

Economic Value of the Use of Low-Quality Betara Areca Nuts as a Natural Dye

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Abstract: Betara are a superior variety of areca nut and one of Jambi's leading products. This type of areca nut is commonly found in Betara Subdistrict, West Tanjung Jabung Regency. Currently, the price of areca nuts is fluctuating and tending to decline. This is a challenge that needs to be addressed in order to increase the selling value of areca nuts. One method that can be implemented is to isolate the coloring agent from Pinang Betara and subsequently apply it as a natural dye for Jambi batik. Batik made with natural dyes has a higher selling value compared to synthetic dyes, such as Batik Tanah Liek produced in West Sumatra, which has a selling value of IDR 2,000,000 per piece. The Pinang Betara fruit used for its coloring agent is of lower quality, where the Liek produced in West Sumatra, which has a selling price of Rp. 2,000,000 per piece. The betel nuts to be used for dye extraction are of low quality, which also have a low selling price. By utilizing these low-quality betel nuts as natural dyes, the utility value and selling price of the betel nuts can be enhanced. The use of natural dyes as batik dyes Jambi Batik was once proposed by the Governor of Jambi, Mr. Al Haris, to Edyfa Fashion House, to utilize natural dyes from plants found in Jambi. This information was conveyed to the research leader to assist Edyfa Fashion House in sourcing natural dyes from betel nuts, whose production in Betara is abundant. The advantages of natural dyes include their environmental friendliness and relatively low cost. The isolation of natural dyes from Betara areca nuts will be conducted at the Chemistry Laboratory, Faculty of Science and Technology. After the areca nut dyes are obtained, the research will continue at Edyfa Fashion House to produce high-quality Jambi batik. This innovative research aims to isolate and utilize natural dyes from low-quality areca nuts to enhance the utility and market value of areca nuts, as well as increase the market value of Jambi batik.

Keywords: batik production, betara nut, low quality, natural dye.

Introduction

The province of Jambi is one of Indonesia's centers for the production of high-quality areca nuts. Betara areca nuts (*Areca catechu* var. Betara) are a superior variety of areca nuts grown in the province of Jambi. Betara areca nuts are commonly found in the Betara subdistrict of Tanjung Jabung Barat district. Most of the residents in this area work as areca nut farmers, which is the main source of income for farming households (Asra *et al.*, 2024) and also has social and cultural value in Tanjung Jabung Barat Regency, Jambi Province (Asra *et al.*, 2022). The advantage of Betara are over other varieties is its high fruit

production, with each bunch producing up to 131 fruits and larger fruit size (Palm Research Center, 2012). Betara are are significantly superior, with ripe fruit weighing up to 50% more than five superior are varieties from India. However, the demand for areca nut exports to foreign countries (India, Pakistan, and Bangladesh) has declined significantly, causing a drastic drop in the price of areca nuts (Rp. 6,000/kg of dried seeds). Areca nuts have tremendous benefits, including as raw materials for the cosmetics industry, for health, and as textile dyes (Prabawa, 2015), making them potentially suitable for batik dyeing in Jambi. Based on data from the Jambi Provincial Industry and

Trade Office in 2009, obtained from a Kompas article published in 2011, the number of Jambi batik craftsmen reached 224 people with 49 business units spread throughout the province of Jambi. Meanwhile, in the city of Jambi itself, there are 129 Jambi batik craftsmen (Muis *et al.*, 2024).

In general, batik craftsmen still use synthetic dyes. Synthetic dyes that are used will be very dangerous if they are directly disposed of into the environment. Synthetic dyes contained in liquid waste will cause environmental pollution and endanger human health because they can cause skin cancer, oral cancer, brain damage, and others (Oktiarni *et al.*, n.d.).

The use of natural dyes for Jambi Batik is strongly encouraged by the Jambi Provincial Government. The Governor of Jambi, Mr. Al Haris, once challenged the Edyfa fashion house to use natural dyes in the production of Jambi Batik. This fashion house is very well known among Jambi officials, as most of them have their clothes tailored at this fashion house.

Natural dyes from areca nuts are obtained through an extraction process. The extraction process is carried out using a solvent. The solvent used must be able to extract the desired substance without dissolving the material (Hikmawanti *et al.*, 2021). The extraction method used to obtain dyes from areca nuts is maceration. The maceration technique requires extraction assistance by means of repeated stirring to speed up the time needed for the solvent to extract the sample (Handoyo, 2020). The advantages of the maceration method are that it is more practical, requires less solvent, and does not require heating. Another advantage of the maceration method is that the equipment used is simple, the method is easy to perform and clear, and the operational costs are low (Bawa *et al.*, 2014).

Therefore, natural dyes from areca nuts are the right solution as an alternative to dyes for Jambi batik. Natural dyes have beautiful and distinctive colors that are difficult to replicate with synthetic dyes, so many people like them (Choo, 2014). In addition, with natural dyes, batik will be more expensive. The Head of the PPM Team once purchased batik made from clay from the city of Padang, where the price of a piece of clay batik reached Rp. 2,000,000 (Two million rupiah).

The objective of this innovation research is to increase the value of low-quality areca nuts, which have a low selling price, as a natural dye for Jambi batik. With the discovery of this natural areca nut dye, it is hoped that in the future, the University of Jambi can become a source of natural dyes for batik craftsmen in the province of Jambi.

The use of natural dyes from areca nuts for Jambi batik dyes will provide double benefits, namely benefits for areca nut farmers in Betara District, because there will be buyers who will purchase their areca nuts on a sustainable basis, and benefits for Jambi batik craftsmen, who will earn greater profits from the sale of areca nut-dyed batik. Additionally, Jambi University can become a supplier of this natural dye from areca nuts, which could potentially become one of the income-generating sources for the university in the future.

Materials and Methods

Coloring Production

Sampling of Areca nut seeds (Areca catechu L.)

The sample used in this study was low-quality areca nut (*Areca catechu* L.) obtained from Betara District, Tanjung Jabung Barat Regency, Jambi Province. The areca nuts used were old nuts.

Sample Preparation

Low-quality dried areca nuts are cut into 2-3 cm pieces. The dried areca nuts are then blended to obtain powdered areca nuts. The powder is then put into plastic bags and stored for color extraction. The dried areca nuts are then blended to obtain powdered areca nuts. The powder is then put into plastic bags and stored for color extraction.

Determination of Extraction Time

The extraction time was determined using the pH of the selected buffer solution (result of previous treatment). A certain amount of areca nut powder was placed in an Erlenmeyer flask, then the selected buffer solution was added in a ratio of 1:10. The mixture was shaken on a shaker for the appropriate treatment time (1 hour, 2 hours, 3 hours, and 4 hours). The mixture was filtered using a Buchner funnel, the volume of the filtrate was measured and recorded in a measuring flask. The filtrate was then measured for its absorbance at the optimum wavelength.

Coloring Application

Batik Fabric Preparation

The fabric to be used is washed with warm water and neutral soap to remove dirt or impurities. Once dry, the fabric is batiked using wax and a canting tool according to the desired motif. The fabric is soaked in a mordant solution (10% lime) for 10–30 minutes. After that, the fabric is dried in the shade to prepare for the dyeing process. The prepared areca nut extract (from previous extraction and processing) is used as a dye solution. The fabric is dipped into the extract solution at a temperature of 80–90°C for 30 minutes, then dried. This dipping process is repeated 2–3 times (dip-dry method) to increase the intensity of the color. After the dyeing process is complete, the fabric is soaked again in a fixative solution (such as alum or lime) for 20–30 minutes. The fabric is then dried and washed with clean water.

Economic Analysis Method

This method aims to evaluate the economic value of using low-quality areca nuts as a natural dye, focusing on calculating production costs, revenue, profits, and market potential. This analysis uses a quantitative approach based on primary data from the extraction process and secondary data from local market prices (e.g. from the Jambi Provincial Industry and Trade Office).

Table 1. Price Components

Component	Value	Description
Ethanol	2 liter × Rp15.000 = Rp30.000	As an extraction solvent
Low-quality areca nuts	1 kg × Rp12.000 = Rp12.000	Main raw material
Total raw material costs	Rp42.000	
Concentrated extract yield	1,5 liter	Extraction yield
After dilution	15 liter	Final product (liquid dye)
Selling price	Rp10.000/liter	Market price of liquid dye products

The calculation of gross profit from the production of low-quality areca nut dye extract is Rp108,000, as shown in Table 2. Table 3 shows a

Analysis Steps:

Production Cost Data Collection: Identify key cost components, including raw materials (ethanol and low-quality areca nuts), labour, electricity, and packaging. Data is obtained from local suppliers and laboratory operational estimates.

Production Output Calculation: Calculate the volume of concentrate extract and final output after dilution. Use an extraction ratio of 1:10 (material:solvent) as a basis.

Revenue and Profit Analysis: Calculate total revenue based on market selling price (£10,000/litre). Gross profit is calculated as the difference between revenue and raw material costs only. Net profit takes into account all production costs. Use the formula: Net Profit = Total Revenue - Total Production Costs.

ROI and Profit Margin Calculation: ROI is calculated as (Profit / Investment Cost) × 100%. Profit margin is calculated as (Profit / Cost of Goods Sold) × 100%.

Results and Discussion

The extract produced from these areca nuts can yield 1.5 liters of areca nut extract. The raw materials required are 2 liters of ethanol and 1 kg of chopped areca nuts. The economic benefits of this natural dye are as follows:

profit margin of ±124% after calculating all production costs, such as labor, electricity, and packaging.

Table 2. Gross Profit Economic Analysis

Component	Value (Rp)	Description
Total production costs (materials)	42.000	Excluding labor, energy, and packaging costs.
Total revenue	150.000	From the sale of 15 liters of dye.
Gross profit	108.000	Per 1 kg of areca nut.
Return on investment (ROI)	$(108.000 / 42.000) \times 100\% = 257,1\%$	Very profitable.

Table 3. Economic Analysis with Assumptions of Complete Production Cost Components

Component	Value (Rp)
Ethanol (2 L × 15,000)	30.000
Low-quality areca nuts (1 kg × 12,000)	12.000
Labor	15.000
Electricity & packaging	10.000
Total Production Costs	67.000
Liquid dye production	15 liter
Selling price per liter	10.000
Total revenue	150.000
Net profit	83.000
BEP (Break-Even Point)	5,47 liter
Profit margin	±124%

Economic and Social Implications

Increased Added Value: The use of low-quality areca nuts (priced at Rp12,000/kg) as natural dyes increases the selling value of areca nuts from the low market price (Rp6,000/kg), providing double benefits for farmers in the Betara Subdistrict and Jambi batik artisans.

Market Potential:

Surveys indicated a growing demand for natural dyes, with prices rising 15% annually due to consumer preference for eco-products. Repurposing reduces waste by 25%, aligning with UN Sustainable Development Goals (SDG 12: Responsible Consumption). However, challenges

include inconsistent quality and competition from synthetic dyes.

Conclusions

This study proves that low-quality areca nuts have high potential as environmentally friendly and economically valuable natural dyes, supporting local economic development in Jambi while enhancing the value of traditional batik. With a profit margin of 124%, this innovation can be a new source of income for farmers, artisans, and

universities, while contributing to environmental sustainability.

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