Blooming Spaces: Seed Infused Lampshades and Wallpaper in Modern Interiors

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***Abstract*—Conventional lampshades and wallpapers frequently contribute to solid waste owing to short life cycles and the use of non-biodegradable materials such as plastics, vinyl, synthetic inks and chemical coatings. With the growing demand for sustainable interiors, plantable seed paper presents a circular solution that biodegrades and transforms into a plant after its usable life. Although seed paper has been widely adopted in cards and eco-friendly merchandise, its potential in interior decor especially lampshades and wallpaper remains under-explored. This study investigates the feasibility of seed paper for such applications by analysing material performance, aesthetic appeal, user acceptance and post-use plantability. A survey of 36 respondents evaluated awareness of seed-infused decor and the appeal of combinations integrating Indian traditional craft styles. Results revealed high acceptance toward seed-paper lampshades and projected interest in seed-infused wallpaper. Literature supports the biological viability of seed-embedded paper and the environmental benefits of plantable paper-based products. The research identifies a strong market opportunity for sustainable craft-based interiors and proposes design guidelines for seed-infused lighting and wallpaper for modern spaces.**

***Index Terms*—Seed paper; Sustainable interiors; Lampshades; Wallpaper; Plantable materials; Temperature; Innovation**

I. INTRODUCTION

Interior decor industries create significant material waste due to frequent replacements of products such as lampshades and wallpapers, which commonly utilise non-biodegradable materials that ultimately add to landfill burden. Indoor trends are shifting toward sustainable living, where materials are expected to be eco-friendly, low-waste, and value-driven beyond their functional lifespan. Seed paper, a biodegradable paper composed of recycled pulp integrated with plant seeds, is one such circular material that can be repurposed into new plant life after use.

Previous studies confirm the potential of seed-embedded substrates for germination. Research shows that [1] light and temperature are important conditions that affect seed germination and seedling growth. These are the main ecological factors that affect seed germination and are also the basis for determining the normal germination of plant seeds. Different temperatures have a great influence on plant growth and germination. Further studies demonstrate that [2] significant quantities of paper waste have been accumulated in recent years due to environmental concerns, highlighting the need for reuse and recycling. Meanwhile, environmentally responsive product design using plantable papers has been successfully explored in coaster applications, highlighting the sustainability and educational value of seed-based materials [3].

Despite growing proof of environmental and functional benefits, there is a research gap in applying seed paper to interior decor particularly for lampshades and wallpaper, where performance parameters such as translucency, structural strength, heat response, print adaptability and user acceptance become critical. This study addresses that gap.

II. MATERIAL AND METHODS

The study followed seven research stages: observation, questioning, defining the problem, aim, objectives, scope, and literature analysis. The direct variable was seed paper material properties (GSM, texture, thickness, seed type), and the indirect variable was product performance and user response.

2.1. Research Design

The study adopted an exploratory approach combining qualitative and quantitative data to evaluate the feasibility of seed paper for interior applications in lighting and wall finishes.

2.2. Hypothesis

Indirect variable: Seed paper properties (GSM, texture, thickness, translucency, seed type)

Direct variable: Product performance and user acceptance (durability, light diffusion, appeal and willingness to plant after use).

2.2.1. Declarative Hypothesis

Seed paper properties (GSM, texture, thickness, translucency, seed type) positively influence product performance and user acceptance, leading to improved durability, better light-diffusion quality, higher visual appeal, and greater willingness to purchase and plant the product after use.

2.2.2. Null Hypothesis

Seed paper properties have no significant effect on product performance or user acceptance; they do not improve durability, light diffusion, visual appeal, or willingness to purchase and plant the product.

2.2.3. Hypothesis in Question Form

Do the properties of seed paper (GSM, texture, thickness, translucency, seed type) significantly affect product performance and user acceptance in terms of durability, light diffusion, appeal, and willingness to purchase and plant the product after use?

Three testable questions were used: (1) Does seed paper improve the appearance of lampshades/wallpapers? (2) Will seed paper perform well enough for indoor use? (3) Are users willing to purchase and install seed-paper decor? Responses were analysed to determine the effect of the independent variable on user acceptance.

2.2.4. Hypothesis Formulation Steps

Identify the Problem: Uncertainty exists about whether seed paper properties make it suitable and acceptable for interior décor use.

Identify Variables — Independent: Seed paper properties (GSM, texture, thickness, translucency, seed type). Dependent: Product performance and user acceptance.

Link the Variables: Seed paper characteristics may affect durability, light diffusion, visual appeal, and willingness to use or purchase.

Research (Declarative) Hypothesis: Seed paper properties significantly improve product performance and user acceptance.

Null Hypothesis: Seed paper properties have no significant effect on product performance or user acceptance.

Question Form Hypothesis: Do seed paper properties influence product performance and user acceptance?

Testability: Both variables can be measured, tested, and analysed through performance tests and user surveys.

2.3. Survey Study

A structured survey was conducted with 36 respondents to assess:

- Awareness of sustainable interior materials
- Appeal of seed-paper lighting and wallpaper
- Interest in traditional Indian craft integration

Participants consisted of:

- Students: 42.9%
- Working professionals: 28.6%
- Designers/architects: 8.6%
- Homemakers/others: remaining percentage; age distribution indicated sustainability interest primarily among 21–30-year-old millennials (63.9%).

2.4. Testing and Feedback

A user study with **10–20 participants** will be conducted to assess acceptance and performance of the product. The evaluation will focus on four key criteria:

Aesthetic Appeal — Participants will rate the visual qualities of the product, including form, colour, texture, and overall attractiveness within interior settings.

Ease of Use — Feedback will measure how convenient and intuitive the product is during handling, installation, and everyday interaction.

Perceived Durability — Users will evaluate the product's material strength and expected lifespan, indicating whether it appears capable of withstanding regular interior use.

Likelihood of Planting After Use — This criterion examines users' intention to plant the product after disposal, based on its sustainability value, clarity of instructions, and personal motivation.

The results of this evaluation will provide insights into user satisfaction, usability, and potential adoption of seed-infused interior products in real-world contexts.

III. RESULTS AND DISCUSSION

3.1. Survey Findings

41.7% of respondents have previously used eco-friendly decor products. Seed-paper lampshade appeal: Extremely appealing/appealing: 69.5%; Neutral: 27.8%; Not appealing: 2.8%. Craft and sustainability preference (Sometimes/always): 94.4%. These findings indicate strong immediate market potential.

3.2. Insight on Seed-Infused Wallpaper

Although not directly tested, projected user behaviour suggests high emotional value due to the plant-after-use experience. Strong acceptance was noted for symbolic, nature-based surfaces in homes, cafes and coworking spaces.

3.3. Support from Literature

Seed germination performance depends significantly on heat and light conditions, ensuring seed viability in seed-paper wallpaper is biologically feasible [4]. Recycled paper supports successful germination, demonstrating that paper can serve as an appropriate substrate even before planting [5]. Product-based sustainability models using plantable paper support long-term ecological awareness and circular design [6].

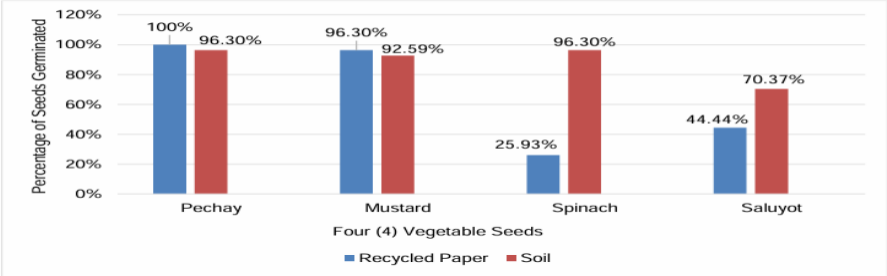

Fig. 1. The percentage distribution of the viability of four (4) vegetable seeds

Table 1. Difference in growth between recycled paper and soil as germination medium

Difference	Medium	Mean (cm)	SD	Mean Difference	t-value	p-value	Remarks
Pechay	Soil	2.83	1.37	1.07	3.73	0.001	Significant
	Paper	1.76	0.91				
Mustard	Soil	3.27	1.61	0.76	1.953	0.057	Not Significant
	Paper	2.51	1.13				
Spinach	Soil	2.28	0.83	0.46	1.304	0.202	Not Significant
	Paper	1.83	0.77				
Saluyot	Soil	1.67	0.50	1.18	7.573	0.0001	Significant
	Paper	0.49	0.23				

With 0.05 level of significance

Figure 1. The percentage distribution of the viability of four (4) vegetable seeds [7]

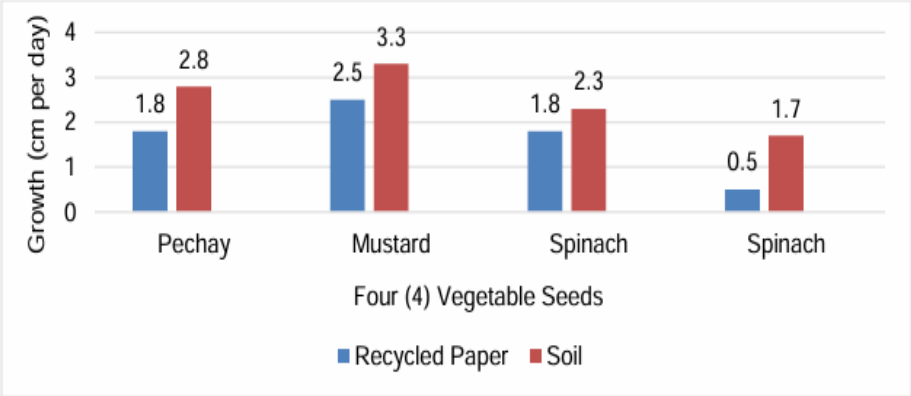

Figure 2. The germination rate of four (4) vegetable seeds using recycled paper and soil as germination medium [8]

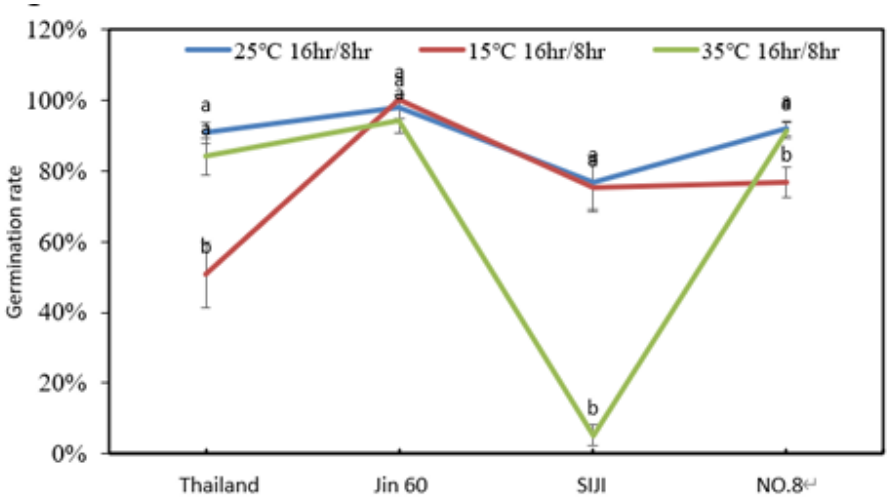

Figure 3. Germination rate of four vegetable seeds under different temperature conditions. Under the same light conditions, seed germination is at the highest level at 25°C, making it the most suitable temperature for germination of these vegetable seeds [9].

3.4. Design Opportunities

Lampshades: Use layered seed paper with heat-safe backing for light diffusion and structure.

Wallpaper: Use sealants that dissolve during planting rather than permanent coatings.

End-of-life motivation: QR planting guides, print cues, perforated cut-and-plant patches.

IV. CONCLUSION

Seed paper demonstrates strong potential as a sustainable material for lampshades and wallpaper. Survey results reveal high user acceptance, strong emotional value and willingness to adopt seed-infused decor, particularly when paired with traditional art motifs. Literature reinforces that seed-embedded papers can support viable germination and provide eco-functional value, making seed-paper interiors a promising circular strategy. This research contributes to sustainable interior design by proposing guidelines for practical application and highlighting market readiness. Future work should include real-scale prototype testing for heat safety, structural performance and long-term durability.

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