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Identification of Plant Diversity for Natural Dyes in the Making of Kodi Balaghar Ikat Weaving

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Abstract

The study aims to examine more about the kinds of plants that are used as natural dyes, how they are classified and described, what organs are used, what colours are generated, how to combine different plant types, and how to create patterns on Kodi Balaghar ikat cloth. The researchers employed a qualitative methodology, with observation, interviews, exploration, and documentation as the primary data-gathering modes. The results of this study show that there are nine types of plants used as natural dyes, namely: Indigo leaves (*Indigofera tinctoria* L.), Kesambi wood (*Scheilchera oleosa*), Kepuh (*Sterculia foetida* L.), Pule (*Alstonia scholaris*), Poison Sumac (*Toxicodendron radicans*), Yellow wood (*Arcangelisia flava* L.), Noni (*Morinda citrifolia* L.), Black rice (*Oryza sativa* L.), Rice (*Oryza sativa* L.). Descriptions of each type of natural dye plant have been made in full. The plant organs used are roots, bark, fruit, and leaves. The coloring process includes pounding, mixing with water, and soaking. The resulting colors are dark blue and black. The motifs produced include Kris flowers and buffalo eyes.

Keywords: ikat weaving; natural dyes; plant diversity

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INTRODUCTION

One of Indonesia's abundant natural resources is plants, which can be used to create natural dyes using their parts. Every plant is a source of natural dye because it contains natural pigments. The intensity of the color produced determines the potential of natural dye sources and depends on the type of dye present in the plant (Paramita, 2021; Pranta & Rahaman, 2024; Rossi et al., 2017).

Indonesia is known as a country rich in cultural heritage. This cultural wealth encompasses various aspects of life, including traditions, language, art, music, dance, traditional clothing, food, and more. Indonesia's culture is highly diverse because it consists of thousands of islands with various ethnic groups and communities, each with its own traditions and culture. This cultural diversity makes Indonesia one of the world's premier cultural destinations. Indonesian woven fabrics, which are famous cultural treasures, are not only valued for their production techniques, diverse motifs, and the types of fabrics produced. Moreover, they reflect the various functions and meanings these fabrics hold in people's lives, symbolizing Indonesia's national identity. This concept is reinforced by the view of Mubin (2018), who states that Indonesia, as an archipelago, possesses rich natural

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and cultural resources scattered across its regions, resulting in cultural diversity. Traditional fabrics, particularly woven fabrics, represent a craft art that reflects the cultural richness of Indonesia. This aligns with Atmoko and Dharsono (2015), who says that weaving is a cultural element where its growth and development occur due to the adaptation process of a people or ethnic group to the social and natural environments where they live. Thus, every pattern produced in weaving usually reflects the identity of the culture and community that created it, influenced by their belief systems.

The East Nusa Tenggara region (NTT) is rich in biodiversity and home to various types of plants. The NTT community has traditionally utilized plants for various purposes. Using plants as natural dyes for making ikat fabrics is one significant application. The creation of ikat fabrics by the NTT community has been ongoing since ancient times, passed down from generation to generation, and continues to be preserved to this day (Imeldanita et al., 2023). The basic concept of fabric production involves the arrangement of threads vertically and horizontally. According to the prevailing customs, ikat fabrics are valued because certain motifs hold mystical and spiritual meanings. The initial purpose of woven fabrics was to provide clothing or body protection for daily needs. Additionally, they were used for traditional ceremonies such as weddings, dances, festivals, and funerals. Nowadays, they are used to create formal and modern clothing for everyday wear (Küchler & Were, 2019).

Natural dye plants contain natural colour substances derived from nature (Arora et al., 2017; Lahur et al., 2023; Taya et al., 2015). Natural dyes are colours extracted from various parts of dye-producing plants, such as leaves, bark, stems, seeds, roots, and flowers, which are then processed by boiling, burning, pounding, soaking, or cooking (Berlin et al., 2017; Singh et al., 2020). Most plants grow in gardens and yards, while a small portion grows in forested areas (Seran et al., 2022). Each region has its distinctive characteristics in its woven products. These characteristics are influenced by several factors, including the era, environment, and geographical location of the weaving production, as stated by Woelandhary et al. (2018). These characteristics encompass various aspects, including motifs, thread types, traditional production techniques, historical development, and the functional use of woven fabrics in daily life, reflecting each region's culture and customs.

Using plants as natural dyes is advantageous because natural dyes are non-toxic, environmentally friendly, biodegradable, inexpensive, and easily found around the home (Chattopadhyay & Pan, 2019; Seran & Hana, 2018; Singh, 2017). However, with the advancement of technology and the discovery of synthetic dyes, the use of plant-based natural dyes has declined in the current era. Synthetic dyes have become increasingly popular due to their benefits, including a wider range of colors, ease of use, faster processing, and various shades. As a result, only a small portion of low-income communities continue to utilize natural colours.

The Sumba community has used natural dyes derived from local plants for many years. Over time, weavers began to adopt these dye sources after discovering natural dye sources for ikat fabrics. To preserve these plants, research is needed to inspire the community to utilize plants as natural dyes. In this way, the ikat weaving heritage will be maintained, particularly the use of plants as natural dye sources. The varieties of plants used in ikat dyeing, the plant components used in the procedures, the steps taken at the processing plants to produce ikat dyes, and the colour variations produced by these dyes are all subjects of this research. The study was conducted in Flores, Harona Kalla village, West Laboya district, West Sumba regency.

One method used in Sumba to produce ikat fabrics with natural dyes is plant dyes from the region. This research aims to explore the diversity of plants that can be used as natural dyes for making ikat textiles.

METHOD

This research used a qualitative method. Qualitative methods focus on broad observations. Therefore, using qualitative methods in research provides a more comprehensive study of a phenomenon or something that can be viewed from all sides as a whole (according to Flick, 2022). This research was conducted over 1 week and 3 days, from April 15 to April 27, 2024, in Wainyapu village, Kodi Balaghar district, Southwest Sumba Regency, East Nusa Tenggara province. The subjects of this research were individuals related to the research or those who are part of the ikat weaving artisans group.

The research employed qualitative methods, with data collection techniques including 1) observation of plants used as natural dyes, 2) interviews to gather information on the processing of plants for natural dyes, 3) exploration through nature expeditions or observing plants in the surrounding areas of Wainyapu village, and 4) documentation through photographs or images of observations and nature expeditions. Informant selection uses the purposive sampling method, where informants are directly selected due to their knowledge of the research topic (Sugiyono, 2016). Five informants representing the ikat weaving artisans group were interviewed. The instruments used in this research are observation sheets, interview sheets, and documentation. Data analysis techniques used include: 1) data reduction, where key elements are filtered, summarized, focused on, important aspects identified, and irrelevant data discarded; 2) data presentation, where data or information that has been compiled is organized and presented in a framework of relationships, making it more structured and easier to understand; 3) drawing conclusions, which involves continuously refining conclusions throughout the research, from data collection to the final stages. The conclusion drawing process implies that the information or data presented from the beginning will be substantiated by evidence gathered during field research, resulting in reliable conclusions.

RESULTS AND DISCUSSION

The types of plants used as natural dyes in the colouring of woven fabrics in Wainyapu Village can be seen in Table 1.

Table 1 Types of plants as natural dyes

No	Common Name	Local Name	Scientific Name
1	*Daun Nila*	*Royo Kanabu*	*Indigofera tinctoria* L
2	*Kayu Keìsambi*	*Ghayo Komi*	*Scheilchera oleosame*
3	*Kepuh*	*Wuyo Kapaka*	*Sterculia foetida* L
4	*Pule*	*Puli*	*Alstonia scholaris*
5	*Sumak Racun*	*Ngalir bangga*	*Toxicodendron radicans*
6	*Akar Kuning*	*Paneta*	*Arcangelisia flava* L
7	*Mengkudu*	*Kombo*	*Morinda citrifolia* L
8	*Padi Hitam*	*Pari Mete*	*Oryza sativa* L
9	*Padi*	*Pari*	*Oryza sativa* L

The weavers in Wainyapu Village use nine types of natural dye plants to produce woven fabrics. The plants used in the dyeing process are those believed by the ancestors to produce good colours. These plants have been used for generations as natural dyes and are environmentally friendly because they do not harm nature and the surrounding environment. The plants are easy to find, their colours are durable or do not fade easily, and the fabrics sell for a high price. Some plants are cultivated or planted around homes, while others grow wild in forests or gardens. The parts of the plants used for natural dyes include leaves, bark, roots, and fruit. The plant organs used, the colors produced, and the benefits of these natural dye plants can be seen in Table 2.

Table 2 Plant organs used, colours produced, and their benefits

No	Type of Plant	Plant Name	Organ Used	Colour Produced	Benefits
1	Dye Plant	*Nila*	Leaf	Biru Tua dan Hitam	Colour Producer
2	Supporting Plant	*Kepuh*	Fruit	-	Material burned to produce ash
		Pule	Outer Bark	-	Additional ingredient for black colour
		Sumak Racun	Bark and Root	-	Additional ingredient for black colour
		Akar kuning	Root	-	Ingredient for black colour
		Mengkudu	Bark	-	Ingredient for black colour
		Padi Hitam	Seed	-	Strengthens color
		Padi	Seed	-	Strengthens thread and prevents it from fading
		Kesambi	Trunk	-	Material burned to produce ash

Plant organs used as natural dyes include trunks, seeds, fruits, bark, roots, and leaves. Almost all colours are derived from plants because plant tissues contain different pigments depending on their chemical structure. Bark, leaves, and fruits are the most commonly used organs in the dyeing process.

Classification and Description of Natural Dye Plants

Below is the classification and description of the types of plants used in Wainyapu Village to naturally dye their woven fabrics.

a. Indigo *(Indigofera tinctoria L)*

1) Common Name: Indigo
2) Local Name: Royo Kanabu
3) Classification:
   Kingdom: Plantae
   Division: Spermatophyta
   Class: Dicotyledonae
   Order: Fabales
   Family: Fabaceae
   Genus: Indigofera
   (Wahyuningsih et al., 2017)
4) Description: Appearance: Bushy. Root: Taproot. Stem: Woody, round shape, slightly rough surface, and highly branched. Leaves: Compound leaves are pinnate, oval, green on the underside and dark green above. Flowers: Compound, raceme-shaped, butterfly-shaped petals, pink in colour. Fruit: Compound, pod-shaped. Seeds: Oval, green when young, black when mature, with 37 seeds in a pod (Gunun et al., 2022; Pattanaik et al., 2020).

b. Noni *(Morinda citrifolia L)*
1) Common Name: Noni
2) Local Name: Kombo
3) Classification:
Kingdom: Plantae
Division: Spermatophyta
Class: Dicotyledonae
Order: Rubiales
Family: Rubiaceae
Genus: Morinda
4) Description:
Appearance: Shrub. Root: Taproot. Stem: Round, not straight, grayishbrown, rough surface, and highly branched. Leaves: Single, thick texture, glossy, pointed tip, smooth edge, pinnate veins. Flowers: Grow in leaf axils opposite regular leaves, bisexual, white petals. Fruit: Stone fruit, with the dotted or warty surface, green and hard when young, white and soft with a foul odour when mature (de Araújo Souza & Passos, 2021; Jahurul et al., 2021).

c. Kesambi *(Scheilchera oleosame)*
1) Common Name: Kesambi
2) Local Name: Komi
3) Classification:
Kingdom: Plantae
Division: Magnoliphyta
Class: Magnoliopsida
Order: Sapindales
Family: Sapindaceae
Genus: Scheilchera
4) Description:
Appearance: Tree. Root: Taproot. Stem: Woody, upright, rough surface, dirty brown colour. Leaves: Single, smooth edges, pointed tip, reddishbrown when young, green when mature, pinnate veins. Fruit: Small, green when young, brownish yellow when mature, consisting of skin, flesh, and seed. Seeds: Elliptical, covered by flesh, easily cracked, oil-rich (Hadi et al., 2020; Situmeang et al., 2016).

d. Kepuh *(Sterculia foetida L)*
1) Common Name: Kepuh
2) Local Name: Wuyo Kapaka
3) Classification:
Kingdom: Plantae
Division: Magnoliphyta
Class: Magnoliopsida
Order: Malvales
Family: Malvaceae
Genus: Sterculia
4) Description:
Appearance: Tree, up to 40 meters tall, with horizontal branches. Root: Taproot. Stem: Upright. Leaves: Compound, sharp-tipped, oval, pointed at both ends. Flowers: Grow in clusters at the base or tips of branches, yellowish gray at first, turning red later. Fruit: Oval, green when young, red when mature, thickskinned.

Seeds: Oval, brownish yellow, covered by a black seed coat, oil-rich (Kurnia et al., 2024; Musawwa et al., 2022).

e. Rice *(Oryza sativa L)*
1) Common Name: Rice
2) Local Name: Pari
3) Classification:
Kingdom: Plantae
Division: Spermatophyta
Class: Monocotyledoneae
Order: Poales
Family: Poaceae
Genus: Oryza
4) Description:
Characteristics: Fibers were removed, lance-shaped leaves, parallel veins, leaf sheath, and compound flowers were arranged in clusters (Shrestha et al., 2020).

f. Black Rice *(Oryza sativa L)*
1) Common Name: Black Rice
2) Local Name: Pari Mete
3) Classification:
Kingdom: Plantae
Division: Spermatophyta
Class: Monocotyledoneae
Order: Poales
Family: Poaceae
Genus: Oryza
4) Description:
Characteristics: Same as rice, but the seeds are dark purple to black, indicating anthocyanin content, which is effective as an antioxidant (Bhandari et al., 2023; Ito & Lacerda, 2019).

g. Pule *(Alstonia scholaris)*
1) Common Name: Pule
2) Local Name: Puli
3) Classification:
Kingdom: Plantae
Division: Tracheophyta
Class: Magnoliopsida
Order: Gentianales
Family: Apocynaceae
Genus: Alstonia
4) Description:
Height: 610 meters, trunk diameter 60100 cm. Root: Pores present on the root surface. Stem: Light brown bark, milky white sap, fragile old bark. Leaves: Oval, spatula-shaped, pointed at the tip, prominent veins on the underside. Flowers: Bisexual, grouped at the leaf tips, white-greenish with inward curved edges. Fruit: Long and mucilaginous, with two follicles, splitting when dry (Kaushik et al., 2011; Patel & Patel, 2016).

h. Yellow Wood *(Arcangelisia flava L)*

1) Common Name: Yellow Wood
2) Local Name: Paneta
3) Classification:
   Kingdom: Plantae
   Division: Spermatophyta
   Class: Dicotyledoneae
   Order: Ranunculales
   Family: Menispermaceae
   Genus: Arcangelisia
4) Description:
   Appearance: Vine, up to 10 meters long, with large branches resembling an adult's arm. Stem: Airfilled, tough, bitter taste. Leaves: Eggshaped to oval, pointed at the tip, shiny green surface. Flowers: Pale yellow, grow in panicles on old stems. Fruit: Yellow, mucilaginous, large and flat seeds (Harnelly et al., 2024).

2. Plant Processing for Natural Dye Production in Wainyapu Village

The general process of plant treatment for natural dyeing includes:

a. Dark Blue and Black Dye

1) Preparation of Tools and Materials:
   The tools used include machetes, crowbars, jars, cooking pots, sieves, knives, mortars, pestles, bowls, buckets, thread, natural lime, and rice water.
2) Plant Collection:
   The raw materials are carefully selected plants based on local availability and their dye potential. The plants include indigo leaves (royo kanabu), yellow wood (paneta), noni (kombo), kesambi, and kepuh. Pule plants are sourced from Ede forest in West Sumba.
3) Processing Plants into Natural Dye:
   a) Pick indigo leaves (Royo Kanabu) using a knife.
   b) The process of picking indigo leaves using a knife.
   c) After collecting the leaves, mix them with water and ferment them in a mate (bucket) for 2 nights. Fermenting the indigo leaves is a process of soaking the leaves to convert the indican glycosides naturally present in them into blue indigotin dye. The appearance of blue bubbles during fermentation indicates that the fermentation of the indigo leaves has been successful.
   d) After two nights of fermenting the indigo leaves, the residue is removed, and the liquid is mixed with natural lime (Katanga Langap). The ratio is one-half of a coconut shell for one clay pot.
   e) After mixing, the liquid is left to settle for half a day or 12 hours.
   f) Burn kesambi wood and wuyu kapaka fruit on a clean zinc sheet so it does not mix with soil, producing ash. Three kilograms of ash are needed, which is then soaked in water.
   g) After soaking, the ash water is filtered, and only the liquid is used.
   h) Ingredients such as bark and roots (ngalir bangga), outer bark (puli), roots (paneta), and roots (kombo/noni) are dried to reduce moisture content. Once dried, the ingredients are ground into a fine powder and mixed with the ash water. This mixture is then fermented in a clay pot for 4-6 nights.
   i) The sediment from the indigo leaves and natural lime is mixed with the fermented herb solution and ash water.

4) Dyeing Process:
White threads are soaked in the dye solution for one hour.

5) Drying Process:
The dyed threads are hung and dried until the desired colour is achieved.

b. White Dye
1) Materials: Raw threads
2) Process:
The threads are boiled two to three times in rice water and then dried thoroughly for a satisfactory white colour. This information was obtained from an interview with Mrs. MTI, YM, PPR, MBD, and Mr. YMJ.

CONCLUSION

Nine types of plants are used as natural dyes to make authentic Kodi fabrics (ghundu kodi) throughout the Kodi Blaghar district. These plants include indigo leaf (Indigofera tinctoria L), kesambi wood (Scheilchera oleosame), kepuh (Sterculia foetida L), pule (Alstonia scholaris), poison sumac (Toxicodendron radicans), yellow wood (Arcangelisia flava L), noni (Morinda citrifolia L), black rice (Oryza sativa L), and rice (Oryza sativa L). The parts of the plants used include roots, trunks, bark, and leaves. The colors produced are black, dark blue, and white. The plant parts are dried, pounded, cooked, and fermented before the threads are soaked for a certain period of time. The dyeing process involves boiling the threads to prevent the colors from fading or to lock in the color (patonggoro), followed by soaking. The length of soaking time determines the color of the threads produced. Generally, the motifs used in the Kodi Blaghar district are the chrysanthemum flower and buffalo eye. The chrysanthemum symbolizes the beauty of nature, while the buffalo eye motif represents highly sacred customs. This study's findings only apply to certain areas, specifically the Kodi Blaghar district. Therefore, the results cannot be generalized to other regions where dyeing practices may differ.

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