

Cavendish Banana Pseudostem and Blitar Honey Pineapple Leaves as Fiber Sources for Tapestry Weaving Featuring the Lung-Lungan Pattern

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Abstract. The increasing awareness of sustainability and the utilisation of organic waste have encouraged the exploration of natural fibres as alternative raw materials for craft and textile products. This study investigates the potential of Cavendish banana (*Musa acuminata*) pseudostems and Madu pineapple (*Ananas comosus*) leaves from Blitar Regency, East Java, as sustainable fiber resources for contemporary tapestry. Blitar is a major producer of Madu pineapple and Cavendish banana, generating significant amounts of agricultural waste with the potential for creative and innovative processing. Previous studies have widely examined the fibres of abaca, ramie, water hyacinth, pandan, and pineapple, specifically those of the Smooth Cayenne and Queen varieties, for textile and craft applications. However, research on Cavendish banana pseudostems and Madu pineapple leaves remains limited. This study aims to explore the characteristics of these fibers, their integration with Indonesian traditional motifs—specifically lung-lungan as a symbol of life and continuity—and their application in tapestry design. The novelty of this research lies in: (1) introducing new materials for fiber-based tapestry, (2) integrating traditional motifs into contemporary crafts, (3) promoting sustainability through agricultural waste utilization, and (4) contributing to the development of local craft industries within the framework of the circular economy. The findings are expected to provide both artistic and environmental value, while opening new opportunities in contemporary textile crafts.

1 Introduction

In the midst of increasing global awareness of sustainability and the utilisation of organic waste, natural materials such as banana pseudostems and pineapple leaves are beginning to attract attention as alternative fibre sources for craft and textile products. One of the most widely cultivated banana varieties in Blitar is Cavendish banana (*Musa acuminata*), while Madu pineapple (*Ananas comosus*) is a leading variety in Blitar Regency, East Java. Both

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plants generate large volumes of agricultural waste, which hold high potential if processed creatively and innovatively.



Fig. 1. Cavendish banana pseudo-stem and honey pineapple leaves.

Blitar Regency is well known as a production centre for Madu pineapples and Cavendish bananas. Approximately 18 million pineapple plants are cultivated on 600 hectares of land on the slopes of Mount Kelud, with Queen variety dominating (90%), followed by Banasari (8%), and other varieties (Putri, 2017). Additionally, Cavendish bananas are widely cultivated, particularly in Gunung Gedang, with a total area exceeding 250 hectares across several villages (Andriani, 2023). The abundance of these crops positions Cavendish banana pseudostems and Madu pineapple leaves as waste materials worthy of further research.

Previous studies have investigated the utilisation of natural fibres, such as abaca, ramie, water hyacinth, pandan, and pineapple fibres from Smooth Cayenne and Queen varieties, for textile and functional craft applications. However, research on Cavendish banana pseudostems and Madu pineapple leaves remains scarce, despite their strong and flexible fiber characteristics, which make them suitable for weaving.

Furthermore, most natural fibre applications to date have focused on practical functions (such as weaving, sacks, or simple textiles), rather than aesthetic and symbolic purposes that can be realised in contemporary crafts, such as tapestry. To date, there has been no study integrating local materials with Indonesian traditional motifs—such as lung-lungan, a symbol of life and continuity—within the tapestry medium. Accordingly, this study offers novelty in several aspects:

1. New material exploration: utilizing abundant Cavendish banana pseudostems and Madu pineapple leaves as fiber sources for tapestry.
2. Traditional motif integration: embedding lung-lungan motifs from Indonesian culture into fiber-based tapestry.
3. Sustainability approach: transforming agricultural waste into artistic craft products that support a circular economy model.
4. Contribution to contemporary craft: developing tapestry as an artistic medium rarely explored using Indonesian local fibers.

This research aims to develop Cavendish banana pseudostem and Madu pineapple leaf fibers as weaving materials for tapestry that are not only artistic but also environmentally friendly. Through appropriate design and material processing approaches, this innovation is expected to open new opportunities in textile crafts while supporting the development of a circular economy in local craft industries.

2 Methodology

2.1 Research design

This research employed an exploratory qualitative approach combined with experimental practice-based methods. The study was conducted in Blitar Regency, East Java, focusing on the utilization of Cavendish banana (*Musa acuminata*) pseudostems and Madu pineapple (*Ananas comosus*) leaves as sustainable fiber sources. The methodology integrated material experimentation, fibre extraction, and artistic design processes to develop contemporary tapestry works.

2.2 Materials

The primary materials used in this study were:

- a. Cavendish banana pseudostems obtained from plantations in Gunung Gedang, Blitar.
- b. Madu pineapple leaves collected from the slopes of Mount Kelud, Blitar.
- c. Supporting materials such as cotton threads and natural dyes were also applied to strengthen the weaving process and enhance the aesthetic value of the tapestry.

2.3 Fiber extraction process

The fiber extraction process followed several stages:

- a. Cutting and Selection – Banana pseudostems and pineapple leaves were cut into segments and sorted according to length and fibre quality.
- b. Decortication – Fibers were mechanically separated from the plant tissue using a decorticator.
- c. Washing and Drying – The extracted fibres were washed to remove impurities and then sun-dried to achieve an optimal moisture content.
- d. Softening Treatment – To improve flexibility, the fibres underwent a natural softening process, which included boiling with a soda ash solution and mechanical beating.
- e. Spinning Preparation – Processed fibers were aligned and twisted into threads suitable for tapestry weaving.

2.4 Tapestry design approach

The design of the tapestry adopted a practice-based research model, where the creative process was considered a method of inquiry. The approach included:

- a. Motif Development – The lung-lungan motif, symbolizing life and continuity in Indonesian traditional ornamentation, was selected and adapted into contemporary compositions.
- b. Weaving Techniques – Traditional handloom weaving was combined with experimental tapestry techniques to highlight the visual and tactile qualities of the fibers.
- c. Sustainability Consideration – The design emphasized low-waste production, the use of natural dyes, and the integration of agricultural waste into high-value craft products.

2.5 Data analysis

The analysis was carried out through two perspectives:

- a. Material Performance – Observations were conducted to evaluate the strength, flexibility, and visual texture of the fibers.
- b. Artistic Expression – Qualitative assessments were applied to examine how the integration of natural fibers and traditional motifs contributed to contemporary craft innovation.

3 Results and Discussion

3.1 Results

3.1.1 Fiber extraction outcomes

The extraction of Cavendish banana pseudostem and Madu pineapple leaf fibers produced strong and flexible filaments suitable for weaving. The decortication process successfully separated long fibers with relatively uniform thickness. After the softening treatment, the fibers exhibited improved pliability, making them comparable to commonly used natural fibers such as abaca and ramie.

1. Banana pseudostem fibres were found to have a coarse yet strong texture, characterised by a natural beige colouration.
2. Pineapple leaf fibres exhibited a smoother surface and a shinier appearance, resulting in a silk-like lustre.

These results indicate that both materials provide complementary qualities: the banana fibres contribute durability, while the pineapple fibres enhance the aesthetic quality with their natural sheen.

3.1.2 Fiber characteristics and performance

Testing and observation revealed several notable characteristics:

1. Strength and Durability – Banana pseudostem fibers showed higher tensile strength compared to pineapple fibers, making them suitable as structural elements in weaving.
2. Flexibility – Pineapple fibers demonstrated greater softness and pliability, which supported intricate weaving patterns.
3. Visual Qualities – The natural hues of beige and off-white provided an earthy aesthetic, which could be enhanced with natural dyes to achieve a broader color palette.



Fig. 2. Color variation in fibers due to moisture content.

3.1.3 Integration into tapestry

The processed fibers were successfully applied in the creation of tapestry samples. The lung-lungan motif was integrated using a combination of handloom weaving and experimental tapestry techniques. The results highlighted:

1. **Material Harmony** – The contrast between the coarse banana fibers and the smooth pineapple fibers created a dynamic surface texture.
2. **Motif Expression** – The lung-lungan motif was effectively represented, reinforcing cultural symbolism while maintaining contemporary visual appeal.
3. **Aesthetic Innovation** – The use of local agricultural waste materials elevated their value, transforming them into sustainable craft products with artistic significance.

3.1.4 Practical applications

The research demonstrated that Cavendish banana pseudostem and Madu pineapple leaf fibers are not only technically viable for textile applications but also artistically relevant. The integration of these fibers into tapestry can potentially contribute to:

1. The development of eco-friendly craft products aligned with circular economy principles.
2. The promotion of local identity through the use of regional materials and traditional motifs.
3. The expansion of contemporary textile art practices that emphasize sustainability and cultural narratives.

3.2 Discussion

The findings of this study highlight the potential of Cavendish banana pseudostem and Madu pineapple leaf fibers as alternative raw materials for tapestry making. When compared to previous studies that utilized fibers such as abaca, ramie, water hyacinth, pandan, and Smooth Cayenne pineapple leaves (Putri, 2017; Andriani, 2023), the results demonstrate several points of novelty and practical contribution.

3.2.1 Comparison with previous research

Earlier works on natural fibers have predominantly focused on their functional applications, such as ropes, mats, sacks, or utilitarian textiles. Studies involving pineapple fibers mostly emphasized Smooth Cayenne and Queen varieties, while banana fibers were generally obtained from species other than Cavendish. In contrast, this research specifically explored Cavendish banana pseudostem fibers and Madu pineapple leaves from Blitar, which have been underutilized despite their abundance. The comparison reveals that:

1. Banana pseudostem fibers exhibited durability similar to abaca but with greater availability in the local context of Blitar.
2. Madu pineapple leaf fibres provided a sheen comparable to silk, adding aesthetic value that is rarely highlighted in earlier utilitarian studies.
3. Unlike previous research, this study emphasized not only practical usability but also aesthetic and symbolic dimensions, particularly within contemporary tapestry art.

3.2.2 Artistic and cultural contribution

The integration of the lung-lungan motif into the tapestry exemplifies how natural fibers can embody cultural narratives. Traditionally symbolizing life and continuity, the motif

functioned as both a decorative and symbolic element. This approach distinguishes the study from prior research, which rarely combines material innovation with cultural symbolism in contemporary craft. The artistic exploration confirms that agricultural waste materials can be recontextualised into works of art that possess both functional resilience and symbolic resonance. Such integration aligns with current trends in sustainable craft practices that emphasize cultural identity, storytelling, and ecological awareness.

3.2.3 Sustainability and circular economy implications

From a sustainability perspective, this research illustrates the feasibility of transforming agricultural by-products into value-added creative outputs. In Blitar, where Cavendish bananas and Madu pineapples are cultivated extensively, the volume of agricultural waste is significant. Utilizing these wastes reduces environmental burden while generating economic opportunities for local artisans. The findings contribute to the circular economy model by:

1. Diverting agricultural residues from waste streams.
2. Enhancing resource efficiency by transforming organic waste into art-based products.
3. Offering artisans eco-friendly and locally accessible materials.

3.2.4 Novelty and broader impact

This study offers four main novelties:

1. Material Innovation – The first documented use of Cavendish banana pseudostem and Madu pineapple leaf fibers in contemporary tapestry.
2. Cultural Integration – Embedding Indonesian traditional motifs within sustainable textile art.
3. Artistic Expansion – Introducing local natural fibers into the rarely explored medium of tapestry.
4. Sustainability Model – Providing a framework for eco-friendly craft practices that support rural economies.



Fig. 3. Tapestry made from madu pineapple leaf and cavendish banana pseudostem fibers with lung-lungan motif.

4 Conclusion

This study explored the potential of Cavendish banana pseudostem and Madu pineapple leaf fibers from Blitar, East Java, as sustainable materials for tapestry. The results demonstrate that both fibers possess strength, flexibility, and aesthetic qualities suitable for artistic weaving. Beyond their material properties, the incorporation of the lung-lungan motif highlights the potential for embedding cultural symbolism within sustainable textile practices. The research contributes novelty in four dimensions:

1. Material innovation, by utilising underexploited agricultural by-products.
2. Cultural integration, through the application of Indonesian traditional motifs in tapestry.
3. Artistic expansion, positioning tapestry as a medium for contemporary craft innovation using local fibers.
4. Sustainability contribution, aligning agricultural waste management with the principles of the circular economy.

By transforming agricultural residues into value-added art products, the study highlights how local resources can foster both environmental sustainability and economic empowerment for rural communities. Future research could further investigate fiber processing techniques, durability testing, and collaborations with artisans to scale up production while maintaining cultural authenticity.

Ultimately, this study confirms that agricultural waste materials such as Cavendish banana pseudostems and Madu pineapple leaves can transcend their utilitarian roles, serving as agents of sustainability, cultural preservation, and artistic innovation.

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