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ETHNOBOTANICAL STUDY OF PLANT-BASED NATURAL PRESERVATIVES AND COLORANTS FOR SUSTAINABLE PRACTICES IN BLITAR, INDONESIA

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Abstract

This study investigated the ethnobotanical use of plants as natural preservatives and colorants in food and textile applications in Blitar, Indonesia. An exploratory ethnobotanical survey using qualitative and quantitative approaches involved 30 informants through field observations, semi-structured interviews, and documentation. A total of 15 plant species belonging to 13 families were documented for food preservation, food coloration, and ecoprint dyeing. Leaves were the most frequently utilized plant parts (33.3%), followed by flowers (20%), stems or bark, and fruits (13,3% each), while fruit rind, bulbs, and tubers each represented 1 species (6.7%). Use Value (UV), calculated from informant reports, ranged from 0.13 to 0.70. Allium sativum and Pandanus amaryllifolius recorded the highest UV values (0.70), whereas Rhizophora apiculata had the lowest (0.13). The Informant Consensus Factor (ICF) was 0.94 for natural preservatives, 0.94 for food colorants, and 0.92 for ecoprint dyes, indicating substantial agreement among informants regarding plant use. Reported phytochemical compounds included eugenol, allicin, tannins, flavonoids, anthocyanins, and carotenoids, based on published literature. These findings highlight the continued relevance of local ethnobotanical knowledge and the potential of locally available plants as source of plant-based preservatives and colorants, supporting further research into sustainable resource utilization and biodiversity conservation.

Keywords: *Ethnobotany; Local knowledge; Natural colorants; Natural preservatives; Sustainability*

1. INTRODUCTION

Plants are important sources of bioactive compounds and natural pigments that have been used in food preservation, food coloration, and textile dyeing across different cultures. Growing scientific interest in plant-derived ingredients is associated with the search for alternative materials that may support food quality and more sustainable production practices. In food preservation, plant-derived compounds, including phenolics, terpenoids, and essential oils, have demonstrated antimicrobial and antioxidant potential, although their effectiveness depends on the

plant species, chemical composition, extraction method, concentration, and food matrix (Ahmadi et al., 2024; Cedillo-Olivos et al., 2025). These factors are important because traditional use does not necessarily establish the efficacy or safety of a plant when applied as a food preservative. Plant-derived colorants are similarly attracting attention as potential alternatives to synthetic colorants in food and textile applications. However, their practical application remains influenced by challenges such as pigment stability, extraction efficiency, reproducibility, and production costs (Che & Yang, 2022; Pizzicato et al., 2023). Therefore, documenting plants used by local communities for preservation and coloration provides a starting point for identifying biological resources and traditional practices that merit further scientific investigation.

Plant-based colorants originate from different plant organs and contain diverse pigments and secondary metabolites, including anthocyanins, carotenoids, chlorophylls, and tannins. These compounds contribute to a broad range of colors and offer opportunities for exploring natural materials for food and textile applications. In textile production, natural colorants have received particular attention because of concerns about the environmental impacts associated with synthetic dyes and conventional dyeing processes. Nevertheless, natural dyes are not inherently sustainable under all conditions, since their environmental performance can be influenced by extraction procedures, water and energy consumption, mordant selection, and the availability of plant resources (Che & Yang, 2022; Pizzicato et al., 2023; Uddin et al., 2022). Ethnobotanical documentation can help identify locally recognized dye-producing plants and the plant parts used by communities, thereby providing baseline information for subsequent research on extraction methods, color performance, resource management, and potential applications. Similarly, documenting plants used to color foods can help distinguish traditional practices from applications that have already undergone laboratory evaluation. This distinction is

important because the presence of a pigment or bioactive compound in a plant does not, by itself, demonstrate its suitability for a particular food or textile application.

Ethnobotany provides a framework for examining relationships between people, plants, and the knowledge developed through their interactions with local environments. Such knowledge can inform biodiversity documentation, resource management, and the identification of useful plant species, while also contributing to the understanding of cultural practices associated with plant utilization(Pei et al., 2020). In Indonesia, ethnobotanical studies have documented plant resources used in traditional textile production. For example, Rahayu *et al.* (2020) documented plants used as dyes and natural color binders in traditional woven fabrics in Pringgasela, East Lombok (Rahayu et al., 2020) , while Seran et al. (2024) investigated the diversity and ethnobotanical knowledge of plants used for natural dyeing in traditional woven textiles in Belu, East Nusa Tenggara (Seran et al., 2024) . These studies demonstrate the importance of recording plant diversity, the organs utilized, and traditional preparation practices within their local contexts. However, the scope of ethnobotanical knowledge extends beyond textile coloration to include plants used in food preservation and food coloration (Novais et al., 2022; Utami et al., 2025). Documenting these different uses within a common research framework can provide a broader account of how communities recognize and utilize plant resources for practical purposes.

Quantitative ethnobotanical approaches can complement qualitative documentation by providing structured measures of reported plant use and agreement among informants. The Use Value (UV) is commonly applied to describe the relative importance of plant species based on reported uses, while the Informant Consensus Factor (ICF) is used to assess the degree of agreement among informants within specified use categories(Albuquerque et al., 2006). These indices can support comparisons among species and use categories, provided that the underlying data, definitions, and calculations are clearly reported. Nevertheless, quantitative indices

should be interpreted within the limits of the information they measure. A high UV indicates greater reported use according to the study's operational definition, rather than direct proof of biological effectiveness or universal cultural importance. Similarly, a high ICF indicates a concentration of use reports among a relatively limited number of species within a category, but does not independently establish the safety, efficacy, or sustainability of the reported practices. The methodological interpretation of ethnobotanical indices therefore requires attention to sampling, the categorization of uses, and the relationship between reported knowledge and the biological properties of the plants being investigated (Leonti, 2022)

Blitar, East Java, Indonesia, provides a local context for investigating plant resources used for food preservation and coloration. A systematic account of these practices can help document the diversity of plants recognized by local informants, the plant parts utilized, and the purposes for which these resources are reportedly used. In particular, considering natural preservatives, food colorants, and textile dyes or ecoprint materials together enables the study to examine several practical use categories within one ethnobotanical inventory. This integrated perspective is relevant because previous studies have often focused on particular applications, such as traditional textile dyes, medicinal plants, or food plants, whereas the present study brings together three categories of plant utilization. The contribution of the study is therefore framed around the integrated documentation and quantitative description of these reported uses in the study area, rather than the assumption that the plants have already been experimentally validated for preservation, coloration, or environmental performance (Weckerle et al., 2018) .

Accordingly, this study aimed to document plant species reportedly used as natural preservatives, food colorants, and textile dyes or ecoprint materials in Blitar, Indonesia; describe their reported applications and plant parts utilized; and summarize phytochemical compounds associated with the recorded species based on published literature. The study also applied the Use Value (UV) to describe the relative

importance of reported plant species and the Informant Consensus Factor (ICF) (Albuquerque et al., 2006) to examine agreement among informants across the identified use categories. By combining species documentation, reported uses, literature-based phytochemical information, and quantitative ethnobotanical indices, this study provides a baseline for understanding local plant utilization and identifying species and practices that may warrant further investigation. The findings may inform subsequent research on biological activity, food safety, color performance, and sustainable resource use, while recognizing that these applications require additional evaluation beyond ethnobotanical documentation.

2. METODE PENELITIAN

2.1. Study Area and Research Design

This study employed a descriptive ethnobotanical approach to document plant species used as natural preservatives, food colorants, and textile dyes or ecoprint materials in Blitar, East Java, Indonesia. The study focused on local knowledge concerning plant identity, plant parts utilized, and reported applications in food preservation and coloration. The study locations included Sananwetan and Kademangan, as represented in the collected ethnobotanical records. The documented uses were organized according to these categories to describe the diversity of plant species and their reported applicants in each category.

Ethnobotanical documentation was combined with quantitative analysis to describe the relative importance of reported plant species and the degree of agreement among informants regarding different use categories. Quantitative ethnobotanical indices provide a systematic means of examining reported plant uses, although their interpretation depends on the study design, sampling procedures, and operational definitions applied (Albuquerque et al., 2006).

2.2. Informants and Data Collection

The study involved 30 informants from Sananwetan and Kademangan, Blitar, East Java, Indonesia. Informants were selected using purposive sampling based on their

knowledge of or experience with plants used for natural food preservation, food coloration, or textile dyeing and ecoprint. Data were collected from March to June 2026 through semi-structured interviews conducted in Indonesian and Javanese, depending on the language preferred by the informants.

The interviews focused on plant species used for the identified applications, local plant names, plant parts utilized, and reported methods of application. The information obtained was organized according to three principal use categories: natural food preservatives, natural food colorants, and natural textile dyes or ecoprint materials. Local plant names were recorded based on informants' responses, while scientific names were assigned based on plant identification and consultation of botanical literature. The collected information was subsequently organized for descriptive and quantitative ethnobotanical analyses (Tongco, 2007).

2.3. Plant Identification and Phytochemical Information

The recorded plant species were organized using their local names, scientific names, botanical families, plant parts utilized, and reported applications. Scientific names and family assignments should be checked against an authoritative botanical database to maintain taxonomic consistency.

Information on phytochemical compounds associated with the recorded species was compiled from relevant scientific publications. The literature review focused on compounds reported in the plant species and their potential relevance to preservation or coloration. This information was used to contextualize the reported ethnobotanical applications rather than as direct experimental evidence of the effectiveness of the plants recorded in this study. No claim of laboratory-based phytochemical analysis should be made unless such analyses were actually conducted.

2.4. Quantitative Ethnobotanical Analysis

2.4.1. Use Value (UV)

The Use Value (UV) was applied to describe the relative importance of each plant species based on the number of informants reporting its use. In this study, UV was

calculated by dividing the number of informants who reported a particular species by the total number of informants. The formula was expressed as:

$$UV_i = \frac{\sum U_i}{N}$$

where (UV_i) represents the Use Value of plant species (i), (U_i) is the number of informants who reported the use of species (i), and (N) is the total number of informants interviewed. In this study, (N) was 30. A higher value indicates that a greater proportion of informants reported the use of a particular species within the study sample. This index reflects the frequency of informant reporting and should not be interpreted as direct evidence of biological effectiveness, safety, or ecological sustainability.

2.4.2. Informant Consensus Factor (ICF)

The Informant Consensus Factor (ICF) was used to describe the degree of agreement among informants within each plant-use category. The calculation followed the formula:

$$ICF = \frac{N_{ur} - N_t}{N_{ur} - 1}$$

where (N_{ur}represents the total number of use reports recorded for a particular use category, and (N_t) represents the number of plant species reported in that category. ICF values range from zero to one when the number of use reports exceeds one. Higher values indicate that reports within a category are concentrated among fewer species, reflecting greater agreement in the pattern of reported plant use. In this study, ICF was calculated separately for natural preservatives, natural food colorants, and natural textile dyes or ecoprint materials. The resulting values were interpreted in the context of the study sample and the definitions used to classify plant-use reports.

The UV and ICF results were presented descriptively using tables and narrative interpretation. The analysis was intended to identify patterns in reported plant use and informant agreement, not to establish the experimentally verified effectiveness of the recorded plants as preservatives or colorants.

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3. RESULTS AND DISCUSSION

3.1 Diversity of Plant Species and Ethnobotanical Uses

The ethnobotanical inventory documented 15 plant species used as natural preservatives, food colorants, and textile dyes or ecoprint materials in the study area (Table 1). The documented species represented 15 taxa from different botanical families, with plant parts and reported applications varying according to their intended use. Five species were reported for food preservation: *Syzygium aromaticum, Allium sativum, Piper betle* L., *Morinda citrifolia,* and *Garcinia mangostana*. Five species were associated with food coloration or other coloring applications: *Gomphrena globosa, Pandanus amaryllifolius*, *Clitoria ternatea*, *Ipomoea batatas*, and *Capsicum annuum.* Another five species—*Swietenia mahagoni, Rhizophora apiculata, Terminalia catappa, Mangifera indica,* and *Artocarpus heterophyllus*—were reported for textile dyeing and ecoprint. This classification provides an overview of the diversity of plant resources used for food-related purposes and natural coloration in the study area.

Ethnobotanical inventories are important for documenting local knowledge and identifying plant resources that may contribute to conservation and sustainable development (Pei et al., 2020) . In the present study, the recorded uses demonstrate that local ethnobotanical knowledge encompasses several practical applications of plants, ranging from food preservation to food and textile coloration. However, the inventory represents reported practices rather than experimental evidence of the effectiveness of the plants or their preparations. The findings therefore provide a baseline for further investigations into the applications, chemical properties, and potential sustainability of these plant resources.

Table 1 Plant Species Used as Natural Preservatives and Colorants in Blitar, Indonesia

No.	Local Name	Scientific Name	Family	Location	Plant Part Used	Ethnobotanical Use
1	Cengkeh	*Syzygium aromaticum*	Myrtaceae	Sananwetan	Flower	Natural preservative for meat, fish, and fruit

No.	Local Name	Scientific Name	Family	Location	Plant Part Used	Ethnobotanical Use
2	Bawang putih	*Allium sativum*	Amaryllidaceae	Sananwetan	Bulb	Natural preservative for meat, fish, and fermented foods
3	Daun sirih	*Piper betle* L.	Piperaceae	Sananwetan	Leaf	Natural preservative for fish, meat, and vegetables
4	Daun mengkudu	*Morinda citrifolia*	Rubiaceae	Sananwetan	Leaf	Natural preservative for fish and meat
5	Manggis	*Garcinia mangostana*	Clusiaceae	Sananwetan	Fruit rind	Natural preservative for fish, meat, tofu, and tempeh
6	Mahoni	*Swietenia mahagoni*	Meliaceae	Kademangan	Stem bark	Natural textile dye and ecoprint
7	Bakau	*Rhizophora apiculata*	Rhizophoraceae	Kademangan	Stem bark and leaves	Natural textile dye and ecoprint
8	Ketapang laut	*Terminalia catappa*	Combretaceae	Kademangan	Leaf	Natural textile dye and ecoprint
9	Gumintir/telek-telekan	*Gomphrena globosa*	Amaranthaceae	Kademangan	Flower	Natural colorant for crafts and food
10	Mangga	*Mangifera indica*	Anacardiaceae	Kademangan	Leaf	Natural textile dye and ecoprint
11	Nangka	*Artocarpus heterophyllus*	Moraceae	Kademangan	Stem bark	Natural textile dye and ecoprint
12	Pandan	*Pandanus amaryllifolius*	Pandanaceae	Sananwetan	Leaf	Natural colorant for cakes and beverages
13	Telang	*Clitoria ternatea*	Fabaceae	Sananwetan	Flower	Natural colorant for food and beverages
14	Ubi ungu	*Ipomoea batatas*	Convolvulaceae	Sananwetan	Tuber	Natural food colorant
15	Cabai merah	*Capsicum annuum*	Solanaceae	Sananwetan	Fruit	Natural food colorant

Five species were reported for natural food preservation: *Syzygium aromaticum*, *Allium sativum*, *Piper betle*, *Morinda citrifolia*, and *Garcinia mangostana*. These findings are consistent with broader research interest in plant-derived compounds as potential sources of natural food preservatives. Plant extracts and essential oils have been investigated for their antimicrobial properties, although their effectiveness depends on factors such as chemical composition, concentration, food matrix, and application conditions (Tajkarimi et al., 2010). Such literature provides a scientific context for the preservation practices documented in this study.

3.2 Plant Parts Used and Phytochemical Relevance

The distribution of plant parts used in the documented practices provides an

overview of the plant materials selected for natural preservation and coloration (Table 2). Leaves represented the largest category in the initial inventory, accounting for five species (33.3%), followed by flowers, with three species (20.0%). Stem bark and fruits each accounted for two species (13.3%), while fruit rind, bulbs, and tubers each represented one species (6.7%). These findings indicate that different plant organs were utilized for the reported applications. However, the distribution describes the number of species assigned to each plant-part category rather than the frequency of use among informants.

Table 2 Distribution of Plant Parts Used for Natural Preservation and Coloration

No.	Plant Part Used	Number of Species	Percentage (%)
1	Leaves	5	33.3
2	Flowers	3	20.0
3	Stem bark	2	13.3
4	Fruits	2	13.3
5	Fruit rind	1	6.7
6	Bulb	1	6.7
7	Tuber	1	6.7
Total		15	100.0

Leaves were among the plant parts reported for food preservation and coloration. In the inventory, leaves of *Piper betle* and *Morinda citrifolia* were associated with food preservation, whereas leaves of *Terminalia catappa*, *Mangifera indica*, and *Pandanus amaryllifolius* were associated with coloration. Leaves contain diverse secondary metabolites, including phenolic compounds, flavonoids, and tannins, although their composition and concentration vary among species and depend on environmental and physiological conditions (Qaderi et al., 2023; Yang et al., 2018) . Some plant-derived phenolic compounds have been investigated for antioxidant and antimicrobial properties, while leaf pigments such as chlorophyll contribute to green coloration (Ahmadi et al., 2024; Novais et al., 2022). These findings from previous research provide a scientific context for the documented uses of leaves; nevertheless, the present study did not measure the phytochemical composition or biological activity of the collected plant materials.

Flowers were also represented in the inventory, including *Syzygium aromaticum*, *Gomphrena globosa*, and *Clitoria ternatea*. These species were associated with different applications, ranging from food preservation to coloration. Clove flower buds contain eugenol, a phenolic compound that has been investigated for its antimicrobial properties (Cortés-Rojas et al., 2014) . In contrast, the blue flowers of *Clitoria ternatea* are known for their anthocyanin-derived pigments, particularly ternatins, which contribute to their characteristic coloration (Jeyaraj et al., 2022; Vidana Gamage et al., 2021). The flowers of *Gomphrena globosa* have also been investigated as sources of natural pigments. These examples illustrate that different plant organs may provide compounds with different functional properties, depending on the species and intended application. However, the presence and concentration of specific compounds in the materials used by the informants were not determined in this study.

Stem bark and fruit rind were reported in connection with natural coloration and food preservation, respectively. The bark of *Swietenia mahagoni*, *Rhizophora apiculata*, and *Artocarpus heterophyllus* was associated with textile dyeing or ecoprint, while the rind of *Garcinia mangostana* was reported for food preservation. Plant bark can contain phenolic compounds, including tannins and other polyphenols, that have been investigated for their potential applications in natural coloration and textile finishing (Vashist et al., 2021). Specifically, the bark of *Swietenia mahagoni* has been reported to contain tannins and flavonoids and has been investigated for textile dyeing (Lestari et al., 2020) , while *Rhizophora apiculata* bark extract has been studied as a natural textile dye (Punrattanasin et al., 2013) . The composition and concentration of these compounds may vary among plant species. The recorded uses therefore identify plant materials that warrant further investigation, but they do not independently demonstrate dyeing performance, antimicrobial effectiveness, or food-preservation efficacy.

Other plant parts in the inventory included the bulb of *Allium sativum*, the tuberous root of *Ipomoea batatas*, and the fruit of *Capsicum annuum*. Garlic contains

organosulfur compounds, including allicin formed when its tissues are disrupted, which have been investigated for antimicrobial activity. Purple sweet potato is a source of anthocyanin pigments, whereas red chili contains carotenoid pigments, including capsanthin and capsorubin, that contribute to its red color. These examples demonstrate the diversity of plant-derived compounds relevant to the reported applications. Research on natural preservatives and plant pigments has emphasized that their performance depends on chemical composition, extraction procedures, processing conditions, and stability in the intended application (Novais et al., 2022; Rodríguez-Mena et al., 2023).

3.3 Use Value (UV) of Plant Species

The Use Value (UV) analysis showed variation in the proportion of informants reporting the use of the 15 documented plant species (Table 3). The highest values were recorded for *Allium sativum* and *Pandanus amaryllifolius*, both with a UV of 0.70, corresponding to 21 of the 30 informants. These were followed by *Clitoria ternatea*, with a UV of 0.57 (17 informants), and *Terminalia catappa*, with a UV of 0.50 (15 informants). The remaining species had UV values ranging from 0.13 to 0.47. These findings indicate variation in the reporting of plant uses among the informants involved in the study.

Quantitative ethnobotanical indices provide a systematic approach to organizing and comparing information about plant use. (Albuquerque et al., 2006) examined the application of quantitative ethnobotanical techniques to assess the relative importance of plant species, while Hoffman and Gallaher (2007) discussed the different approaches used to quantify plant importance and emphasized that the interpretation of an index depends on its formulation . In Indonesia, Sofiyana et al. (2025) applied Use Value (UV) and Informant Consensus Factor (ICF) to document medicinal and cosmetic plants in Blitar (Sofiyana et al., 2025). Their study demonstrates the applicability of quantitative ethnobotanical approaches to documenting local plant-use knowledge. Although the plant-use categories and study locations differ, both studies contribute to

the documentation of ethnobotanical knowledge in the Blitar region.

Table 3 Use Value (UV) of Plant Species Used as Natural Preservatives and Colorants (N=30)

No.	Local Name	Scientific Name	Number of Informants Reporting Use	Use Value (UV)
1	Cengkeh	*Syzygium aromaticum*	13	0.43
2	Bawang putih	*Allium sativum*	21	0.70
3	Daun sirih	*Piper betle*	14	0.47
4	Daun mengkudu	*Morinda citrifolia*	13	0.43
5	Manggis	*Garcinia mangostana*	5	0.17
6	Mahoni	*Swietenia mahagoni*	12	0.40
7	Bakau	*Rhizophora apiculata*	4	0.13
8	Ketapang laut	*Terminalia catappa*	15	0.50
9	Gumintir/telek-telekan	*Gomphrena globosa*	7	0.23
10	Mangga	*Mangifera indica*	13	0.43
11	Nangka	*Artocarpus heterophyllus*	9	0.30
12	Pandan	*Pandanus amaryllifolius*	21	0.70
13	Telang	*Clitoria ternatea*	17	0.57
14	Ubi ungu	*Ipomoea batatas*	14	0.47
15	Cabai merah	*Capsicum annuum*	12	0.40

Among the species documented in the present study, *Allium sativum* and *Pandanus amaryllifolius* had the highest reporting values. The high value for *Allium sativum* indicates that its use in natural food preservation was reported by a relatively large proportion of informants. Garlic contains organosulfur compounds, including allicin, that have been investigated for antimicrobial properties. Meanwhile, the high value for *Pandanus amaryllifolius* reflects the frequent reporting of its use as a natural colorant. Pandan leaves are associated with green coloration in food preparations. These findings identify both species as relevant subjects for further investigation into local preservation and coloration practices. Nevertheless, their UV values reflect informant reporting and do not demonstrate the effectiveness, safety, or stability of the preparations used.

Clitoria ternatea had a UV of 0.57, with 17 informants reporting its use, while *Terminalia catappa* had a UV of 0.50, with 15 informants reporting its use. The flowers

of *Clitoria ternatea* are known for their blue pigments, particularly anthocyanin-derived compounds, whereas *Terminalia catappa* was reported for textile dyeing and ecoprint. The relatively high reporting values of these species suggest that their locally documented applications merit further study. However, the UV values do not establish why informants reported these species or whether their applications perform better than those of other plants.

In contrast, *Rhizophora apiculata* had the lowest UV (0.13), with four informants reporting its use, followed by *Garcinia mangostana* (0.17), reported by five informants. These values indicate that fewer informants in the study sample reported the respective uses of these species. A lower UV should not automatically be interpreted as evidence of low cultural importance, limited usefulness, or reduced biological activity. Reporting patterns may be influenced by the distribution of knowledge among informants, the specificity of a particular application, or the scope of data collection. These possible explanations require further investigation and cannot be established from UV values alone.

Overall, the UV analysis provides a comparative overview of the proportion of informants who reported each plant species for natural preservation or coloration. *Allium sativum* and *Pandanus amaryllifolius* had the highest values, whereas *Rhizophora apiculata* and *Garcinia mangostana* had the lowest. In line with previous work on quantitative ethnobotanical methods (Albuquerque et al., 2006)and their application in local plant-use documentation in Blitar (Sofiyana et al., 2025), the findings illustrate how numerical indices can summarize ethnobotanical records. However, the values in this study should be interpreted according to the operational formula used: they represent the proportion of informants reporting each species rather than a direct measure of biological effectiveness, sustainability, or overall cultural importance.

3.4. Informant Consensus Factor and Implications for Sustainable Plant Use

The Informant Consensus Factor (ICF) was used to assess the degree of agreement

among informants regarding the use of plant species in three categories: natural preservatives, natural food colorants, and natural textile dyes/ecoprint. As presented in Table 4, the ICF values ranged from 0.92 to 0.94, indicating a high concentration of use reports among the five plant species documented in each category. Natural preservatives and natural food colorants both recorded the highest ICF value of 0.94, with 66 and 71 use reports, respectively. These results indicate that the reported uses of plants in these two categories were concentrated among a relatively limited number of documented species. In the natural preservation category, the recorded plants included *Syzygium aromaticum*, *Allium sativum*, *Piper betle*, *Morinda citrifolia*, and *Garcinia mangostana*. Meanwhile, the natural food colorant category included *Gomphrena globosa*, *Pandanus amaryllifolius*, *Clitoria ternatea*, *Ipomoea batatas*, and *Capsicum annuum*. The high ICF value suggests that these plants represent important components of the documented ethnobotanical knowledge concerning natural preservation and food coloration in the study area.

The natural textile dyes/ecoprint category had an ICF value of 0.92, based on 53 use reports involving five plant species: *Swietenia mahagoni*, *Rhizophora apiculata*, *Terminalia catappa*, *Mangifera indica*, and *Artocarpus heterophyllus*. Although this value was slightly lower than those of the other two categories, it still indicates a high concentration of use reports among the documented species. The finding highlights the potential of locally known plants as sources of natural dyes for textile coloration and ecoprint practices. However, the ICF value alone does not establish the intensity of use, the effectiveness of the resulting dyes, or the economic feasibility of applying these plants in textile production.

Table 4 Informant Consensus Factor (ICF) for Plant Use Categories

No.	Use Category	Number of Use Reports	Number of Species	ICF
1	Natural preservatives	66	5	0.94
2	Natural food colorants	71	5	0.94
3	Natural textile dyes/ecoprint	53	5	0.92

In quantitative ethnobotanical research, a high ICF value generally indicates that use reports within a particular category are concentrated among a relatively small

number of species (Heinrich et al., 2009). Nevertheless, the interpretation of ICF depends on the definition of use reports and the categorization of uses employed in a study. Therefore, the values obtained here should be understood as indicators of the concentration of reported plant uses within the three categories, rather than direct measurements of the effectiveness or safety of the plants.

These findings also provide a basis for considering the relationship between ethnobotanical knowledge and sustainable resource use. Knowledge of plants used for food preservation, natural coloration, and ecoprint may support the exploration of locally available biological resources for household practices, educational activities, and potential small-scale product development. Ethnobotanical documentation can contribute to biodiversity awareness and conservation by recording traditional plant knowledge and identifying species that may warrant further investigation (Pei et al., 2020). In the context of Blitar, this approach is also relevant to previous ethnobotanical research conducted by (Sofiyana et al., 2025) , which applied quantitative indices to document plant-use knowledge in the region.

The use of plant-derived materials does not necessarily guarantee sustainability, as ecological impacts depend on harvesting practices, plant-part selection, regeneration capacity, and resource availability (Schmidt et al., 2011). In particular, repeated or extensive bark removal can damage trees and reduce their capacity to recover, highlighting the need for species-specific harvesting practices (Delvaux et al., 2009). These considerations are relevant to the plant species documented for natural coloration and ecoprint, although the present study did not assess their population status or harvesting impacts. Furthermore, this study documents reported plant uses and summarizes phytochemical information from published literature; it does not experimentally evaluate preservation efficacy, pigment stability, dye fastness, toxicity, or environmental impacts. Further research should therefore assess application performance and safety alongside plant availability, harvesting practices, and regeneration capacity to determine whether these traditional uses can be developed into

effective and environmentally responsible applications.

4. CONCLUSION

4.1. Conclusion

This study documented 15 plant species used by local communities in Sananwetan and Kademangan, Blitar, Indonesia, for three purposes: natural food preservation, food coloration, and textile dyeing/ecoprint. The Use Value (UV) analysis showed that *Allium sativum* and *Pandanus amaryllifolius* had the highest values (0.70), followed by *Clitoria ternatea* (0.57) and *Terminalia catappa* (0.50). These values indicate that these species were reported by a relatively large proportion of the informants. The Informant Consensus Factor (ICF) ranged from 0.92 to 0.94, with natural preservatives and food colorants recording the highest values (0.94), followed by textile dyes/ecoprint (0.92). These findings indicate that reported plant uses were concentrated among a limited number of species within each use category. Overall, this study provides a quantitative record of local ethnobotanical knowledge and identifies plant species that warrant further investigation for their potential applications in food preservation and natural coloration. The findings also provide baseline information for exploring the relationship between local plant use and sustainable resource management. However, the results reflect reported ethnobotanical practices and phytochemical information obtained from published literature; they do not establish the experimental effectiveness, safety, or environmental sustainability of the documented applications.

4.2. Suggestions

Further research should evaluate the effectiveness and safety of the documented plants through laboratory testing of antimicrobial activity, preservation performance, pigment stability, and textile color fastness, where applicable. Sustainability assessments should also examine plant availability, harvesting practices, and regeneration capacity, particularly for species harvested for their bark. Collaboration

with local communities is recommended to document traditional preparation methods and promote the responsible use of plant resources. These efforts will help establish a scientific basis for safe, effective, and sustainable applications.

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