










Research Article

# Mycelium-Based Panel: A Sustainable Medium for Creative Application

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**Abstract:** This study explores the development and evaluation of mycelium-based panels as a sustainable material for creative and installation applications. Grounded in sustainability theory and the in-creasing demand for eco-friendly alternatives, the research investigates how agricultural waste substrates such as rice straw and sawdust can be transformed into viable structural panels using fungal mycelium as a natural binding agent. The study utilized an exploratory-descriptive design, including substrate preparation, inoculation, molding, incubation, and drying, followed by systematic observation and respondent evaluations. Results revealed panels with natural beige-brown coloration, fibrous texture, moderate density, porosity, and mild earthy odor, indicating successful colonization and material stability. Evaluation through Likert-scale responses showed strong acceptance in terms of performance, reliability, adaptability, aesthetics, and sustainability, highlighting their usability for indoor installations and creative applications. The findings suggest that mycelium panels provide a functional, biodegradable, and visually appealing alternative to conventional panel materials, demonstrating promise for future eco-focused design innovations. The study concludes that mycelium panels offer practical benefits while supporting environmental responsibility, and recommends further refinement of substrate mixtures, mechanical testing, and full-scale installation trials to optimize their potential in sustainable design contexts.

**Keywords:** mycelium-based panels; art installations; agricultural waste

## 1. Introduction

The escalating challenges of climate change, resource depletion, and solid waste accumulation have intensified efforts to identify sustainable materials that minimize environmental impact while preserving functional performance and aesthetic value. In the construction and creative sectors, traditional materials like plastics, resins, and high-energy composites are known to have high embodied carbon and waste generation. This has led to the growing popularity of bio-based materials for their regenerative properties and compatibility with circular economy strategies. Among these, mycelium-based composites, produced by the controlled growth of fungal mycelium on organic substrates, have been identified as promising eco-materials that can act as a sustainable alternative to existing materials because of their biodegradability, low embodied energy, and potential to convert agricultural waste into functional material systems.

Recent academic studies establish both the technical viability and the expanding application spectrum of mycelium composites. A critical review by Jones et al. (2020) highlights their mechanical performance, insulation properties, and compatibility with sustainable manufacturing systems. Meanwhile, Appels et al. (2022) emphasize that fabrication variables directly influence strength, moisture resistance, and structural stability. In addition, Elsacker et al. (2019) provide a systematic production framework, underscoring the importance of process control in achieving reliable and reproducible composite panels.

However, beyond structural and environmental performance, the topicality of mycelium research is increasingly anchored in its creative and artistic potential. Camere and Karana (2018) frame the cultivation of living materials as an emerging design practice in which

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biological growth becomes part of the creative process. This approach shifts material development from purely industrial fabrication toward bio-fabrication, where designers intentionally engage with organic form, texture, and transformation. Architectural explorations documented by Horvath et al. (2025) further demonstrate how mycelium can be grown within experimental molds to produce sculptural and spatial elements, validating its relevance in artistic and experiential environments. Complementing academic research, discourse in design platforms such as emphasizes the aesthetic, symbolic, and narrative value of living materials, particularly in exhibitions and installations that communicate sustainability themes (Amandolese, 2024).

While global literature continues to expand, limited localized studies examine the development of mycelium composites specifically for creative applications such as art installations, especially using accessible agricultural residues like rice straw and sawdust. In many rice-producing communities, these materials are abundant yet underutilized, often contributing to waste and environmental degradation. Transforming such biomass into mycelium-based panels for artistic use not only supports waste valorization but also provides artists and designers with biodegradable, texturally unique, and conceptually meaningful material alternatives.

This study therefore focuses explicitly on the production and evaluation of mycelium-based panels intended for creative and installation-based applications rather than purely structural construction purposes. The main objective is to assess the panels' performance, reliability, surface characteristics, and aesthetic qualities in relation to their usability in art installations. Specifically, the research aims to (1) document material and technological requirements for fabrication using locally available substrates, (2) describe observable physical and visual features relevant to artistic presentation, and (3) analyze respondent evaluations regarding their suitability, appeal, and functional performance in creative contexts.

By situating local experimentation within contemporary scholarship on living materials, this study contributes to the discourse on sustainable bio-fabrication while emphasizing mycelium's role not only as a construction material, but as a medium for environmentally conscious artistic expression.

## 2. Materials and Methods

### 2.1. Materials

The primary substrates used in this study were rice straw and sawdust sourced from locally available agricultural waste. Rice straw was selected due to its fibrous structure and abundance in rice-producing communities, while sawdust was incorporated as a fine lignocellulosic component capable of increasing matrix density. Both materials are rich in cellulose, hemicellulose, and lignin, which serve as nutrient sources for fungal growth and structural reinforcement once colonized. Their utilization aligns with sustainable material development by converting underutilized biomass into value-added composites suitable for creative applications such as art installations.

Mushroom spawn was used as the fungal inoculant to initiate mycelial growth. The spawn contains actively growing fungal mycelium capable of colonizing lignocellulosic substrates under controlled environmental conditions. The biological binding mechanism of mycelium enables the transformation of loose agricultural fibers into a cohesive composite panel without the use of synthetic adhesives. This biological self-assembly process is central to the material's structural integrity and ecological advantage.

Rectangular molds were utilized to define the panel's dimensions and thickness, enabling a transition from traditional fruiting-bag cultivation to material fabrication. Basic equipment such as basins, steam or boiling apparatus, and a conventional oven supported substrate preparation, microbial load reduction, and post-growth drying. Alcohol was used to sterilize tools and working surfaces to minimize contamination risks during inoculation. All materials and tools were selected based on local accessibility, reinforcing the study's objective of demonstrating feasible mycelium-based panel production within community-level settings.

### 2.2. Experimental Procedure

The experimental procedure followed a modified substrate preparation and inoculation process commonly used in mushroom fruiting-bag production, with adaptations to accommodate panel fabrication for creative applications. The primary modification involved transferring the inoculated substrate into rigid molds rather than plastic cultivation bags, thereby shaping the composite into structural panels suitable for artistic installation use.

The procedure consisted of four major phases: substrate preparation, inoculation and mold preparation, incubation, and heat treatment with drying. Each phase was designed to ensure optimal mycelial colonization while maintaining panel form stability and surface quality. Particular attention was given to moisture regulation, aeration, and contamination control, as these factors significantly influence the mechanical cohesion and visual characteristics of the final composite.

The process prioritized simplicity and reproducibility using locally available equipment. While industrial production of mycelium composites often employs controlled incubation chambers and specialized curing systems, this study implemented practical adaptations appropriate for small-scale, creative material fabrication.

### 2.2.1. Substrate Preparation

Substrate preparation began with the collection of rice straw from agricultural fields and the procurement of sawdust as a secondary component. These two materials served as the foundational matrix of the panel. Rice straw provided fibrous reinforcement and internal porosity, while sawdust contributed fine particles that enhanced compactness and surface uniformity. The combination was intended to balance tensile support and density within the composite.

The rice straw was manually chopped into approximately 1-inch segments to increase surface area for mycelial attachment and promote uniform colonization. Size reduction also improved internal porosity, facilitating oxygen diffusion necessary for fungal respiration. After chopping, the straw was soaked in water for approximately 24 hours to soften the fibers and ensure uniform moisture absorption. This soaking stage also prepared the substrate for effective heat treatment.

Following soaking, the straw was drained until it reached a moist but non-dripping consistency, a condition critical for maintaining aerobic fungal growth. The drained straw was then thoroughly mixed with sawdust in a fixed, balanced ratio. This single-ratio approach ensured consistency across samples and allowed evaluation of panel performance without variability from differing substrate proportions. The combined substrate subsequently underwent heat treatment using steam or boiling water to reduce microbial load and eliminate competing organisms. After heating, the mixture was cooled to room temperature prior to inoculation.

### 2.2.2. Inoculation and Mold Preparation

Once cooled, the prepared substrate was inoculated with mushroom spawn. The spawn was evenly distributed and thoroughly mixed to promote uniform mycelial colonization throughout the composite matrix. Even distribution is critical to achieving structural consistency and preventing weak, uncolonized regions within the panel.

The inoculated substrate was transferred into a rectangular mold that determined the final dimensions and thickness of the panel. During loading, the material was compacted carefully to eliminate excessive air pockets while preserving sufficient internal aeration for fungal respiration. This balance between compaction and porosity directly influences both mechanical rigidity and biological growth efficiency.

The shift from flexible fruiting bags to rigid molds represents the primary methodological adaptation in this study. Instead of producing mushrooms for harvest, the objective was to grow a dense, interwoven mycelial network that would function as a natural binder, forming a cohesive panel suitable for creative structural and aesthetic applications.

### 2.2.3. Incubation Phase

After molding, the panel was incubated for approximately two to three weeks in a shaded environment at room temperature. The incubation area was selected to minimize direct sunlight exposure and maintain relatively stable environmental conditions. During this phase, the mycelium actively colonized the substrate, digesting lignocellulosic components and binding fibers together.

Throughout incubation, visual inspection was conducted to monitor contamination and colonization progress. Gradual whitening of the substrate surface indicated successful mycelial growth. As colonization advanced, the composite developed increased internal cohesion and a visibly fibrous surface texture characteristic of mycelium-bound materials.

Full colonization was confirmed when the entire surface appeared uniformly white, signaling that the mycelial network had densely permeated the substrate. At this stage, the panel exhibited structural stability sufficient for removal from the mold and preparation for drying and heat treatment.



### 2.2.4. Heat Treatment and Drying

Post-incubation heat treatment was conducted to terminate biological activity, prevent further growth, and enhance panel rigidity. Ideally, mycelium composites are cured within a temperature range of 60-80°C; however, the only available equipment was a conventional oven with a minimum temperature of 100°C. Consequently, a controlled manual heating method was developed to approximate safe curing conditions.

The oven was preheated for 10 minutes at 100°C before introducing the fully colonized panel. To reduce excessive heat accumulation, the oven door was kept slightly open, allowing thermal regulation through passive ventilation. The panel underwent three heating cycles consisting of 15 minutes inside the oven followed by 10 minutes of air drying outside. This cyclical method minimized risks of overheating, burn spots, and internal steam buildup that could compromise structural integrity.

After completing the heating cycles, the panel was air-dried for 24 hours to allow residual moisture to evaporate naturally. This final drying phase increased material rigidity, stabilized the internal matrix, and reduced the likelihood of microbial reactivation. The resulting mycelium-based panel was then ready for performance evaluation and aesthetic assessment in relation to its intended use in creative installations.

## 3. Results

### 3.1. Observable Physical Characteristics of the Panels

The produced mycelium-based panels were documented in terms of color, texture, porosity, rigidity, and odor. The observations are summarized in table 1.

**Table 1.** Physical and visual characteristics of the mycelium panel.

Characteristic	Observation
Color	The panels were soft brown to beige-brown with scattered white patches of mycelium. The white areas show that the fungus grew well throughout the substrate.
Texture / Surface	The surface was mostly fibrous and slightly rough. Areas with more mycelium were smoother, while spots with more wood chips were coarser.
Density / Rigidity	The panels were moderately dense. They could compress slightly under pressure but mostly regained their shape, showing they were strong yet slightly flexible.
Porosity	The panels had small visible holes throughout. These pores made the panels lighter but did not reduce their strength.
Size / Thickness	The panels matched the mold size and were mostly even in thickness, with only small differences at the edges.
Odor	The panels had a mild earthy smell, which is normal for healthy mycelium growth.
Overall appearance	Uniform panel with natural, organic look with minor surface irregularities

The physical and visual characteristics of the mycelium panels were observed and recorded in table 1. The panels had a soft brown to beige-brown color with scattered white patches, showing that the fungus grew well throughout the substrate. Their surface was mostly fibrous and slightly rough, with smoother areas where the mycelium was thicker and coarser spots where more wood chips were present. The panels were moderately dense, able to compress slightly under pressure but generally returning to their original shape, which shows they are strong yet a little flexible. Small visible pores were present throughout, making the panels lighter without affecting their strength. The size and thickness of the panels matched the mold, with only minor differences at the edges. They had a mild earthy smell, which is normal for healthy mycelium growth. Overall, the panels looked natural and uniform, with only minor surface differences, making them suitable for creative or art projects.

### 3.2. Evaluation of Panel Usability

Four areas of evaluation were assessed using a Likert-based questionnaire: performance, reliability, features, and aesthetics.

The results of the performance criteria are shown in table 2, indicating favorable handling, stability, and lightness

**Table 2.** Weighted mean results of performance evaluation.



Description	5	4	3	2	1
The panel is manageable and easy to mount for installation.	27%	55.10%	18%	0%	0%
The panel can stand securely when displayed indoors.	21.30%	64%	12.40%	2.20%	0%
The panel is lightweight for frequent repositioning in exhibit setups.	41.60%	46.10%	10.10%	2.20%	0%
The panel remains intact during repeated installation handling.	30.30%	55.10%	13.50%	1.10%	0%
Overall weighted mean	30.05%	55.08%	13.50%	1.38%	0.00%

Performance feedback shows that the panel is generally easy to handle, stable when displayed, and durable during repeated installation. For mounting, 56.1% of respondents rated the panel as Acceptable and 27% as Highly Acceptable, while 18% rated it Moderately Acceptable, showing good overall usability. The strongest performance rating was for its ability to stand securely indoors, with 64% Acceptable and 21.3% Highly Acceptable. Only small per-centages (12.4%, 2.2%, and 0%) expressed concerns. Regarding its lightweight property, 46.1% rated it Acceptable and 41.8% Highly Acceptable, showing that the panel's weight allows easy repositioning in exhibit setups. For durability during repeated handling, 55.1% rated it Acceptable. Overall, these results indicate that the panel works well, is easy to manage, stable, and durable, making it suitable for creative or exhibition use.

The reliability of the mycelium panels is shown in table 3. The panels were rated for their ability to keep shape indoors, withstand handling during transportation and setup, maintain cohesion between mycelium and substrate, and resist surface damage during mounting.

**Table 3.** Weighted mean results of reliability evaluation.

Description	5	4	3	2	1
The panel retains its form when displayed in indoor gallery conditions.	23.60%	57.30%	16.90%	2.20%	0%
The panel withstands handling during transportation and setup.	33.70%	50.60%	10.10%	4.50%	0%
The panel maintains its cohesion (binding of mycelium and substrate).	30.30%	55.10%	5.60%	6.70%	2.20%
The panel resists surface damage during exhibit mounting.	39.30%	46.10%	9%	4.50%	0%
Overall weighted mean	31.73%	52.28%	10.40%	4.48%	0.55%

For retaining shape indoors, 57.3% of respondents rated the panel as Acceptable and 23.6% as Highly Acceptable, showing that most users found it stable. Only a small portion (16.9% or less) rated it lower. The cohesion of the mycelium and substrate was also rated positively, with 55.1% Acceptable and 30.3% Highly Acceptable, indicating that the panels hold together well.

Regarding durability during transportation and setup, 50.6% rated it Acceptable and 33.7% Highly Acceptable, while only 10.1% marked it Moderately Acceptable, showing the panels can handle movement without damage. The panel's resistance to surface damage during mounting received 46.1% Acceptable and 39.3% Highly Acceptable, confirming that the panels remain intact during installation. Overall, these results show that the panels are strong, durable, and reliable. They maintain their shape, structure, and surface quality even with repeated handling and typical exhibition use.

Assessment of features, such as adaptability to installation formats and sustainability, is summarized in table 4.

**Table 4.** Weighted mean results of features evaluation.

Description	5	4	3	2	1
The panel is adaptable for various installation formats (wall-mounted, free-standing, suspended).	24.70%	62.90%	9%	2.20%	0%
The panel can be modified (cut, shaped, trimmed) to suit design needs.	36%	47.20%	12.40%	4.50%	0%
The panel supports integration with	39.30%	42.70%	12.40%	3.40%	0%



lighting, paint, or other art media.					
The panel demonstrates eco-friendly and sustainable attributes.	46.10%	46.10%	5.60%	2.20%	0%
Overall weighted mean	36.53%	49.73%	9.85%	3.08%	0.00%

The features evaluation shows that the mycelium panel is highly functional and adaptable, with most ratings in the Acceptable range (42-63%). The panel's adaptability for different installation formats, such as wall-mounted, free-standing, or suspended displays, received 62.9% Acceptable and 24.7% Highly Acceptable, indicating strong confidence in its flexible use. Its compatibility with lighting, paint, and other art media also performed well, with 42.7% Acceptable and 39.3% Highly Acceptable, showing that respondents believe it can integrate effectively with various creative elements. In terms of modifiability, including cutting, shaping, and trimming, 47.2% rated it Acceptable and 36% Highly Acceptable, confirming that the panel can be easily customized. The sustainability feature was one of the strongest, with 46.1% Acceptable and another 46.1% Highly Acceptable, highlighting that respondents value its eco-friendly properties. Very few respondents rated any feature as Less Acceptable (2-5%), supporting the conclusion that the panel is practical, adaptable, and environmentally responsible.

The aesthetic appeal of the panel is summarized in table 5, showing positive approval of visual texture and natural tones.

**Table 5.** Weighted mean results of aesthetics evaluation.

Description	5	4	3	2	1
The natural surface texture is visually engaging for art/design use.	34.80%	50.60%	10.10%	2.20%	2.20%
The earthy color tones complement eco-inspired themes.	43.80%	47.20%	6.70%	2.20%	0%
The overall visual appeal suits artistic, eco-centric installations.	48.30%	44.90%	3.40%	3.40%	0%
Overall weighted mean	42.30%	47.57%	6.73%	2.60%	0.73%

The aesthetic evaluation shows that respondents strongly appreciate the visual qualities of the mycelium panel. Most ratings were Acceptable (44-51%) or Highly Acceptable (34-48%) across all criteria. For the natural surface texture, 50.6% rated it Acceptable, indicating that the organic texture is visually engaging for art and design. The overall visual appeal received 44.9% Acceptable, showing that the panel suits artistic and eco-centric installations. The earthy color tones also performed well, with 47.2% Acceptable, demonstrating that respondents approve of its natural look that complements eco-inspired themes. Very few respondents rated any aspect as Less Acceptable or Not Acceptable (2-10%), confirming that the aesthetic qualities of the mycelium panel are highly appreciated.

### 3.3 Analysis of Data

#### 3.3.1. Analysis of Observable Characteristics

The observable characteristics of the mycelium-based panels demonstrated that the material developed consistently biological and structural traits that reflect effective colonization and integration of the substrates used. The panels naturally formed beige to soft brown coloration with scattered white patches of mycelium, signifying healthy fungal growth throughout the substrate. Their texture ranged from mildly rough to moderately smooth depending on the level of mycelial coverage, with rougher areas corresponding to higher concentrations of sawdust and fibrous rice straw. The panels exhibited moderate density, compressing slightly under manual pressure before curing but becoming firmer and more structurally stable after the drying process. Visible pores throughout the material created a lightweight structure while also highlighting the organic binding effect of the mycelium. A mild earthy scent further confirmed active and uncontaminated fungal growth. Overall, the finished panels displayed a naturally organic appearance with minor irregularities, reflecting both the biological nature of mycelium composites and their potential practical and aesthetic suitability for sustainable creative installations.

#### 3.3.2. Analysis of Evaluation Results

The evaluation results showed strong overall acceptance of the mycelium-based panels, with respondents indicating that the material performed well across functional, structural, and



aesthetic categories. Users found the panels easy to mount, stable when displayed indoors, and lightweight enough for frequent movement, demonstrating practical suitability for installation environments. The panels were also considered reliable as they maintained form during handling, transportation, and repeated setup, while showing adequate cohesion between the mycelium and the substrates. Respondents emphasized the material's adaptability for multiple installation formats, including wall-mounted, free-standing, and suspended displays, and noted its compatibility with various artistic techniques such as painting, lighting effects, and surface modifications. Sustainability emerged as a major strength, with the material recognized for its eco-friendly and biodegradable properties. Aesthetically, the panels' natural textures and earthy tones were well-received and viewed as visually appealing for environmentally themed exhibits. Overall, the evaluation data, supported by the recent research (Bonenberg et al., 2023), confirm that the panels are functionally dependable, creatively versatile, and visually suitable for sustainable art and design applications.

### 3.3.3. Substrate-Based Sample Analysis

The analysis of the panels produced using sawdust substrate (Heinze et al., 2025) revealed consistent growth behavior and structural outcomes across all samples. Each panel showed successful colonization as evidenced by uniform whitening of the substrate during incubation, indicating effective fungal spread and healthy development. The surfaces varied slightly in appearance due to the natural differences in substrate particle distribution, but all demonstrated cohesive binding and compactness once fully colonized and dried. The texture ranged from moderately firm to dense, suggesting that sawdust contributes stability and structural strength to the final product. A naturally earthy odor was present in all samples, confirming uncontaminated development throughout the growth process. The overall appearance of the sawdust-based panels displayed a uniform, organic composition suitable for artistic or display applications. These consistent results affirm that sawdust is a reliable substrate for developing mycelium-based panels with dependable structural and aesthetic characteristics.

## 4. Discussion

This research demonstrates that locally accessible agricultural waste materials, such as rice straw and sawdust, can be used effectively as growth substrates for mycelium panels. The produced panels have fibrous structures, moderate rigidity, light porosity, and a natural beige-brown color with visible mycelium growth. These findings are consistent with previous studies on mycelium composites, which have shown low-density materials with strong internal bonds suitable for creative design applications (Jones et al., 2020). The produced panels, with their lightness and moderate rigidity, clearly show that bio-fabricated materials can be functional without being heavy or synthetic.

Natural irregularities in the surface and color variations were also noticed on the panels. Such minor irregularities in texture are inherent in bio-fabricated materials and do not affect the integrity of the material. Rather, they add to the aesthetic uniqueness of mycelium composites, adding a natural variation that cannot be achieved in conventional panels produced on a mass scale (Horvath et al., 2025; Ng et al., 2022). The contrast between the smooth surfaces where mycelium has grown and the coarser fibrous parts adds to the natural texture, which was appreciated by the participants in the evaluation process and added to the aesthetic appeal of the panels. Such aspects indicate that the aesthetic appeal of mycelium composites is inextricably linked to the biological nature of the material, where irregularity is not a limitation but an advantage.

An important finding from this research is the feasibility of producing structurally stable panels using low-technology methods (Camilleri et al., 2025). Contrary to other research that takes place in controlled laboratory or industrial environments, our project was able to fully colonize and cohere through simple molding, and modified oven drying. This proves that while growth may be optimized in a controlled environment, it is possible to achieve fully functional mycelium panels using small-scale approach and simple substrate preparation (Elsacker et al., 2019). Although industrial-scale growth may have its advantages in terms of consistency and density, the findings of this research show that even in low-resource environments, it is possible to create functional, structurally stable biomaterials.

The results of the evaluation further supported the usability and practicality of the panels. The participants found them to be light, manageable, and stable for indoor use (table 2). The stability of the panels after drying and the positive response from the participants suggest that

these panels can be easily handled and rearranged without any damage, which is in line with previous studies on the impact of incubation and drying on the rigidity of the composite (Appels et al., 2019). The natural texture and earthy colors of the panels were also greatly valued for aesthetic use (table 5), which further supports the use of mycelium-based materials for artistic purposes related to the environment. The participants were aware of the flexibility of the panels and realized that they could be used in a variety of installation designs, such as wall-mounted, freestanding, or suspended designs, which is essential for artistic and educational purposes.

Sustainability was identified as a central strength of the developed panels. The respondents appreciated the eco-friendliness and biodegradability of the panels, which correspond to the conversion of agricultural by-products, considered as waste, into useful and aesthetic materials (Livne et al., 2022). This research proves that local production with local materials can promote sustainable design practices, which complement existing research on mycelium composites and their sustainability aspects (Amandolese, 2024). The production of aesthetically pleasing panels from waste materials validates the role of the circular economy approach in local artistic and design projects.

Some limitations were found, which included some minor inconsistencies in thickness and surface texture, which are likely due to the compaction process and the natural variability that comes with fungal growth. This type of variability is to be expected in a biological material and suggests areas in which process improvements can be made. Future studies could investigate the use of mechanical pressing, a standardized particle size for the substrate, and more optimized drying conditions. Further validation of the panels' strength properties through quantitative mechanical testing would also help to more accurately compare to previous studies.

This experiment reaffirmed that mycelium panels made from rice straw and sawdust are cohesive, aesthetically pleasing, and environmentally sustainable. The fact that these qualities have been achieved through low-technology means a testament to the fact that functional and innovative biomaterials can be created on a small scale with limited resources. The fact that high levels of evaluation were achieved in terms of usability, adaptability, and aesthetic appeal is a testament to the fact that mycelium panels can be used as a medium for sustainable artistic and interior design projects.

## 5. Conclusions

Based on the findings of this study, it can be concluded that mycelium-based panels represent a viable and promising sustainable medium for creative applications. The research successfully achieved its primary objective of transforming locally available agricultural waste materials, specifically rice straw and sawdust, into structurally coherent and aesthetically appealing panels through a simple, low-tech cultivation process that leverages the neutral binding properties of fungal mycelium. This achievement demonstrates that meaningful sustainable innovation need not depend on sophisticated technology or substantial financial resources, as functional bio-materials can be produced using basic equipment and locally sourced waste.

The physical characteristics observed in the developed panels affirm the effectiveness of the production methodology employed. The panels exhibited consistent organic features including natural fibrous texture, earthy beige brown coloration with white mycelial colonization and effective substrate integration throughout the incubation and drying phases. The mild earthy odor further confirmed healthy uncontaminated fungal growth. Notably, the panels demonstrated an advantageous combination of strength and flexibility, compressing slightly under pressure while regaining their original shape, which enhances their practicality for installation environments where some material may be necessary.

The evaluation results provide robust empirical support for the panel's practical utility across multiple dimensions of usability. Respondents consistently rated the material highly in terms of performance, confirming that the panels are manageable, lightweight, and stable when displayed indoors. The reliability assessments further validated that the panels maintain their form, cohesion, and structural integrity throughout the typical demands of transportation, setup, and repeated handling. Most significantly, the features evaluation revealed strong recognition of the panels' adaptability for various installation formats including wall-mounted, freestanding, and suspended configurations, as well as a particularly noteworthy strength, with respondents clearly valuing the eco-friendly and biodegradable nature of the material.



Aesthetically, the panels received overwhelming approval for their natural surface texture and earthy color tones, which respondents found visually engaging and well-suited to environmentally themed artistic expressions. This aesthetic acceptance is crucial as it confirms that the mycelium panels offer a unique aesthetic language that celebrates organic processes and natural variation, potentially opening new creative possibilities for artists and designers working with biomaterials.

In conclusion, mycelium-based panels offer a compelling synthesis of functionality, biodegradability, aesthetic appeal, and creative versatility. By transforming agricultural waste into valuable material resources, this approach supports circular economy principles and environmental responsibility while simultaneously expanding the creative palette available to artists and designers. The study recommends further refinement of substrate mixtures, formal mechanical testing, and full-scale installation trials to optimize the material's potential. Nevertheless, the current findings firmly establish mycelium panels as a meaningful step toward greener creative industries, demonstrating that ecological responsibility and artistic innovation can indeed grow from the same foundation.

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