

Eco-Textiles, Mycelium and Upcycled Matter: Sustainable Material Practices in Contemporary Art

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Abstract: *The growing interest in sustainability within contemporary artistic practices has encouraged the integration of eco-textiles, post-consumer fabrics, and biomaterials into experimental visual research. This paper investigates the use of upcycling methodologies, eco-dyeing, textile layering, rust printing, and mycelium cultivation as artistic strategies that connect ecological awareness with material transformation and creative expression. The experimental framework combines traditional textile techniques with sustainable processes, including natural dyeing using turmeric, pomegranate tannins, and Castellani solution, together with the cultivation of *Pleurotus ostreatus* mycelium on textile substrates. The resulting works reveal organic textures, layered structures, chromatic instability, and sculptural surfaces that emphasize the relationship between materiality, temporality, and ecological consciousness. The study demonstrates that eco-textiles and biomaterials can function not only as sustainable alternatives, but also as expressive artistic media capable of generating new visual languages within contemporary textile art and interdisciplinary artistic research.*

Keywords: *Eco-textiles; Upcycling; Biomaterials; Mycelium; Contemporary textile art; Material experimentation; Sustainable artistic practices;*

Introduction

Environmental concerns increasingly influence contemporary artistic practices, especially within the field of textile art and material experimentation. Artists are progressively exploring recycled materials, biomaterials, and sustainable processes as alternatives to industrial production and excessive material consumption. In this context, eco-textiles and post-consumer materials become not only ecological resources, but also conceptual and aesthetic instruments through which artists investigate fragility, transformation, memory, and the relationship between humanity and nature.

This paper explores eco-textiles and biomaterials as experimental media within contemporary artistic practices, emphasizing sustainability, material transformation, and interdisciplinary creative methodologies. The research investigates how upcycling processes, natural dyeing, textile layering, and mycelium cultivation can generate expressive visual and tactile structures while contributing to ecological awareness.

The study situates textile experimentation within current debates on ecological art, material sustainability, and contemporary artistic research. Through interdisciplinary artistic inquiry, the paper examines the capacity of sustainable materials to produce hybrid artistic forms situated between textile art, sculpture, biomaterial research, and installation practices.

The research contributes to contemporary artistic discourse by exploring sustainable materials not only as ecological alternatives, but also as active generators of new aesthetic and conceptual possibilities. Through practice-based experimentation, the study proposes an interdisciplinary methodology situated at the intersection of textile art, biomaterial research, and ecological aesthetics. The academic relevance of the research resides in its capacity to transform artistic practice into a reflective process of knowledge production and critical ecological inquiry.

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Research Question and Knowledge Gap. While numerous studies investigate textile upcycling and biomaterials from environmental, industrial, or design perspectives, fewer studies examine how these materials function as generators of aesthetic meaning within contemporary textile art. This research addresses this gap by investigating the following question: How can eco-textiles, mycelium cultivation, and upcycled materials generate new aesthetic languages and material narratives in contemporary textile art? The study assumes that sustainable materials do not function solely as ecological alternatives but actively contribute to the production of new artistic forms, sensory experiences, and conceptual frameworks.

2. Related Work and Theoretical Background

Recent studies on textile upcycling and biomaterials highlight the growing interest in sustainable artistic and design practices. Contemporary research increasingly focuses on the ecological impact of textile industries, the reuse of post-consumer materials, and the development of alternative biomaterials capable of reducing environmental waste.

Within contemporary art, eco-textiles and biomaterials are often approached not only as sustainable solutions, but also as conceptual media that transform the understanding of materiality and artistic production.² Processes such as eco-printing, natural dyeing, rusting, and fungal cultivation generate unstable surfaces and organic structures that challenge conventional perceptions of permanence and control in artistic practice.

Mycelium-based experimentation has become particularly relevant in contemporary artistic and architectural research due to its capacity to create living, adaptable, and biodegradable forms³. Similarly, textile upcycling practices emphasize repair, transformation, and recontextualization, positioning discarded materials within new aesthetic and symbolic frameworks⁴.

This paper contributes to these discussions by combining textile experimentation with biomaterial cultivation and sustainable artistic methodologies, emphasizing the expressive potential of ecological material practices in contemporary art.

The present study is theoretically positioned within practice-based artistic research, where material experimentation functions simultaneously as a creative process and a method of knowledge production. Following Ingold's understanding of making as a form of thinking through materials, the research interprets eco-textiles and biomaterials not only as physical substances but as active agents that influence artistic decision-making, sensory perception, and ecological reflection.

3. Materials and Methods

3.1. Materials

The experimental research used post-consumer textiles including cotton, silk, and polyester blends. Natural dyes and pigments included turmeric, pomegranate tannins, and Castellani solution. *Pleurotus ostreatus* mycelium was cultivated on sterilized textile substrates. Additional supporting materials included methylcellulose-based adhesives and reclaimed textile fibers.

² Zhou, J., & Sethi, M. 2025. "Is Upcycling the Best Approach for Designers to Contribute to Sustainable Textile Industry?" *Textile: Journal of Cloth and Culture*, 23(2), 276–288.

³ Patel, P., Singh, R., & Zhao, H. 2025. "Mycelium-based composites: An updated comprehensive review". *Construction and Building Materials*, 420, 134587.

⁴ Adamson, G. 2013. *The Invention of Craft*. Bloomsbury Publishing.

3.2. *Experimental Methods*

Practice-Based Research Framework. The study adopts a practice-based artistic research methodology in which knowledge emerges through direct material engagement, iterative experimentation, visual observation, and reflective analysis. Each material process—eco-dyeing, rust printing, textile layering, and mycelium cultivation—was documented through photographic records, material sampling, and comparative evaluation of aesthetic, tactile, and structural transformations. The resulting artworks function both as artistic outcomes and as research data that support the analytical interpretation of material behavior and visual expression.

The methodology combined traditional textile techniques with experimental sustainable processes.

A) *Pre-treatment of textiles*

Textile materials were cleaned, boiled in sodium bicarbonate solutions, mordanted using alum or tannins, and air dried before experimental intervention.

B) *Eco-dyeing and rusting*

Eco-printing techniques using plant materials were combined with steam fixation, vinegar-based oxidation, rust printing, and Castellani solution dyeing under varied temperature conditions.

Castellani solution was selected due to its strong chromatic interaction with protein-based fibers. Originally developed as an antiseptic preparation containing phenol, resorcinol, fuchsin, and boric acid, the solution produces intense red-violet tonalities and allows the investigation of unconventional dyeing processes within artistic textile experimentation. In this study, the solution was diluted and applied as an alternative coloring agent in order to explore material responsiveness and chromatic variability.

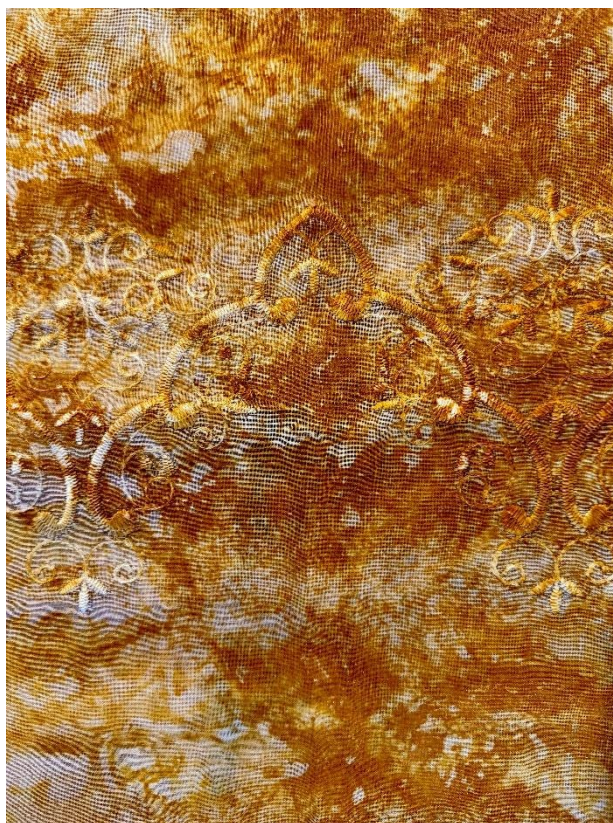


Fig. 1. Eco-printing on silk

C) *Upcycling through layering*

Textile collage techniques were developed through the stratification of multiple textile layers, tufting with reclaimed yarn, hand stitching, and experimental embroidery interventions.



Fig. 2. Layered textile collage

D) *Mycelium cultivation*

Mycelium cultivation involved substrate sterilization, inoculation with *Pleurotus ostreatus*, incubation at approximately 22–25°C under relative humidity levels of 80–90%, and regular monitoring over a period of approximately 14–21 days. Textile substrates consisted of layered cotton and reclaimed textile fibers, with approximately 150–200 g of substrate used for each experimental sample. Colonization rates varied according to material density and moisture retention, reaching approximately 80–100% surface coverage in the most successful samples. Following full colonization, the material was dehydrated and stabilized using wax finishing in order to preserve structural integrity and prevent further biological activity.



Fig. 3. Mycelium growth on textile support

4. Results and Discussion

4.1. *Artistic Results*

The experiments generated complex visual and tactile outcomes characterized by layered surfaces, unstable chromatic effects, and organic structural formations. Silk absorbed pigments intensely, producing saturated colors, while cotton generated diffuse and pale

chromatic transitions. Rust printing techniques created unpredictable organic traces and oxidized textures that emphasized material temporality and transformation.

The mycelium cultivation process produced sculptural, network-like structures that visually connected textile surfaces with biological growth patterns. These forms suggested relationships between decay, regeneration, and interconnected ecological systems.

From an analytical perspective, the experiments demonstrated that material behavior significantly influenced visual outcomes. The interaction between fungal growth and textile substrates generated irregular structures that could not be achieved through conventional textile techniques. Similarly, the chromatic instability produced through eco-dyeing and oxidation processes introduced an element of unpredictability that became an active component of artistic expression. These findings suggest that sustainable materials possess not only ecological value but also distinctive aesthetic capacities that contribute to the development of new artistic vocabularies.

The layering of reclaimed textiles, embroidery, and eco-printing techniques generated hybrid surfaces situated between textile object, relief structure, and experimental installation. Material instability and irregularity became essential aesthetic components of the artistic process.



Fig. 4. Final textile-art samples

4.2. Educational and Interdisciplinary Dimensions

The experimental methodology encouraged interdisciplinary artistic thinking, tactile exploration, and ecological reflection⁵. Working with biomaterials and recycled textiles facilitated a deeper understanding of sustainability through direct material interaction and practice-based research.

The integration of textile processes, biomaterial experimentation, and ecological methodologies also supported collaborative approaches situated between visual arts, design, craft practices, and material research.

4.3. Comparative Discussion

The findings align with current discussions on sustainable artistic practices, biomaterial experimentation, and textile upcycling. However, the study emphasizes the distinctive role of artistic practice in transforming sustainability into an expressive and conceptual framework rather than solely a technical or industrial solution.

Through material experimentation, the research highlights how eco-textiles and biomaterials can generate new aesthetic languages that reflect ecological fragility, transformation, and material memory⁶.

Unlike industrial research focused primarily on performance, durability, or environmental efficiency, the present study evaluates biomaterials through their capacity to generate meaning, sensory engagement, and conceptual reflection. The findings therefore extend existing

⁵ Sterling, S. 2010. "Transformative learning and sustainability". *Learning and Teaching in Higher Education*, 5, 17–33.

⁶ Ingold, T. 2013. *Making: Anthropology, Archaeology, Art and Architecture*. Routledge.

sustainability research by emphasizing the cultural and artistic dimensions of material transformation.

5. Conclusions

This study confirms the relevance of eco-textiles and biomaterials as sustainable resources for contemporary artistic practice and experimental material research. The combination of textile upcycling, eco-dyeing, rust printing, layering, and mycelium cultivation demonstrates the potential of sustainable materials to generate innovative visual and tactile experiences.

The research also highlights the importance of interdisciplinary artistic methodologies that connect ecological awareness with material experimentation and contemporary creative practices. Eco-textiles and biomaterials function not only as environmentally responsible alternatives, but also as active artistic media capable of producing new conceptual and aesthetic perspectives.

The original contribution of this study resides in the integration of eco-textiles, unconventional natural dyeing methods, textile upcycling, and mycelium cultivation within a unified artistic research framework. By connecting ecological sustainability with material aesthetics, the research proposes a model through which biomaterials can function simultaneously as environmental resources, creative media, and generators of artistic knowledge.

Future research may further investigate hybrid biomaterials, expanded sculptural applications, and the integration of living materials into contemporary textile installations and interdisciplinary artistic environments.

6. References

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