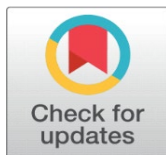
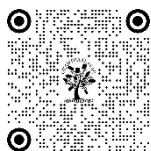


HISTORY OF NATURAL TEXTILE DYES IN TRADITIONAL WEAVING IN KERALA

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ABSTRACT

This essay explores the historical evolution and cultural significance of organic dyes used in typical weaving techniques in Kerala, a region renowned for its rich history and artisanal craftsmanship. By examining their sources, uses, and socioeconomic impacts, the study highlights the crucial role that organic dyes play in describing the identity of its weaving traditions. This paper examines the importance of textile dyes, how they were used in local agrarian economies, and how they were incorporated into cultural practices. It also examines how the artisanal ecosystem was disrupted by industrialization, which caused a decrease in natural dyeing methods and the subsequent emergence of synthetic alternatives.

This study emphasizes the relationship between heritage and monetary history while highlighting the complex relationship between natural resources, skill, and cultural identity through the use of an ethnographic approach. Additionally discussed are contemporary efforts to bring back traditional dyeing techniques and their potential benefits for ethical fashion and cultural preservation. By combining historical knowledge with current perspectives, the paper aims to contribute to the greater discussion on protecting material cultural assets while highlighting the ongoing significance of traditions in the present.

Keywords: Natural Textile Dyes, Traditional Weaving

1. INTRODUCTION

Natural dyes have long been used in the creation of handloom fabrics, serving as both decorative accents and markers of regional pride and one's culture (Debnath, 2021). These dyes, which were made from minerals, chemicals, and plant based sources like madder, turmeric, and indigo, demonstrated the close ties that local communities have with their natural surroundings (Chatterjee, 2022; Nedumpillil et al., 2022). Kerala's traditional weavers, particularly those from areas as Balaramapuram, Chendamangalam, or Kuthampully, were skilled in dyeing techniques that gave their textiles more color and durability, transforming them into cultural artifacts.

Beyond their aesthetic value, natural dyes had cultural significance because the colors they produced frequently had cultural significance and were essential to social and religious rituals (Jose et al., 2022; Nair & MV, 2024). In Kerala's multi cultural context, for example, particular colors were linked to social classes or auspicious events, acting as identity markers (Grace Annapoorani, 2021). Furthermore, during the era prior to industrial these dyes were essential to trade both inside and outside the region, connecting Kerala's twirling areas to international textile sectors (Alegbe & Uthman, 2024). The use of plant dyes gradually decreased, though, as a result of the disruption caused by production and the launch of synthetic dyes in the 19th century (Surjit et al., 2024).

To achieve this, the paper is divided into five interconnected sections. The first section explores the origins and evolution of Kerala's natural hues methods by following their development over key historical periods. The second

section examines the societal metaphor and meaning of organic dyes, with a focus on their use in events, traditions, and social classes. The economic impacts of natural dyes are examined in the third section, with a focus on how they sustain local trade networks and means of subsistence. The fourth section looks at the challenges posed by production and the rise of synthetic dyes, which caused traditional methods to lose favor. The final section discusses recent efforts to revive natural dyeing traditions and their significance for promoting sustainable practices in the modern textile industry.

2. HISTORICAL OVERVIEW OF NATURAL TEXTILE DYES

2.1. GLOBAL ORIGINS AND EVOLUTION OF NATURAL TEXTILE DYES

Natural pigments have been utilized for color materials for both functional and decorative purposes since ancient times. Archeological evidence suggests that dyeing techniques were widely used as early as 2600 BCE in ancient egypt, and the Indus valley cultures. Egyptian mummies have revealed the use of indigo, one of the most well known natural dyes, in both rites and practical contexts. Similarly, insane and its cochineal in dyes were used extensively to produce vibrant reds in Americas, Europe, and Persia. These dyes, which were often made from plants, stones, and insects, were highly valued commodities that were traded extensively along ancient trade routes like the silk road.



Figure 1 Fabric Bits and Dye Pots Discovered at Archaeological Sites Demonstrate Kerala's Long History in Organic Dyeing

(This artwork was drawn by an artist, inspired by an image available on the following source: Kerala Made - AyurTex. The original image served as a reference for visually representing the archaeological and cultural significance of natural dyeing practices in Kerala.)

Figure 1 provides extensive archaeological evidence of Kerala's frequently natural dyeing practices. The uncovered artifacts, which include pieces of simply dyed cloth and dye pots, demonstrate the advanced talent and inventiveness of Kerala's artisanal communities. These findings demonstrate the historical significance of natural dyes that were engrained in the local market and culture, such as indigo and turmeric. The artifacts further illustrate Kerala's role in the initial trade groups, where these vibrant textiles were valued for their quality and aesthetic appeal. By linking tangible evidence to historical narratives, this visual representation bridges the gap between the past and present and also emphasizes the longevity and depth of Kerala's dyeing traditions.

Natural dyes were unique within their regions due to being specific to local flora and minerals, which helped to create the distinctive identities of textile traditions around the world. As a symbol of money, power, and ethnicity, natural dyes have been an essential part of economic structures for centuries.

Table 1 Global Use of Natural Textile Dyes Across Civilizations

Civilization	Key Dyes	Sources	Applications	Significance
Indus Valley	Indigo, Madder	Indigofera tinctoria, Madder root	Textile dyeing, ritual garments	Evidence from archaeological sites shows early use of indigo for its vibrant color and durability.

Egypt	Indigo, Saffron	Indigo plants, Crocus sativus	Mummification, royal textiles	Indigo used in mummies, saffron for its luxurious golden hue in high-status garments.
Persia	Cochineal, Madder	Insects, Madder root	Royal clothing, trade goods	Renowned for intricate, red-dyed textiles traded along the Silk Road.
Europe	Woad, Madder	Woad plant, Madder root	Tapestries, royal robes	Woad competed with indigo; madder extensively used for producing red textiles in medieval Europe.
Americas	Cochineal	Dactylopius coccus insect	Exported to Europe, ceremonial use	Cochineal provided brilliant red shades; highly valued during Spanish colonization.

Table 1 illustrates the evolution of natural textile dyes throughout major civilizations and their historical significance. Archaeological findings demonstrate that the cultures of the Indus Valley used indigo and madder, which were derived from indigenous plants, to create colorful textiles and ceremonial clothing. Indigo and saffron, which represent luxury and spirituality, were essential components of mummification and royal clothing in ancient Egypt. Using cochineal and worse, which were widely dealt with along the Silk Road, Persia was a master at producing red dyed textiles. Madder was widely used to create long lasting red hues for tapestries and robes, while wood dyed textiles were used to represent nobility in the era of medieval Europe.



Figure 2 Natural Dyeing Materials of Kerala, showcasing the Indigenous Plants and Resources used for Vibrant Textile Dyeing.

(This illustration was drawn by an artist and is inspired by an image available on the India InCH website. The original image provided the contextual reference for visually representing the traditional vegetable dyeing practices in Kerala. (Source of inspiration: India InCH)).

Figure 2 showcases the raw materials traditionally used in Kerala's natural textile dyeing practices. It has pineapple wood, insane roots, turmeric roots, and indigo leaves all carefully arranged in baskets of yarn on a rustic lumber surface. Kerala's rich dyeing tradition, which emphasizes environmentally friendly techniques that have been passed out through the generations, is based on these organic resources. The exchange of dyeing materials along with understanding was made easier by Kerala's coastlines location and participation in historic maritime trade networks, including those with Rome, the Islamic world, and the Philippines.

Kerala was known for its vibrantly colored textiles, which were frequently used as ceremonial attire and trade goods, according to historical accounts like those found in the Sangam literature. By using natural dyes in their weaving processes, the state's traditional handloom clusters Balaramapuram, Chendamangalam, and Kuthampully produced textiles that were both aesthetically pleasing and long-lasting.



Figure 3 Traditional Indigo Dyeing Process in Kerala, showcasing the use of *Indigofera Tinctoria* for Vibrant Blue Hues in Handloom Textiles

(The recent artistry of Kerala's traditional indigo dyeing method is depicted in Figure 3. In huge clay vats, artisans are depicted partnering with dyed leaves to extract the distinctive deep blue dye. A scene of tropical foliage, woven looms, and rustic tools accentuate the cultural and simple essence of this age old custom. A touch of nostalgia is added by the sepia tone, which captures Kerala's long history of using able dyeing methods.

Table 2 Historical Timeline of Natural Dyeing Practices in Kerala

Period	Event/Development	Region/Source	Significance
Sangam Era (300 BCE - 300 CE)	Use of indigo, turmeric, and jackfruit wood in textiles for trade with Roman Empire	Balaramapuram, Kollam	Highlighted Kerala's maritime trade connections and artisanal expertise.
Medieval Period (10th - 16th Century)	Integration of natural dyes into temple offerings and royal attire	Chendamangalam, Kuthampully	Established natural dyes as a cultural and religious symbol.
Colonial Era (18th - 19th Century)	Decline of natural dyes due to British colonial policies favoring synthetic dyes	Across Kerala	Impacted traditional artisanal practices and local economies.
20th Century	Revival efforts initiated through artisan cooperatives and state programs	Government-led regions	Focus on cultural preservation and sustainable practices.
Contemporary Period	Renewed interest in natural dyes due to sustainable fashion movements	State-wide	Natural dyes are positioned as eco-friendly and culturally significant alternatives.

Table 2 charts the development of Kerala's natural dyeing customs, highlighting their importance on a social, economic, and environmental level. During the Sangam Era (300 BC–300 CE), Kerala's links to the oceanic trade and cultural abilities in places as Balaramapuram or Kollam were highlighted by the use of organic shades like purple, the spice turmeric, or pineapple wood in the creation of products for trade with Rome. During the Age of Medieval (10th–16th Century), these dyes solidified their status as religious and cultural icons. They were widely used in royal garments and temple gifts, particularly at Chendamangalam and Kuthampully. During the Colonial period (18th–19th Century), natural dyeing experienced a dramatic decline due to British colonial policies of the fact chose synthetic possibilities, upending tax and having an impact on communities throughout Kerala.

2.2. ROLE OF INDIGENOUS KNOWLEDGE AND LOCAL RESOURCES

Kerala’s natural dye production and application relied heavily on traditional knowledge passed down via the generations of artisans. These communities employed sustainable practices, such as reusing dye baths and using natural mordants, to cut down on waste. Dye preparation was often a laborious process involving careful extraction,

fermentation, and blending to achieve the desired colors and fastness. For instance, indigo dye was made by fermenting foliage of orchid tinctoria, which then oxidized to produce the dye's characteristic deep blue color. Similar to this, turmeric was transformed into a bright yellow paint that was commonly applied to traditional attire. Additionally, local artisans showed off their scientific ingenuity by determining how to mix dyes to change their colors.

3. CULTURAL SIGNIFICANCE OF NATURAL DYES IN KERALA'S WEAVING TRADITIONS

Organic colors have long had significant cultural value and served as more than just ornamental accents in Kerala's traditional weaving techniques. The lively hues that came from nature reflected the social, religious, and cultural aspects of the area. Deeply embedded in Kerala culture, these dyes played an essential role in the state's festivals, traditions, and routine tasks.



Figure 4 Kerala's Typical Weaving, Emphasizing the use of Artisanal Methods and Natural Dyes in the Creation of Handloom Textiles

(This illustration was created by an artist based on inspiration drawn from an image published on the JD Institute of Fashion Technology's website. The original source image served as a reference for the artistic depiction of traditional weaving practices in Kerala. (Source: JD Institute of Fashion Technology)).

Figure 4 shows the traditional weavers of Kerala, particularly those from places like Balaramapuram and Chendamangalam. It features skilled artisans working hard on wooden handlooms to create colorful textiles and elaborate designs. The scene reflects the rich heritage and artistic heritage of Kerala's twisting industry while highlighting the dedication and artistry needed to uphold this timeless tradition.

3.1. SYMBOLIC MEANINGS OF NATURAL DYES

Colors were selected for their cultural and spiritual meanings in addition to their aesthetic value.

- **Saffron and Yellow (Turmeric):** Associated with purity, auspiciousness, and religious significance, yellow was often used in ceremonial and temple garments.
- **Indigo Blue:** *Indigofera tinctoria*'s deep blue color was symbolic of serenity, devotion, and spirituality. Indigo-dyed textiles, which demonstrated intellectual interests and spiritual depth, were widely used by the scientific class and in pious clothing.
- **Red (Madder and Jackfruit Wood):** The vibrant reds produced from madder roots and jackfruit wood were symbolic of vitality, power, and prosperity. Red-dyed fabrics were integral to bridal attire and other significant life events, signifying joy and festivity.

- **White (Unbleached Cotton):** While not a dyed color, the natural off-white of unbleached cotton symbolized simplicity, purity, and mourning. It was often used in Kerala's traditional kasavu sarees, paired with golden borders to denote elegance and status.



Figure 5 Range of Handloom Products in Kerala, Showcasing the Diversity of Textiles Produced Using Traditional Techniques and Natural Dyes

(This artwork was created by an artist, drawing inspiration from an image available on the India InCH website. The original source provided a reference for visually representing the traditional practices of natural vegetable dyeing in Kerala. (Source of inspiration: India InCH).)

Figure 5 showcases a close-up view of vibrant kasavu sarees and other naturally dyed textiles, exemplifying the rich aesthetic and cultural heritage of Kerala's traditional fabric. The intricate weaving patterns, complemented by the natural hues derived from indigo, turmeric, and jackfruit wood, highlight the region's deep artisanal expertise and connection to its natural environment. These textiles, with their vivid colors and fine craftsmanship, serve as cultural symbols in rituals, festivals, and social events, reflecting the societal values and identity of Kerala.

Table 3 Symbolic Meanings of Natural Dye Colors in Kerala

Color	Source	Symbolic Meaning	Context
Yellow	Turmeric (<i>Curcuma longa</i>)	Purity, auspiciousness, and sanctity	Used in temple rituals, wedding garments, and festive attire.
Blue	Indigo (<i>Indigofera tinctoria</i>)	Spirituality, calmness, and intellect	Associated with scholarly attire and worn during religious gatherings.
Red	Madder (<i>Rubia cordifolia</i>) and Jackfruit wood (<i>Artocarpus heterophyllus</i>)	Vitality, prosperity, and fertility	Predominantly used in bridal wear, festivals, and ceremonial offerings.
White	Unbleached cotton	Simplicity, purity, and mourning	Common in kasavu sarees for daily use, funerals, and rituals.
Green	Leaves of various plants (e.g., neem)	Growth, renewal, and harmony	Occasionally used in festival decorations and traditional garments.
Black	Iron-rich water and coconut husk ash	Power, protection, and resistance	Rarely used in textiles, but significant in ritualistic objects.

Kerala's natural dye colors ethnic and symbolic meanings are displayed in Table 3. It emphasizes how colors like red and yellow, which represented life and good fortune, were crucial to celebrations and ceremonies, while blue was associated with wisdom and religion. In sacred and funeral contexts, white, frequently produced from unbleached cotton, represented purity. Green, though less frequently used, stood for growth and renewal, while black was rarely used in protection rituals. This comprehensive table shows the relationship between the region's natural resources and heritage.

3.2. NATURAL DYES IN RITUALS AND FESTIVALS

Natural dyes have an extended record in Kerala culture, as do its festivals and traditions. In addition to becoming purely decorative, the colors produced by natural dyes also had religious connotations. For instance:

- **Temple Offerings and Ritual Garments:** Many temples in Kerala prescribed specific colors for priests' and devotees' attire during festivals.
- **Wedding Attire:** The reds and yellows derived from natural dyes were integral to bridal garments, symbolizing fertility, prosperity, and auspicious beginnings.

Table 4 Natural Dyes in Rituals and Festivals in Kerala

Ritual/Festival	Specific Dye Used	Color Produced	Symbolism	Context/Use
Onam	Turmeric, Jackfruit wood	Yellow, Red	Prosperity, joy, and celebration	Used in kasavu sarees and traditional garments for the harvest festival.
Temple Offerings	Turmeric, Indigo	Yellow, Blue	Sanctity and devotion	Dyes used for garments offered to deities and worn by priests.
Weddings	Madder, Turmeric	Red, Yellow	Fertility, auspicious beginnings	Bridal sarees dyed with vibrant red and yellow hues.
Vishu	Turmeric, Jackfruit wood	Yellow, Red	New beginnings and prosperity	Traditional clothing and decorations for the New Year festival.
Funerals	Unbleached cotton	White	Purity and mourning	Worn during last rites to signify simplicity and respect.
Religious Events	Indigo, Turmeric	Blue, Yellow	Spirituality and sacredness	Textiles dyed for special poojas and festivals dedicated to specific deities.

Table 4 details how organic dyes are used in Kerala's occasions and customs. At festivals like onam and vishu, yellow and red dyes which represent joy, prosperity, and new beginnings were frequently used. As symbols of reverence and theology, turmeric and blue were used in worship and as gifts in temples. At funerals, white stood for mourning and purity, while at marriages, red or yellow felt frequently used to symbolize fertility and good fortune. This table highlights the deep cultural roots and meaning of natural dyes in Keralan customs.

3.3. WEAVING TRADITIONS AND SOCIAL HIERARCHIES

Kerala's navigating customs were strongly linked to the social institutions and tribes of the area. Attaching and dying artisans were common in certain communities, and their skill was handed down with the generations. Kerala's financially and ethnic structure was reflected in the production of natural-colored textiles:

- **Elite Patronage:** Royal families and wealthy merchants often commissioned intricate textiles dyed with natural colors, showcasing their status and power.
- **A caste and Coloring Groups:** Caste affiliations were frequently reflected in the textile and color choices.
- **Gender and Fabric Use:** Another factor that helped differentiate gendered clothing was the use of natural dyes.

4. ECONOMIC ROLE OF TEXTILE DYES IN KERALA'S HISTORY

4.1. CONTRIBUTION OF NATURAL DYES TO KERALA'S ECONOMY

In Kerala's past, natural fiber colors were important economic drivers in addition to being cultural artifacts. The region's traditional attire, which was highly prized both domestically and abroad, was greatly influenced by the vivid colors created by crops, rocks, and other natural objects. Kerala's handloom sector, which is well-known for its durability and exquisite craftsmanship, was able to thrive and produce profitable textiles thanks to the use for natural dyes. The development of similar sectors, such as the production of dye plants like turmeric and indigo, was aided by the use of

natural pigments. The strong demand for inputs benefited farmers and created an advantage scenario for both textile production and agriculture. Combining artisanal labor with agriculture was essential.

Table 5 Contribution of Natural Dyes to Kerala's Economy

Contribution Area	Description	Historical Examples
Agriculture	Cultivation of dye-yielding plants like indigo, turmeric, and jackfruit wood supported rural livelihoods.	Farmers in Kerala cultivated <i>Indigofera tinctoria</i> and <i>Curcuma longa</i> , which were traded in local and international markets.
Trade	Naturally dyed textiles were key commodities in trade, especially via maritime routes.	The Muziris Port (1st Century CE) was a hub for exporting indigo and other dyed textiles to Roman and Middle Eastern markets.
Weaving	Artisanal weaving relied on natural dyes to enhance the value and appeal of textiles.	Balaramapuram sarees and Chendamangalam handlooms were known for their vibrant, naturally dyed fabrics.
Local Markets	Dyed textiles formed an integral part of the local economy, fostering community-based production.	Handloom clusters such as those in Kuthampully played a significant role in distributing dyed textiles within Kerala.
Cultural Festivals	Natural dyes contributed to the creation of ceremonial and ritual garments, generating seasonal demand.	During Onam and Vishu , the demand for kasavu sarees and naturally dyed attire boosted local economies.

The diverse revenues of organic colors to Kerala's legacy are highlighted in Table 5. Natural dyes were used in artisanal weaving to produce high-end textiles, such as Chendamangalam handlooms and Balaramapuram sarees. The profound economic and cultural ties of natural dyes were demonstrated by the way local markets, aided by groupings like Kuthampully, incorporated dyed fabrics into daily life and how cultural celebrations like Onam and Vishu increased seasonal demand.

4.2. ROLE IN LOCAL AND INTERNATIONAL TRADE

Kerala's trade networks, both domestically and internationally, relied heavily on its naturally dyed textiles. The area's closeness to important shipping lanes made it easier to export textiles to far off markets. These textiles, which were frequently embellished with elaborate designs and vibrant colors, were highly prized in markets throughout the world, particularly in Southeast Asia, the Arabian Peninsula, and the Mediterranean.



Figure 6 Historical Depiction of the Muziris Port, Highlighting Kerala's Ancient Maritime Trade Routes That Facilitated the Exchange of Naturally Dyed Textiles with Global Markets

(This illustration was drawn by an artist, inspired by an image published on the Savaari blog. The source image provided contextual reference for recreating the artistic depiction of the historical Muziris port in Kerala. (Source of inspiration: Savaari Blog)).

An artwork of the ancient Muziris civilization port, a key hub for Kerala's maritime trade by sea during the Guardians Era, is presented in Figure 6. It highlights the region's crucial coastal location and its key part in the trading of obviously dyed materials with global markets, such as the Roman Empire, the Persian Gulf, and Southeast Asia. The trade routes shown in the diagram demonstrate how Kerala's craft products, especially indigo and turmeric-dyed fabrics, were sought after for their high quality and artistic merit. The background story highlights the connection between Kerala's natural

dyeing traditions and its thriving economy and global impact, highlighting the importance of older trade in preserving and spreading the region's cloth heritage.

4.3. ARTISANAL COMMUNITY AND LIVELIHOODS

Kerala's artisan communities relied heavily on the twirling and dyeing industries to support themselves and their families for many generations. Caste based clubs were frequently used to organize these industries, and families passed down knowledge and skills to one another. A cohesive system of craftsmanship was produced by artisans who were experts in spinning, weaving, dying, and making patterns, among other facets of textile production.

Table 6 Comparative Analysis of Natural and Synthetic Dyes

Feature	Natural Dyes	Synthetic Dyes
Cost	Higher production costs due to labor-intensive processes and raw material cultivation.	Cheaper to produce due to industrial-scale manufacturing and availability of chemical alternatives.
Durability	Moderate colorfastness; often requires mordants to improve longevity.	High durability with minimal fading over time, even under extreme conditions.
Environmental Impact	Eco-friendly, biodegradable, and non-toxic; less harmful to ecosystems.	Causes pollution due to non-biodegradable chemicals; harmful effluents affect water and soil quality.
Cultural Significance	Integral to rituals, festivals, and traditional craftsmanship; preserves intangible cultural heritage.	Lacks cultural value and is primarily used for mass-market production.
Availability	Limited to regions with suitable climatic and ecological conditions for dye-yielding plants.	Readily available in all regions, as they are not dependent on natural resources.
Health Impact	Non-toxic and safe for skin; suitable for garments used in rituals and ceremonies.	Often contains harmful chemicals that can cause skin irritation or allergies.
Artisanal Knowledge	Requires skilled craftsmanship and traditional techniques passed through generations.	Can be manufactured with minimal labor and technical knowledge.

Table 6 presents the juxtaposition of natural and synthetic dyes, highlighting their distinctions. While green and culturally significant, organic colors are more costly and less resilient than artificial ones, which can be manufactured in factories, more economical, and more durable but harmful to the planet. The former is deeply rooted in culture and requires artisanal expertise, whereas synthetic dyes prioritize scalability over tradition. This table illustrates how production has reduced the use of natural dyes while also highlighting their benefits for cultural preservation and eco friendly processes.

- **Trade Changes:** Lower priced machine made imports fiercely competed with Kerala's conventional fabrics and natural dyes, which were once essential to international trade. Local industries were undermined by colonial trade policies that frequently favored industrial goods from Europe. For instance, the British colonial government encouraged synthetic dyes made in Europe, which further undermined Kerala's natural dyeing sector's economic sustainability.
- **Ecological Challenges:** The depletion of natural dyes was also influenced by overuse of natural resources. The availability of minerals and plant life necessary for the production of dyes was diminished by deforestation and changes in agriculture. This made it harder to sustain natural dyeing, especially when combined with an abundance of ethical methods.

4.4. SOCIAL AND CULTURAL IMPACT ON WEAVING COMMUNITIES

The decline of natural dyes had profound implications for Kerala's weaving communities, affecting their livelihoods, cultural identity, and traditional knowledge systems.

- **Financial hardship:** Many typical dyers and weavers lost their jobs as a result of the switch to artificial dyes and mechanized production. Due to extreme financial hardship, many artisanal areas that had depended on natural hues for generations were forced to give up their craft in search of other sources of income.

- **Loss of Standard Skills:** Native cultural traditions were eroded as a result of the declining use of natural dyes. As fewer craftspeople used the elaborate methods of extracting, mixing, and applying dyes that had been meticulously refined over centuries, they started to wane. This loss signifies a serious ethnic and intellectual starvation in addition to a monetary setback.
- **Cultural Unity at Risk:** Cultural fabric of Kerala society was also upended by the loss of natural dyes. Natural color dyed textiles were essential to festivals, customs, and collective identity. Kerala's rich artistic legacy was diluted as these customs and the historical significance they were associated with declined.
- **Consumer Priorities Have Changed:** The emergence of manufactured textiles and synthetic dyes changed how consumers behaved. Demand for typical handwoven and actually dyed textiles decreased as more accessible, reasonably priced, mass-produced fabrics became available. Kerala's weaving populations and their craft were further marginalized by this change.

4.5. THE PATH FORWARD: REVIVAL AND SUSTAINABILITY

A difficult period in Kerala history was the decline of organic dyes, but current initiatives to bring these customs back are gaining traction. There is hope for Kerala weaving heritage, thanks to government led programs to support handloom industries, ethical clothing movements, and a resurgence of interest in eco friendly dyes. The interpersonal and monetary value of natural dyes could be restored by adopting contemporary innovations while maintaining traditional methods.

5. REVIVAL AND CONTEMPORARY RELEVANCE

5.1. ONGOING EFFORTS TO REVIVE NATURAL DYEING AND TRADITIONAL WEAVING

Kerala's declining use of natural dyeing techniques has led to a number of revival initiatives meant to protect this priceless part of the state's cultural legacy. Governments, charities, artisan associations, and the green fashion sector are leading these efforts, which aim to revive traditional weaving and organic dyeing methods.

- **Government Programs:** The Kerala government has started a number of projects to encourage the use of natural dyes and support the handloom sector. The revival of traditional weaving has been greatly aided by programs like financial subsidies, training sessions, and marketing assistance for handcrafted cooperatives.
- **Artisan and Community-Led Initiatives:** Artisan communities have been at the forefront of preserving traditional knowledge and skills. Cooperative societies, such as the Chendamangalam Handloom Weavers Cooperative Society, have undertaken efforts to reintroduce natural dyes in their production processes.
- **Role of NGOs and Cultural Organizations:** The documentation and promotion of natural dyeing techniques has been greatly aided by the work of charities and cultural institutions. These organizations frequently concentrate on educating the public, planning shows, and training the next generation of craftspeople. Kerala's dyeing tradition has been preserved and its value in today's markets has been highlighted by businesses like Dastkar and Craft Rebirth Trust.
- **Movements for Sustainable Fashion:** Natural dyes are seeing a resurgence in popularity due to the rising demand for ethically and environmentally produced goods worldwide. Kerala weavers and dyers are increasingly working with sustainable fashion brands to create green textiles. These efforts have restored the popularity of naturally dyed textiles by fusing traditional methods with contemporary design.

5.2. THE POTENTIAL OF NATURAL DYES IN MODERN CULTURAL AND ECONOMIC CONTEXTS

Because of their benefits for culture, the environment, and the economy, natural dyes once eclipsed by synthetic alternatives are becoming more and more popular in the modern day.

- **Social Importance:** The resurgence of natural dyeing techniques guarantees the survival of conventional systems of knowledge and contributes to the preservation of Kerala's rich artistic legacy. Kerala's heritage is being preserved and made open to new audiences by artists and designers who use natural dyes in contemporary designs.

- **Financial Possibilities:** There is substantial economic potential in the revival of natural dyes. Inevitably, dyed materials can fetch a premium at both domestic and foreign markets due to consumers' growing preference for ethical and sustainable products. This gives Kerala's handloom sector the chance to grow and become more economically viable.
- **Environmental Features:** Natural dyes are a more environmentally friendly option than synthetic ones because they are non toxic and biodegradable. By lowering the environmental effect of textile production, their use supports global sustainability objectives and strengthens Kerala's standing as a center for environmentally friendly crafts.
- **Integration with Current Trends:** By fusing traditional aesthetics with modern styles, natural dyes are making a comeback in contemporary fashion and design. In addition to appealing to customers who care about the environment, this integration encourages innovation in Kerala's textile sector. The market potential of natural dyes has increased as a result of their use in apparel, accessories, and home furnishings.

Table 7 Potential Benefits of Natural Dyes in Modern Contexts

Benefit Type	Description	Examples
Economic	Generates income for rural artisans and supports local economies.	Artisans benefiting from global demand for naturally dyed sarees, scarves, and home textiles.
Ecological	Biodegradable and non-toxic, reducing environmental pollution caused by synthetic dyes.	Adoption of natural dyes in sustainable fashion and eco-friendly home furnishings.
Cultural	Preserves traditional craftsmanship and promotes regional heritage.	Revival of <i>kasavu sarees</i> and other culturally significant textiles using natural dyes.
Health and Safety	Safe for skin and suitable for sensitive individuals.	Use of non-toxic dyes in baby clothing and ceremonial garments.
Market Opportunities	Aligns with the growing demand for sustainable and ethical products in global markets.	Naturally dyed products featured in international textile exhibitions and boutique stores.
Education and Research	Promotes interdisciplinary research on sustainable practices and traditional knowledge systems.	Studies on optimizing dye extraction processes to enhance colorfastness and scalability.

The many advantages of organic dyes in contemporary settings are examined in Table 7. Economically, natural dyes generate significant income for rural artisans by meeting global demand for naturally dyed sarees, scarves, and home textiles. Ecologically, they are biodegradable and non-toxic, reducing environmental pollution compared to synthetic dyes. Culturally, they aid in the preservation of traditional craftsmanship, exemplified by the revival of *kasavu sarees* and heritage textiles.

5.3. CHALLENGES AND THE WAY FORWARD

Although the resurgence of natural dyeing techniques has a lot of potential, there are obstacles to overcome. Significant obstacles include the lack of raw materials, costly manufacturing, and the requirement for talented artisans. Coordinated efforts are needed to address these problems, including:

- Promoting sustainable cultivation of dye-yielding plants.
- Providing financial and technical support to artisans.
- Raising consumer awareness about the cultural and ecological value of natural dyes.

6. DISCUSSION

6.1. HISTORICAL AND CULTURAL SIGNIFICANCE OF NATURAL TEXTILE DYES IN KERALA

It is impossible to overestimate the cultural and historical significance of Kerala's natural textile dyes, which are the result of the fusion of artisanal creativity, environmental resources, and cultural customs. The significance of dyes like the *Indigofera tinctoria*, turmeric, and *Artocarpus heterophyllus* at forming the state's weaving customs is highlighted by this study. Kerala's handwoven fabrics, which are frequently infused with symbolic colors, were

intricately woven into the sociocultural fabric of the area, reflecting social and spiritual hierarchy in addition to aesthetic values. The results are consistent with the ones of Kumar, et al. (2021), who investigate in general how the Indian handloom industry contributes to regional economic development and cultural heritage preservation. However, this study focuses on Kerala's distinct ecological context, whereas Kumar et al. concentrate on the national context.

6.2. CHALLENGES TO SUSTAINING TRADITIONAL DYEING PRACTICES

Kerala's dwindling use of natural dyeing techniques serves as a sobering reminder of the upheavals brought about by production or the advent of synthetic dyes. According to this study, a significant turning point occurred in the middle of the 19th century when standard dyeing techniques were marginalized due to the affordability and flexibility of synthetic dyes. In a similar vein, Hamdy or Hassabo (2021) draw attention to the difficulties that natural dyes encounter worldwide, specifically the lack of the same well and scalability constraints. Though their research supports biotechnological measures to improve the accessibility and usability from natural dyes, this research emphasizes the necessity of community-driven, locally relevant solutions that are adapted to Kerala's particular economic and ecological circumstances.

6.3. COMPARATIVE INSIGHTS ON REVIVAL EFFORTS

Kerala's traditional dyeing techniques could be revived thanks to the renewed interest in natural dyes brought about by ethical clothing motion and cultural preservation projects. In reply to the ecological risks posed by chemical dyes, Thakker or Sun (2021) highlight the ecological advantages of natural dyes and promote their incorporation into contemporary textile production. The current study backs up this viewpoint while highlighting Kerala's artisanal traditions' exceptional capacity to meet the rising demand for textiles that are both environmentally friendly and culturally significant. This study emphasizes the regional preciseness of renewal actions, such as the function of its Kerala State handicrafts Growing business (Hanveev) to promote naturally turned handloom products, in contrast to Thakker and Sun's global focus.

6.4. THE ROLE OF TECHNOLOGY AND POLICY IN SUSTAINING NATURAL DYES

The long-term viability of natural dyeing techniques depends on the incorporation of cutting-edge tools for analysis and supportive legislative frameworks. According to Sankaran et al. (2022), historic textiles should be documented and preserved using non invasive techniques like FTIR and Raman spectroscopy. In Kerala, where proof has historically been lacking, this study highlights the significance of such tools, especially for examining the composition and techniques of natural dyeing. By using these tools, Kerala's dyeing legacy could be preserved for upcoming generations by bridging the gap among traditional expertise and modern scientific study.

6.5. FUTURE DIRECTIONS AND RECOMMENDATIONS

Both the advantages and disadvantages of current revival initiatives are revealed by comparing this study with earlier research. Although the ecological advantages and worldwide difficulties of natural dyes have been well documented by earlier research, localized, community driven strategies have not received as much attention. By highlighting Kerala's distinct ecological and social setting as a basis for sustainable revival, this study closes that gap. Future studies should concentrate on interdisciplinary strategies that integrate environmental science, textile engineering, and cultural anthropology to tackle the issues of resource sustainability, scalability, and quality consistency. In conclusion, Kerala's natural dyeing traditions provide a rich historical and cultural context for examining more general issues of sustainability and cultural heritage.

7. CONCLUSION

In summary, history. and cultural importance of Kerala's natural textile dyes emphasizes how crucial a role they play in forming the region's weaving customs, business ventures, and sense of self. These dyes, which were made from natural resources like jackfruit wood, turmeric, and indigo, promoted trade and supported artisanal livelihoods while symbolizing creative ingenuity, spiritual principles, and ecological harmony. These customs were upended by production

and synthetic dyes, which caused weaving communities to lose their traditional knowledge and financial security. Nonetheless, recent resurgence initiatives backed by government programs, artisan coops, and the ethical fashion shift highlight the natural dyes' continued significance as environmentally friendly and culturally significant substitutes. This study highlights the necessity of cooperative strategies to protect Kerala's natural resources by connecting historical understanding with contemporary sustainability practices.

CONFLICT OF INTERESTS

None.

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