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## **UTILISATION OF NATURAL DYES FROM NIPAH FRUIT SKIN (NYPA FRUTICANS) USING THE SHIBORI TECHNIQUE IN FASHION PRODUCTS**

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### **ABSTRACT**

This research explores the potential of Nipah fruit skin as a natural dye for textiles and demonstrates its practical application. Natural dyes derived from plant extracts, such as roots, wood, fruit, skin, seeds, or flowers, have long been used in textiles. However, this study investigates using palm fruit skin waste as a natural dye. The Shibori Nui Technique, a tie-dye technique originating from Japan, is employed, where fabric is sewn together and wrapped with thread, then dipped in dye and made into fashion products. The extraction of colour from nipa palm skin is a process of boiling the nipa palm skin, which is then left overnight; the dyeing process on textiles is carried out using the cold dyeing method. The research, conducted in experimental forms with a quantitative approach, utilised data collection techniques, including documentation, literature study, applied experiments, and questionnaires. The data obtained was arranged systematically and described narratively. The research results show that the colour produced from Nipah fruit skin with whiting fixation produces a terracotta colour, and the product produced is outer. The potential of Nipah fruit skin as an alternative natural dye is promising, offering a sustainable and eco-friendly solution for the fashion industry.

**KEYWORDS:** Natural, shibori, dye, textile, fashion, fruit skin

## INTRODUCTION

Using natural dyes in the textile industry is fundamentally an evolution that began many years ago. The usage of natural dyes, on the other hand, has been supplanted by the use of synthetic dyes. Because synthetic dyes often have higher fastness dyeing properties, the colours are more diverse, they do not fade quickly, they are easy to create, and the cost is lower than natural dyes (Che & Yang, 2022). The usage of these colours, unfortunately, is associated with carcinogenicity and is detrimental to the environment. Increasing human awareness of the adverse effects of synthetic products on health has led to changes in the rules for using dyes in food and clothing. Synthetic dyes are artificial dyes derived from chemicals.

The advantages of synthetic dyes are that they have a bright colour even though the use of colour is slight. Colour remains stable against environmental factors such as light and temperature. However, this dye poses a big problem that is very dangerous for human health. Adverse effects such as skin allergies and respiratory system disorders (asthma) from inhaled synthetic dye powders can interfere with the respiratory system. In addition to causing health problems, its use can be toxic and carcinogenic because the human digestive system cannot destroy the heavy metal content in synthetic dyes, and it will accumulate in the body (Union et al., 2020; Che & Yang, 2022). Hence, humans prefer using materials with natural dyes as non-toxic, renewable, easily degraded, and environmentally friendly alternatives (Shahid-Ul-Islam and Sun, 2017; Sutrisna et al., 2020; Grifoni et al., 2011; Shahid et al., 2013). Natural dyes can be obtained from plants and animals found in the environment (Indrianingsih & Warsih, 2013).

Using natural colours that are less harmful to the environment was a solution that was proposed in response to the problem of environmental pollution caused by synthetic dyes in the production of industrial textiles (Handayani et al., 2022). Besides that, the presence of natural dyes is quite widespread; nevertheless, these dyes have several drawbacks, including the fact that they quickly fade, there is no assurance that they will be available, the fact that they do not come in a variety of colours, and the fact that their production process takes longer and requires a specific procedure to extract natural dyes. Because the use of natural dyes to colour fabric will produce colours that are more exotic and sophisticated, a breakthrough must be discovered to make natural dyes more widely used in textile businesses that are on a small or medium scale.

One alternative raw material for making natural dyes is Nipah fruit peel. Nipah is the only type of palm that is a mangrove commodity; Nipah contains oil, flour, sugar, and others. In Indonesia, the area of

natural nipa palm forests reaches 4.237.000 hectares. Nipah palm fruits are oval and flat with 2-3 ribs, reddish brown, grouped to form a ball with a diameter of about 30 cm (Nugroho et al., 2020; Herfayati et al., 2020). This plant is without stems on the surface and forms clumps; the stems are underground, the leaves are like the structure of coconut leaves, the leaves are shiny green on the upper surface and powdery on the bottom, and the shape is a lanceolate, tapered tip, grows on muddy substrates, has a dense and robust root system and can adapt to changes in water input better than most other types of mangrove plants (Zakyani et al., 2023). This plant species inhabits the brackish area, often forming a wide border beyond the fringe of adjacent mangroves or swamp forests. Its ability to adapt and grow in this extreme environmental stress is fantastic. Nipah contains phenolic components, flavonoids and tannins, which are antioxidant indicators as a natural colouring compound (Nugroho et al., 2020; Tungmunthum et al., 2018).

These palm forests are spread across the coasts of the islands of Sumatra, Kalimantan, Sulawesi, Maluku and Papua. The community has widely used Nipah, including making various crafts and food products. Parts of the Nipah plant are also used as ingredients for traditional medicines, including medicine for stomach aches and diabetes and medicine to reduce fever by the coastal communities of Banyuasin, South Sumatra (Zakyani et al. 2023). However, using Nipah as a natural dye for clothing is still rarely done. This research aims to extract palm fruit skin and apply it to clothing to reduce the use of synthetic dyes in clothing.

## **MATERIAL AND METHODS**

### **Experimental Process**

Researchers conducted experiments on applying the shibori nui technique to a cotton fabric with natural Nipah skin dye. The process of extracting dye from Nipah fruit skin is by boiling; the nipa fruit skin that has been cleaned and cut into small pieces is boiled in a ratio of 1 kg of avocado skin/10 litres of water; the skin is boiled until the water reduces by half, then left for one night.

### **Extract Making Process**

The collected palm fruit skin is washed thoroughly. After the skin is cleaned, the extraction process is performed. Boil the water until it boils, then add the palm fruit skin, which has been weighed according to your needs. Boil until the water reduces by half; leave it for one night after boiling.

### **Premordanting Process**

Wash the cloth first. Prepare 150 grams of alum, 100 grams of soda ash and 5 litres of water. Bring the water to a boil, add the alum and soda ash, and stir until dissolved. Put the cloth in an alum and soda ash solution and boil over low heat for at least 30 minutes. Next, turn off the heat and soak the cloth overnight.

After soaking the cloth in the alum and soda ash solution, rinse it with clean water and dry it in a shady place.

### **Colouring Process**

Prepare the tools and materials needed. Next, the shibori technique is applied, and the motif that will be formed on the fabric is drawn using a pencil. After the motif is drawn, make a running stitch following the shape of the motif on the fabric. The ready motif is basted, and then each end of the thread on the basting is pulled until the fabric forms wrinkles, wrapped around, and tied tightly. After the fabric is formed using the shibori technique, it is continued with dyeing. Pour the dye solution into the container provided. The cloth is dipped in the dye solution. Dyeing is done 7 to 10 times until the colour is entirely even.

### **Postmordanting Process**

Prepare each fixing agent, namely writing. Dissolve each fixing agent in water. Place the fabric that has gone through the dyeing process into the fixing agent solution for 5 minutes. Then, lift and drain the cloth, rinse using clean water, and dry it in a cool place.

## **RESULT AND DISCUSSION**

Natural dyes have been used to colour food substrate, leather, and natural fibres. This practice dates back to prehistoric times. In the 1850s, the usage of natural dyes began to decline due to the discovery of synthetic dyes' benefits, including their availability, low cost, outstanding colour fastness, and extensive colour range (Zarkogianni et al., 2010). On the other hand, in recent years, there has been a rise in the number of businesses that use natural dyes due to growing environmental consciousness. To prevent the potentially harmful consequences of synthetic dyes, the textile industry has become increasingly concerned about utilising natural, non-toxic colours that do not cause allergic reactions and are favourable to the environment. Many researchers have examined the usage of natural dyes in recent years because they are non-allergic and non-toxic, even though synthetic dyes have outstanding performance capabilities (Kanchana et al., 2013).

The Nipah plant is a mangrove plant with the shape of a palm and can create secondary metabolites demonstrating a wide range of biological traits and activities. It may be brought on by extremely harsh conditions in the plant's habitat, and it is found near the ocean and in coastal areas, which possess bioactive chemicals that are more distinctive than those found in plants found on land (Boopathy & Kathiresan, 2010). As a side note, the environmental circumstances in which plants can survive are incredibly harsh and external disturbances, such as wind, waves, water currents, and salinity values, must be dealt with (Theerawitayaa et al., 2014; Nugroho et al., 2020).

The anthocyanin in palm fruit skin is a pigment that produces the terracotta colour (a combination of orange and brown) (Samantaa AK & Agarwal P. 2009; Khoo et al., 2017), and we applied it to textiles using the cold dyeing technique, namely the extraction or boiling process of the natural ingredients and leaving them for one night. Filtering is carried out so that the remaining pulp of the Nipah fruit skin does not get mixed into the colour liquid used. Next, repeatedly dip the textile material into the dye for a thick and even colour, and the cloth is dipped repeatedly in the dyeing process so that the colour obtained is not too pale or faded (Sarwono et al., 2019).

The process of dyeing natural dyes is carried out in stages: the mordanting process, which involves soaking the fabric in an alum solution for one night to remove the wax layer on the textile so that the dye is easily absorbed (Sarwano et al., 2019). After drying, the motif is formed using the shibori technique. This mordanting process is intended to increase the attractiveness of natural colours in textile materials and helps produce good colour evenness and sharpness (Sahril et al., 2021).

The initial process of applying the Shibori technique to textiles starts with determining the technique used. This study used Shibori Kumo, Shibori Arashi, and Shibori Nui to make Shibori motifs. After that, the process of dyeing the natural dye of nipa fruit skin, then the final stage is the process of dyeing in a lime solution, which binds the colour of the natural substance. After dipping into the dye, the ties, threads and twists on the fabric are removed to form various motifs following the shape of the ties.



**Figure 1-2. Clothing products (outer) using natural dyes from palm fruit skin. Front view (1), rear view (2)**

The results obtained in the first experiment using the boiled method were satisfactory. We varied the Shibori Kumo and Shibori Arashi techniques in the first experiment. Meanwhile, in the second experiment, by grinding, the researchers used the Shibori Nui technique in two different ways, namely shaving and twisting; in the second experiment, we used a lime fixator to strengthen the colour and change the natural colour that entered the fabric fibres.

As people have become more conscious of the need to take action to protect our planet, the use of natural dyes has increased. The textile industry is increasingly looking into natural dyes to avoid potentially dangerous ingredients. The colours from Nipah are non-allergic, non-toxic, and good for the environment. The technological and economic demands of the modern era, including the need for reproducibility, have proven too great for natural dyes to handle. Natural Nipah dyes have flaws, but we can disregard the mounting environmental worries. Naturally occurring colours from this palm do not pose the same hazards to human health or the environment as their synthetic counterparts. Our textile products are natural, use only natural ingredients, and are in high demand. Researchers have thus emphasised studying natural items, which often contain natural pigments. Using a mordant in our processes is necessary for improving the light fastness, washing, and rubbing qualities of nearly all natural dyes (Repon et al., 2024). Using natural dyes from Nipah poses particular challenges to the dyeing business, and the customers have high expectations, so natural dyes often fall short. The importance of being environmentally conscious and sustainable, however, is higher than it has ever been.

Numerous research organisations have recently examined the textile dyeing industry's usage of natural colours (Repon et al., 2024). At the same time, they have been trying to improve the colour strength and fastness of natural dyes. We also found that using different mordanting and post-treatment approaches improves the colour fastness of natural dyes from Nipah. Hence, there are many ways in which the natural dyeing process can be optimised. Our findings will contribute to the future benefits that are expected to come from using natural colours. Using natural dyes from Nipah in modern dyeing techniques helps make the dying and finishing process for textiles more sustainable by reducing the quantity of water, chemicals, and energy needed.

## **CONCLUSION**

Nipah is one of the Indigenous plant species that can be used to make natural dyes in Indonesia. By employing the proper extraction procedure, it is anticipated that high-quality natural dye extracts will be obtained, suitable for use by small- and medium-sized textile and batik businesses in Indonesia. Terracotta

is the colour formed when the skin of the Nipah fruit is fixed with whiting, and the product that is ultimately produced is of an exterior appearance. The bark of the Nipah tree can be used as an alternative natural dye. Applying the Shibori technique produces clothing products (outer) with attractive and artistic designs. To build a secure relationship between the textile industry and the environment, both in the present and future, it is essential to use environmentally friendly chemicals, dyes, and procedures that allow for maximum productivity while simultaneously minimising the amount of waste produced.

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