowers (*hydrangeas*), 4) gemitir flowers/marigolds, 5) rampe flowers. / pandan, 6) dadap (*Erythrina variegata*) leaves, 7) shallot skin, 8) turmeric and 9) betel nut 10) Japanese/Frangipani flower 11) janur/ young coconut leaf. Each sample was extracted simply by pounding 8-10 gm of sample with 50 ml of water, then cotton cloth (10x1.5cm) was dipped in color extract for 5 minutes. The experiment produces the following colors.

Table 1: First trial colour  
[Source: Udiyani, Diantari & Darmastuti, 2022]

NO	Dye Sample	Results
1	janur/ young coconut leaf	
2	Jepun/frangipani flower	
3	<i>Kembang rampe</i> /pandanus	
4	daun dadap ( <i>Erythrina variegata</i> )	
5	bunga seribu ( <i>hydrangea</i> )	
6	shallot skin	
7	areca nuts	

8	red pacah ( <i>Impatiens balsamina</i> L)	
9	purple pacah ( <i>Impatiens balsamina</i> L)	
10	gemitir/ marigold	
11	turmeric	

Based on the table above, there are two samples of dyes that do not give color to cotton fabrics, namely 1) *janur* / young coconut leaf and 2) *Jepun* / frangipani flowers. Other dye samples can produce visible colors, so processing colors with mordant will only use 9 types of color materials, namely purple pacah (*Impatiens balsamina* L), red pacah (*Impatiens balsamina* L), bunga seribu (*hydrangea*), *gemitir* /marigolds, *kembang rampe* / pandanus, *dadap* leaves (*Erythrina variegata*), shallot skin, turmeric and areca nut.

### C. Color processing Technique

Natural dyes tend to have a less sharp color intensity, so a mordanting process is needed which aims to bind natural dyes with fabric media. The mordant process is divided into pre-mordant (initial mordant), post-mordant (final mordant), and simultaneous mordant. This study uses the simultaneous mordant method, which combines pre-mordant and post-mordant. Mordant is a chemical substance usually acidic, basic, salt, and iron such as vinegar, lime, *tawas* (alum), soda ash, and tunjung ( $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ ). This study used alum mordant (salt) in pre-mordant and whiting ( $\text{CaCO}_3$ ) (base) in post-mordant. Both mordants are easy to obtain because whiting (betel lime) is often used in religious ceremonies in Bali and alum is commonly used for water purification. Based on the explanation above, the color processing technique using the simultaneous mordanting method is divided into 3 stages, namely the pre-mordant stage, color extraction also coloring, and fixation (post-mordant).

#### 1. Pre-Mordant

This study uses cotton fabrics made from 100% cotton fiber without synthetic fibers to facilitate the absorption of dyes on the fabric. Preparation begins by cutting 9 pieces of cotton fabric with size 10 x 10 cm. Each sheet of cloth will be dipped in one dye extract. The cloth sheet is then washed with a solution of 2 grams of liquid soap (brand: sunlight) with one liter of water. The washed cloth is then dried. All the dried cloths are then pre-mordanted by boiling an alum solution of 8 grams/ 1 liter of clean water for 45 minutes. The cloth that has been pre-mordanted and then dried.

#### 2. Color Extraction and Coloring

Preparation of coloring begins with sorting the waste according to the type of material: *Impatiens balsamina* purple, red, *hydrangea*, marigold, pandan leaves, shallot skin, turmeric, and areca nut. All the color material that has been collected is cut into small pieces or ground to facilitate the release of the dye. Natural dyes are obtained by the color extraction process by boiling 100 grams of colored waste in 1 liter of water for 45 minutes or



until the water is reduced by half. The color extract was then filtered to remove the dye residue.

### 3. Fabric Dyeing

Each sheet of cotton fabric that has been pre-mordant alum is boiled with one of the color extracts for 25 minutes. make sure the water does not run out during the coloring process because it will affect the resulting color. The cloth that has been dyed is then drained

### 4. Fixation (Post-Mordant)

Fixation or post-mordant using a solution of 10 grams of powdered lime with 1 liter of warm water to facilitate the mixing of the solution. The solution is then precipitated to produce a clean liquid so that it does not leave a lime residue on the fabric during the fixation process. The dyed cloth is then dipped for 1 minute in lime water. The fixation solution should be changed every fixation of a different color extract to avoid contamination of another colored extract. Finally, dry the cloth by not exposed to direct sunlight.

Based on the color processing above, 9 color variations were produced from the process of mordant alum and lime with dyes from balsamina purple, red, hydrangea, marigold, pandan leaves, shallot skin, turmeric, and areca nut, namely :

Table: Color results from the use of ritual waste in Bali  
[Source: Udiyani & Diantari, 2022]

No	Natural coloring extract	dye with simple extraction	Dye with Mordant		
			Pre-Mordant	Post-mordant	Results
1	purple Pacah ( <i>Impatiens balsamina</i> L)		Alum	Calcium (lime betel)	
2	Areca nuts		Alum	Calcium (lime betel)	
3	shallot skin		Alum	Calcium (lime betel)	

4	gemitir/ marigold		Alum	Calcium (lime betel)	
5	dadap leaves ( <i>Erythrina variegata</i> )		Alum	Calcium (lime betel)	
6	kembang rampe/ pandanus		Alum	Calcium (lime betel)	
7	bunga seribu/ hydrangea		Alum	Calcium (lime betel)	
8	red pacah ( <i>Impatiens balsamina L</i> )		Alum	Calcium (lime betel)	
9	turmeric		Alum	Calcium (lime betel)	

Based on the table above there are changes as follows:

- 1) color change from dim purple to green
- 2) Change the color to be more sharper like brownish red
- 3) Color change becomes sharper
- 4) Color change from soft yellow to brown
- 5) Change to dimmer
- 6) No significant color change

- 7) No significant color change
- 8) Color change from dim pink to soft brown
- 9) Color change from yellow to brownish red

## CONCLUSION

Natural dyes that utilize waste from religious ceremonies in Bali are part of sustainable dyes that come from abundance local sources and at low material prices. The dyes from this waste were used organic materials such as flowers, leaves and fruit skins as well as types of mordant that do not damage the water ecosystem.

Color experiments from the waste of Hindu religious ceremonies in Bali produced several types of outcomes. The output is the discovery of natural dyes derived from the waste of religious ceremonies. Of the nine ceremonial wastes tested, all of these materials have color pigments that can be extracted as textile dye solutions. Based on the above findings, some colors experience color changes, increasing color sharpness and decreasing color sharpness. natural color changes occur as in purple and red balsamina, marigold and turmeric. increased color sharpness was seen in purple balsamina, arcea nut, shallot skin, marigold and turmeric. Decreased color sharpness occurs in red balsamina and there is no change in coloration of hydrangea and pandan leaves.

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