Goethe Institut

MY•CO•LAB

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What is mycelium?

- Mycelium is the root structure of fungi, essential to life on Earth.
- It forms a strong, fast-growing underground network after spores land on soil.
- Beyond its natural role, mycelium is now being used to create sustainable, eco-friendly products, offering immense potential for the future.

Why Mycelium?

Sustainability: Biodegradable, reduces waste, and utilizes agricultural byproducts.

Environmental Impact: Lowers carbon footprint and uses non-toxic processes.

Economic Benefits: Cost-effective raw materials with potential for job creation.

Versatility & Applications: Used in sustainable packaging, construction, fashion (mycelium leather).

Health Benefits: High nutritional value in meat substitutes, with medical potential.

Innovation & Research: Drives biomaterials innovation and fosters sustainable practices.

Why Mycelium?

01
Collect old books

02
Spread mycelium in them

03
Let them grow into edible goods

04
Let them grow into edible goods

05
Dehydrate them and use them as modular units

06
Throw them on soil to decompose as nutrient

How Can Libraries Benefit From Mycelium Products

Eco-Friendly Infrastructure

Furniture & Fixtures: Mycelium-based chairs, tables, and shelves for a sustainable library environment.
Building Materials: Eco-friendly insulation, panels, and bricks to enhance energy efficiency and reduce the carbon footprint.

Sustainable Packaging & Supplies

Packaging: Mycelium-based materials can replace plastic and Styrofoam for shipping books, reducing waste.
Supplies: Mycelium can be used to create sustainable storage boxes and display units.

Innovative Learning & Programming

Educational Workshops: Host programs on mycelium to promote sustainability and community engagement.
STEM Programs: Introduce mycelium into STEM curriculum for hands-on learning in biotechnology and environmental science.

Mycelium Byproducts in Libraries

Health & Safety

- Non-Toxic Materials: Mycelium is chemical-free, ensuring a healthier environment for patrons and staff.
- Air Quality: Some mycelium products have air-purifying properties, improving indoor air quality.

Aesthetic & Functional Design

- Design Elements: Unique textures and forms for natural, aesthetically pleasing interiors.
- Acoustic Panels: Sound-absorbing mycelium panels improve acoustics in reading and study areas.

Community & Collaboration

- Sustainability Initiatives: Libraries can lead in promoting sustainability within the community.
- Partnerships: Collaborate with local businesses and researchers on mycelium technology.

WHAT IS OUR PURPOSE?

Our Purpose: To advance understanding and application of mycelium through open-source research, sustainable practices, and community empowerment.

Short-Term Goals:

- Conduct initial experiments and document findings.
- Create and share open-source guides.
- Build a collaborative community platform.

Long-Term Goals:

- Develop a comprehensive mycelium research database.
- Partner with educational and sustainability organizations.
- Innovate and prototype scalable mycelium products.

Item	Estimated Cost ($)
Mycelium Spawn	150 - 600 20
Substrate Additives	- 150 10 - 30
Containers/Molds	20 - 100 50 -
Sterilization	300 30 - 250
Equipment Humidity	50 - 250 0 -
Control Workspace	2100 150 –
Setup	300
Experimentation	480 - 4080
Space Miscellaneous	
Total	

1. Materials

- Mycelium Spawn: This is the primary ingredient. Prices can vary based on the supplier and the quantity.
  - Cost: $30 - $60 per pound.
  - Estimated Quantity: 5-10 pounds for initial experiments.
  - Total: $150 - $600.
- Substrate: Materials for the mycelium to grow on, such as agricultural waste, sawdust, straw, or cardboard.
  - Cost: $10 - $50 per bulk bag.
  - Estimated Quantity: 2-3 bulk bags.
  - Total: $20 - $150.
- Additives: Nutrients to enhance growth (e.g., bran, gypsum).
  - Cost: $10 - $30.
  - Total: $10 - $30.

2. Tools and Equipment

- Containers/Molds: For shaping the mycelium into desired forms (plastic, metal, or custom-made molds).
  - Cost: $20 - $100.
  - Total: $20 - $100.
- Sterilization Equipment: Pressure cooker or autoclave for sterilizing substrate.
  - Cost: $50 - $300.
  - Total: $50 - $300.
- Humidity Control: Humidifier, hygrometer, and misting bottles to maintain appropriate growth conditions.
  - Cost: $30 - $250.
  - Total: $30 - $250.
- Workspace Setup: Clean area setup costs (shelves, tables, clean room supplies).
  - Cost: $50 - $250.
  - Total: $50 - $250.

3. Additional Costs

- Experimentation Space: Renting a small lab space or setting up a controlled environment at home.
  - Cost: $0 - $700 per month.
  - Total (3 months): $0 - $2100.
- Miscellaneous: Other unexpected expenses (e.g., shipping, utilities, small tools).
  - Cost: $150 - $300.
  - Total: $150 - $300.

UMUT’S EXPERIMENTS

SUBJ01

- Mycelium spores
- Paper sheets from a book *(intact)*

SUBJ02

- Mycelium spores
- Paper sheets from a book *(intact)*
- Wheat straw

SUBJ03

- Mycelium spores
- Paper sheets from a book *(torn)*
- Wheat straw

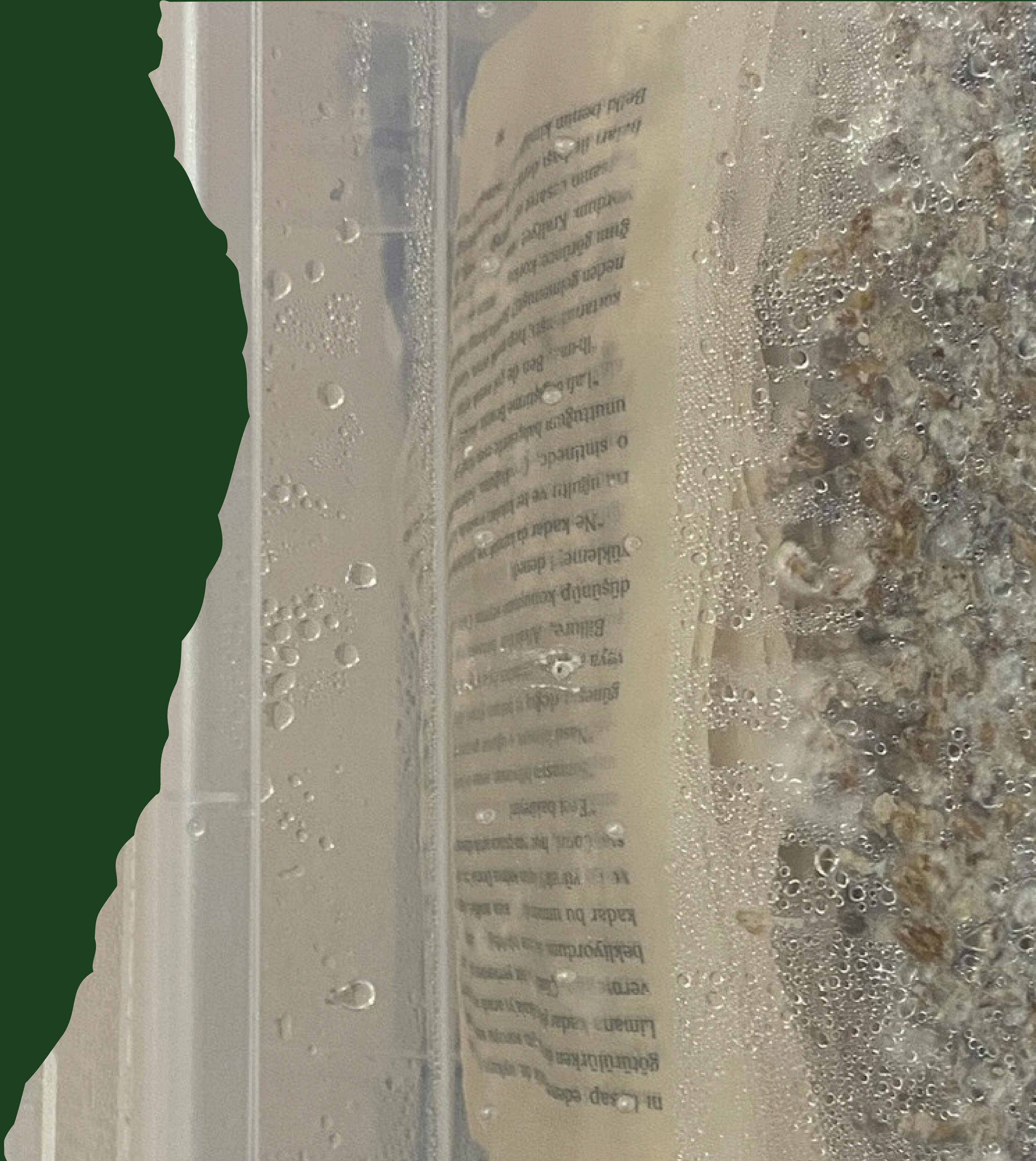
SUBJ01

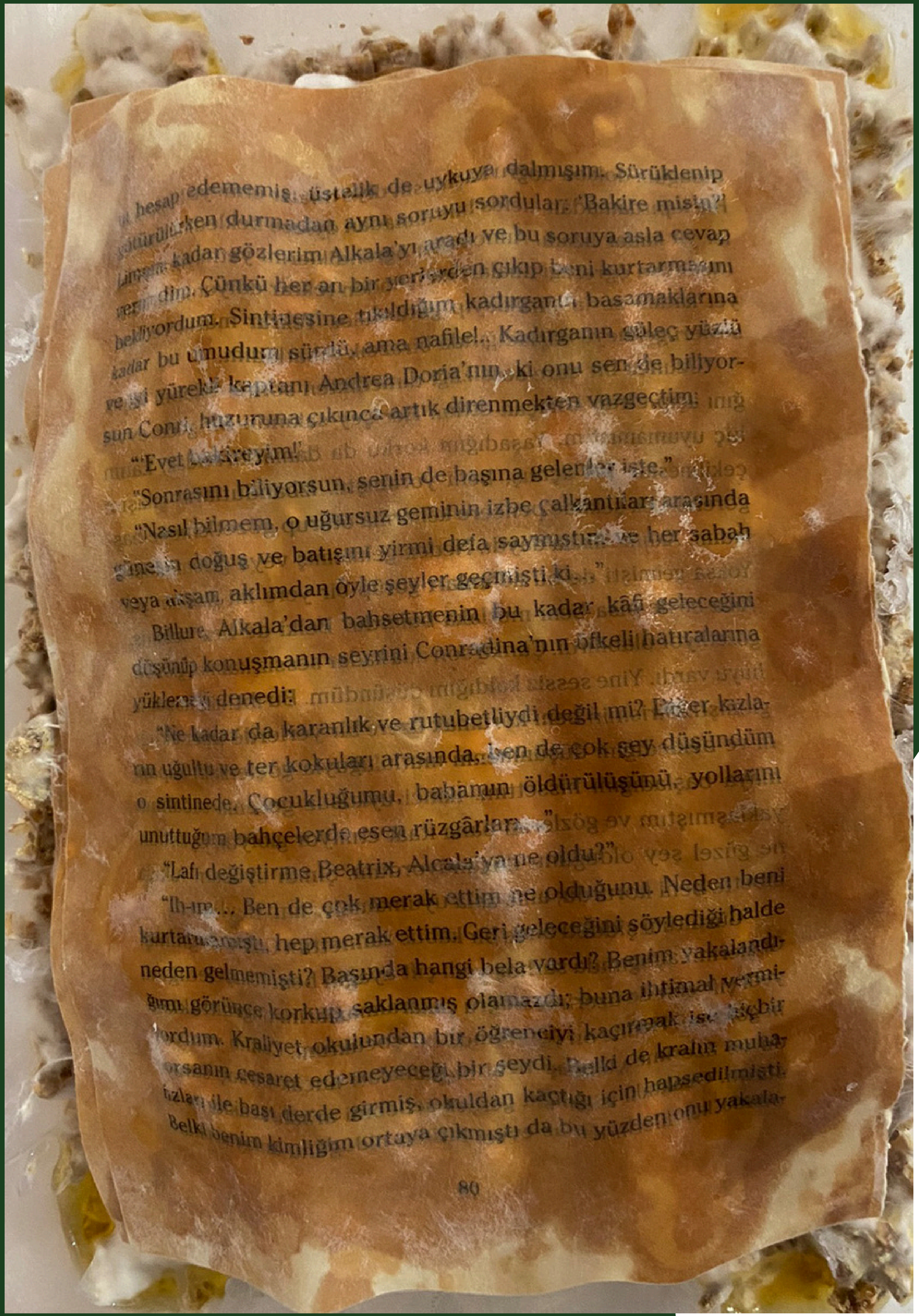
- *mycelium spores*
- *paper sheets from a book (intact)*

Started on 30th of July - Ended 29th of August

Tools utilized in order to create strealized environment:

- gloves
- air-permable tape
- hydrogen peroxide
- cotton
- pot with boiling water





SUBJ01

- *mycelium spores*
- *paper sheets from a book (intact)*

Started on 30th of July - Ended 29th of August

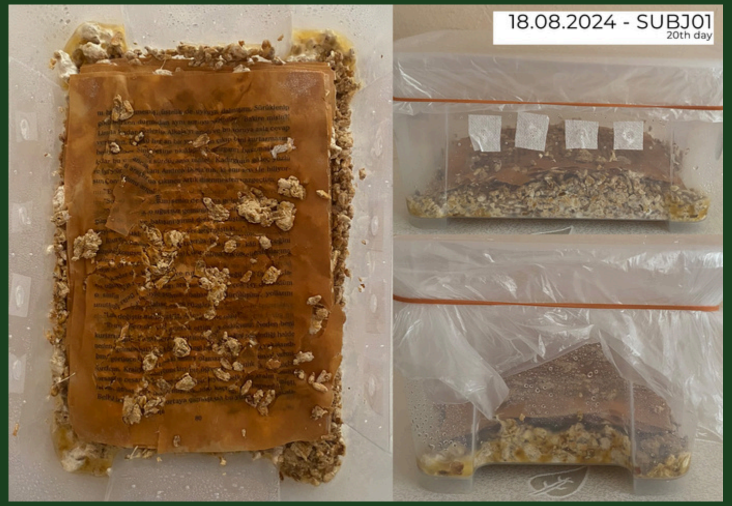
STEPS

1. **Boil the water** to sterilize the sheets.
2. **Create ventilation holes** in the plastic box (on the sides and cover) using a pin, scissors, or utility knife to ensure proper airflow.
3. **Sterilize the box** and the holes with hydrogen peroxide.
4. **Seal the holes** with air-permeable tape after sterilization.
5. **Position the sheets** above the boiling water, ensuring each side receives adequate steam to eliminate any microorganisms.
6. Ensure that the sheets are **damp, not soaking wet**.
7. **Place the sheets inside the container** and layer them with spores.
8. **Close the lid** and store the container in a cool, dark place.

SUBJ01

- *mycelium spores*
- *paper sheets from a book (intact)*

Started on 30th of July - Ended 29th of August



SUBJ02

- *mycelium spores*
- *paper sheets from a book (intact)*
- *wheat straw*

Started on 4th of August - *ongoing*

Tools utilized in order to create strealized environment:

- gloves
- air-permable tape
- hydrogen peroxide
- cotton
- pot with boiling water
- water-permable cloth
- big bucket for soaking straw

SUBJ02

- *mycelium spores*
- *paper sheets from a book (intact)*
- *wheat straw*

Started on 4th of August - *ongoing*

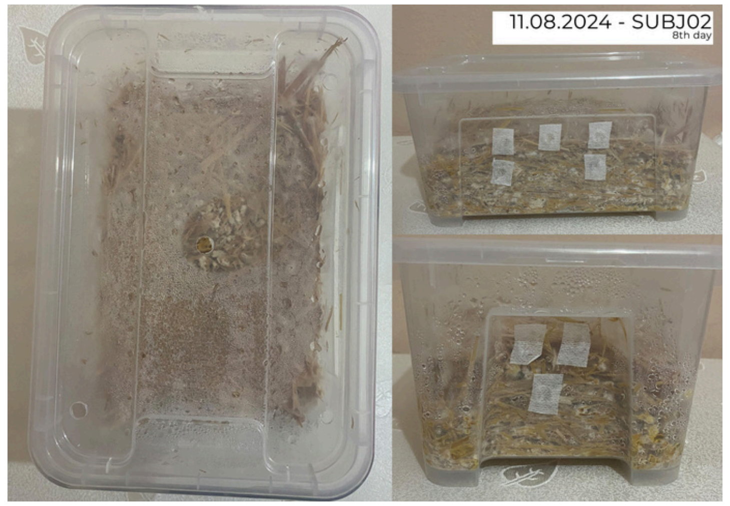
STEPS

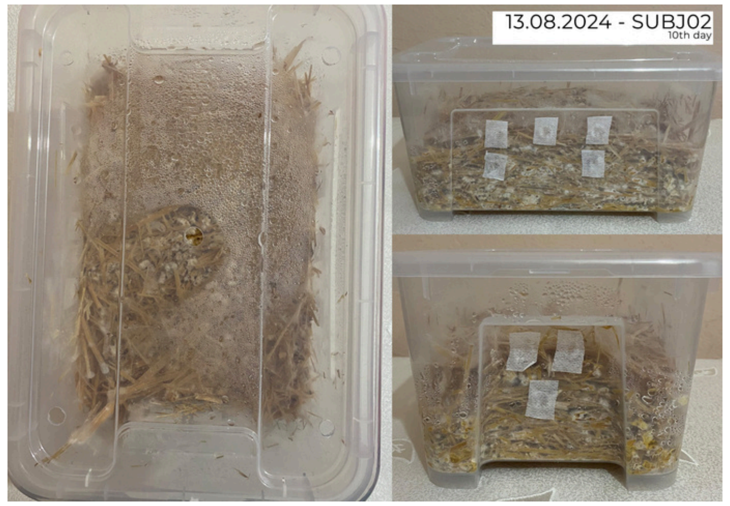
1. **Boil the water** to sterilize the sheets.
2. **Create ventilation holes** in the plastic box (on the sides and cover) using a pin, scissors, or utility knife to ensure proper airflow.
3. **Sterilize the box** and the holes with hydrogen peroxide.
4. **Seal the holes** with air-permeable tape after sterilization.
5. **Place the straw inside a water-permeable cloth** and carefully pour boiling water over it. Allow the straw to remain submerged until the water cools down.Once cooled, remove any excess water by wringing the cloth.
6. **Position the sheets** above the boiling water, ensuring each side receives adequate steam to eliminate any microorganisms.
7. Ensure that the sheets are **damp, not soaking wet**.
8. **Place the sheets inside the container** and layer them with spores.
9. **Close the lid** and store the container in a cool, dark place.

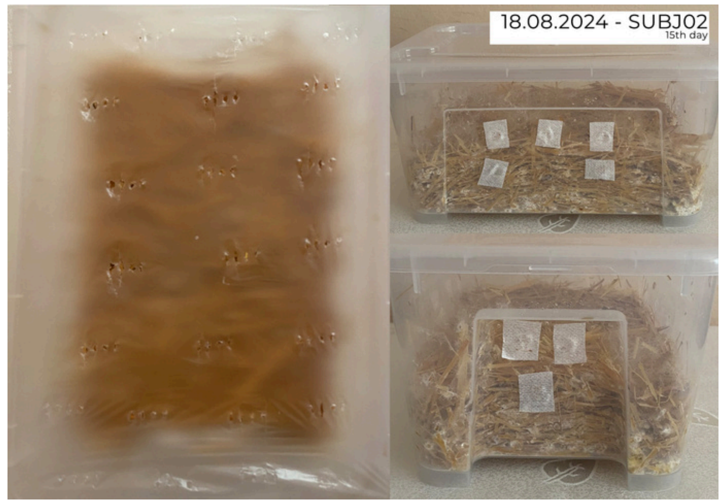
SUBJ02

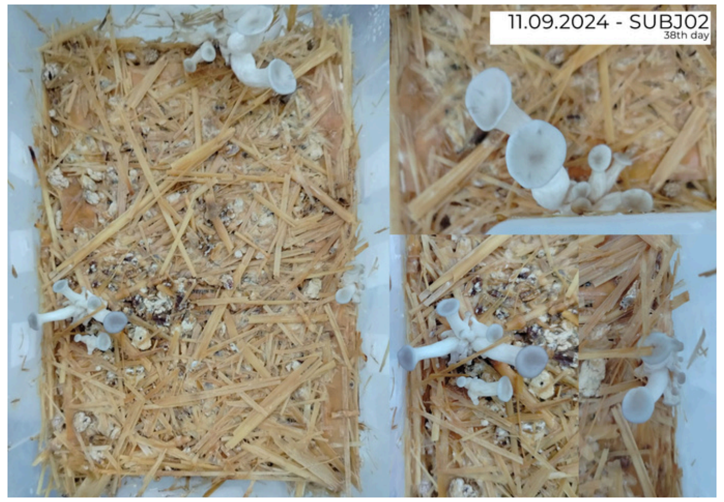
- *mycelium spores*
- *paper sheets from a book (intact)*
- *wheat straw*

Started on 4th of August - *ongoing*









SUBJ03

- *mycelium spores*
- *paper sheets from a book (torn)*
- *wheat straw*

Started on 4th of August - *ongoing*

Tools utilized in order to create strealized environment:

- gloves
- air-permable tape
- hydrogen peroxide
- cotton
- pot with boiling water
- water-permable cloth
- big bucket for soaking straw

SUBJ03

- *mycelium spores*
- *paper sheets from a book (torn)*
- *wheat straw*

Started on 4th of August - *ongoing*

STEPS

1. **Boil the water** to sterilize the sheets.
2. **Create ventilation holes** in the plastic box (on the sides and cover) using a pin, scissors, or utility knife to ensure proper airflow.
3. **Sterilize the box** and the holes with hydrogen peroxide.
4. **Seal the holes** with air-permeable tape after sterilization.
5. **Place the straw inside a water-permeable cloth** and carefully pour boiling water over it. Allow the straw to remain submerged until the water cools down.Once cooled, remove any excess water by wringing the cloth.
6. **Position the sheets** above the boiling water, ensuring each side receives adequate steam to eliminate any microorganisms.
7. Ensure that the sheets are **damp, not soaking wet**.
8. **Tear the sheets into smaller pieces** and add the spores and straw on top. Thoroughly mix the contents to ensure a uniform blend.
9. **Close the lid** and store the container in a cool, dark place.

SUBJ03

- *mycelium spores*
- *paper sheets from a book (torn)*
- *wheat straw*

Started on 4th of August - *ongoing*

Started on 4th of August - *ongoing*

SUBJ02

- *mycelium spores*
- *paper sheets from a book (intact)*
- *wheat straw*

PRO&CONS

- The intact mixture produced greater number of mushroom heads during fruiting, with growth emerging from 4-5 different locations with it's each developing substructures.
- Using straw as a substrate, enhanced the growth, leading to more robust and dense colonization.

Started on 4th of August - *ongoing*

SUBJ03

- *mycelium spores*
- *paper sheets from a book (torn)*
- *wheat straw*

PROS&CONS

- Torn mixture became more colonized by mycelium, it developed a denser, block-like texture.
- Using straw as a substrate, enhanced the growth, leading to more robust and dense colonization.

DANAE’ S EXPERIMENT

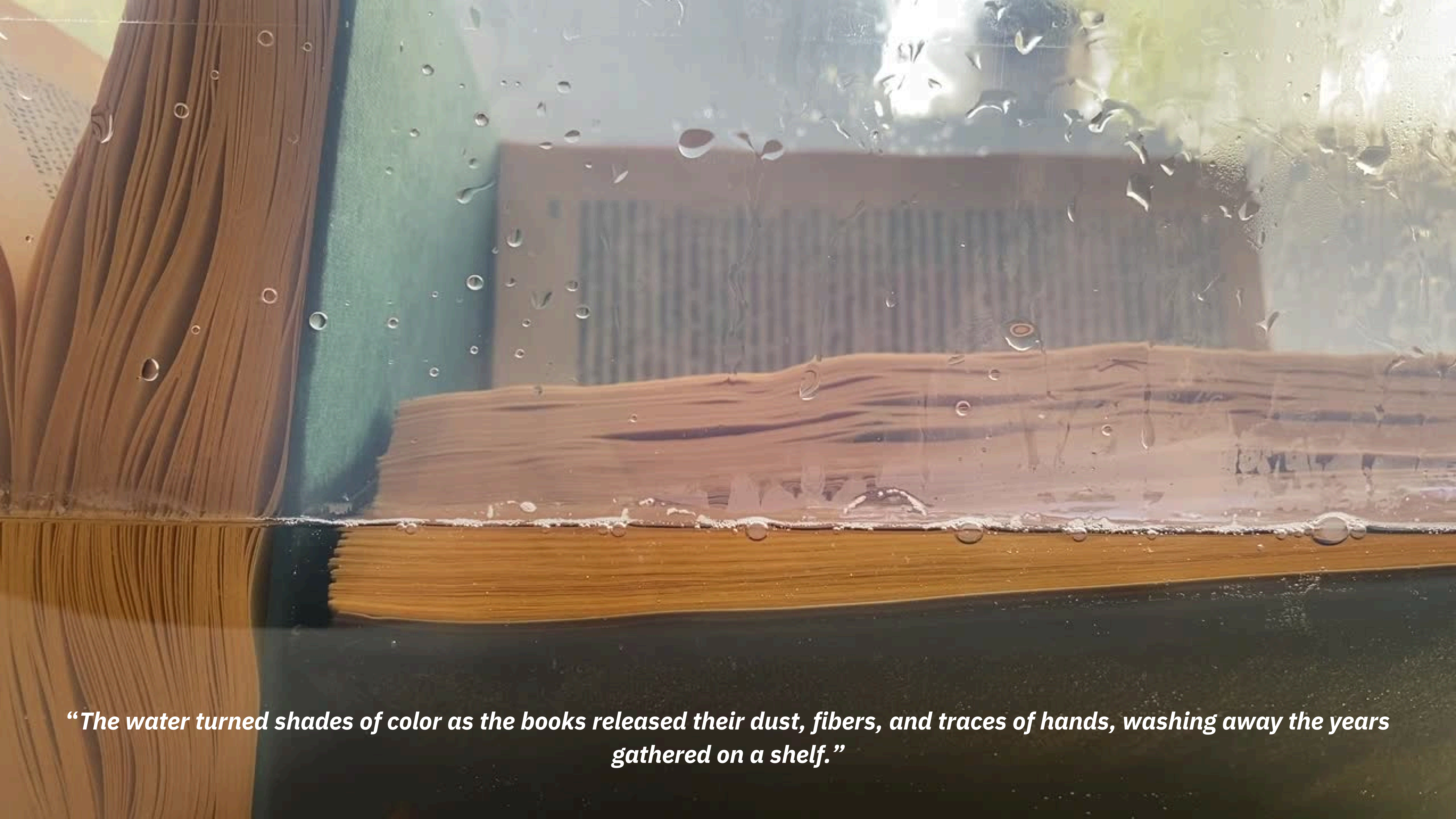
Second hand Books

Steamy picture

At this stage, the old books needed to be **boiled** and **sterilized**.

I **submerged** them in a plastic container with boiling water and let them **sit for a day**.

Afterward, I removed the excess fluid by **squeezing** them.



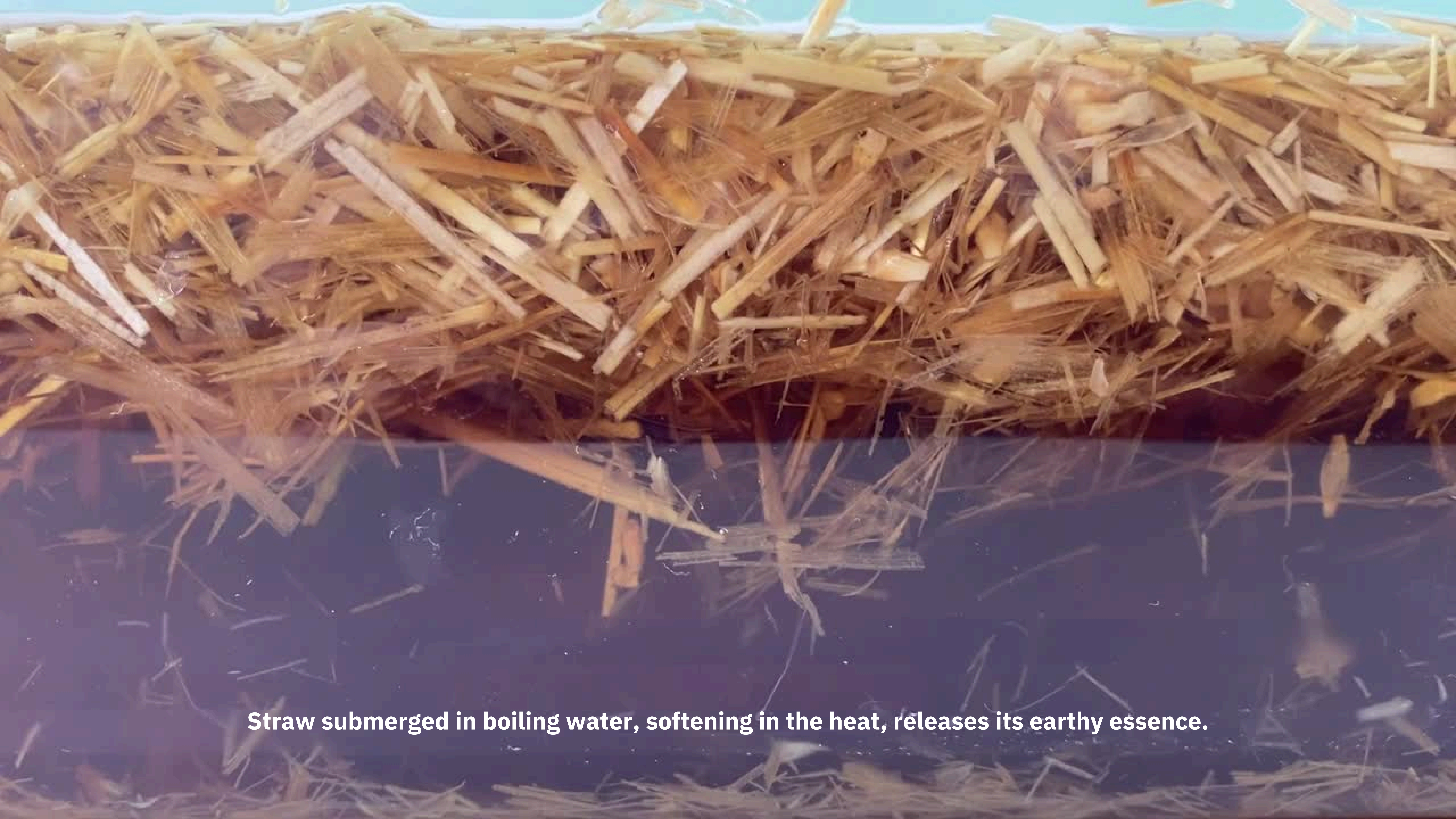
“The water turned shades of color as the books released their dust, fibers, and traces of hands, washing away the years gathered on a shelf.”

Submerged Book

Steamy picture

It was time to sterilize the **straw**.

I followed the same procedure as with the books, using a separate container to keep the ingredients **distinct**, making it easier to evenly **distribute** them afterward.


Straw submerged in boiling water, softening in the heat, releases its earthy essence.

The spores


zak broed
Pleurotus Ostreatus
2000 gram
- Grijze oesterzwam
- Produceert geen sporen
- Na ontvangst koel bewaren
rotterzwam
PM 10 38
8/17
25°C
58%

The mixture

Preparation

The result

A FEW DAYS LATER

Growth

Growth

Latest update

ANY MUSHROOMS YET ?

STILL WAITING

FATMA’ S EXPERIMENT

Preparation

For the beginning, the old paper pieces, straws and oats needed to be **boiled** and **sterilized**.

I have put them in a pan with boiling water and let them sterilized.

Afterward, I removed the leftover water by **draining** them.

1 week later green mold happened in the plastic container and I had to **start again.**

Ongoing Process

For the second experiement:

I have **boiled** the straws and old book pages.

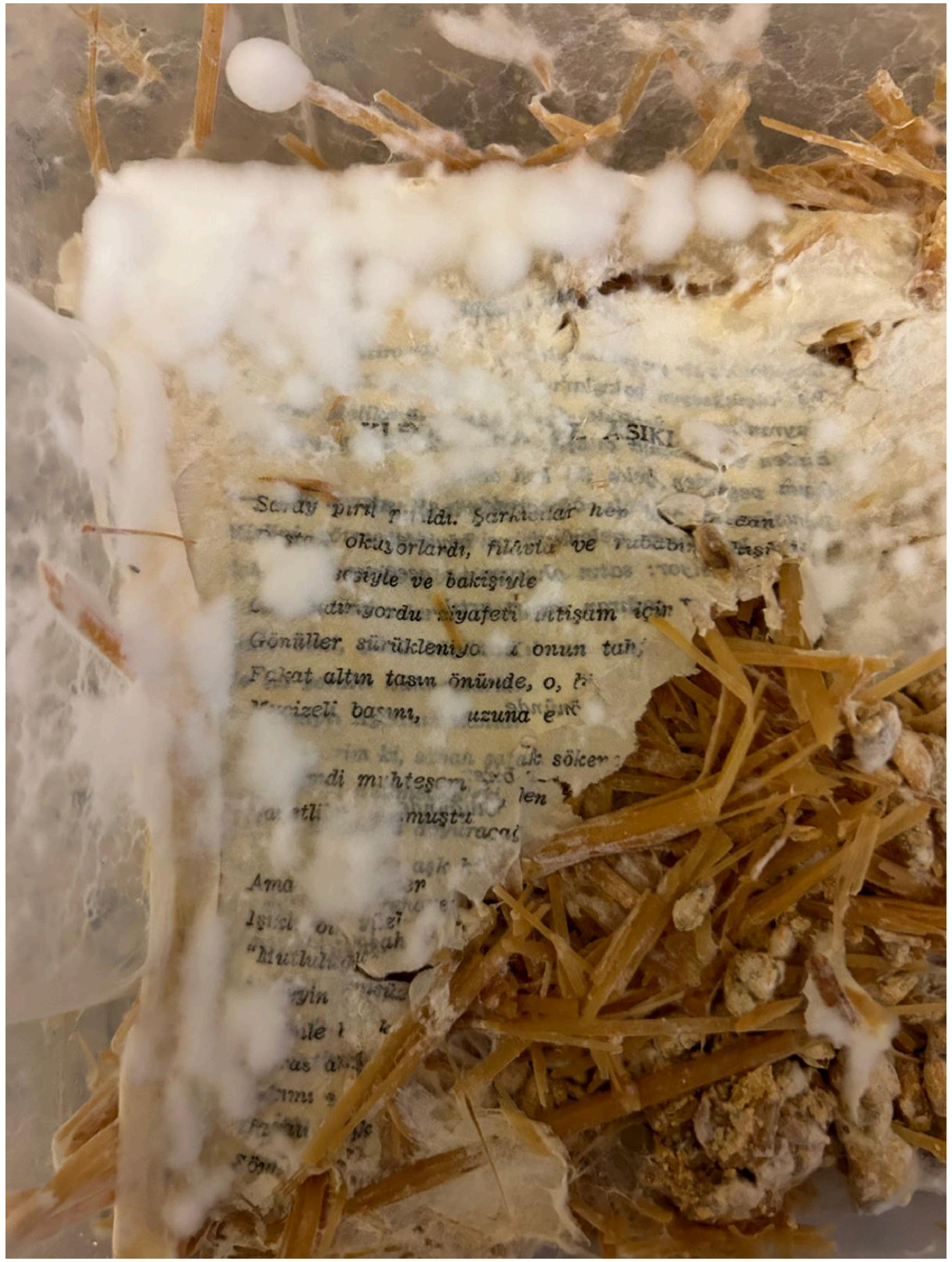
After waiting them to be cooled,
I have placed everything in the plastic container again.

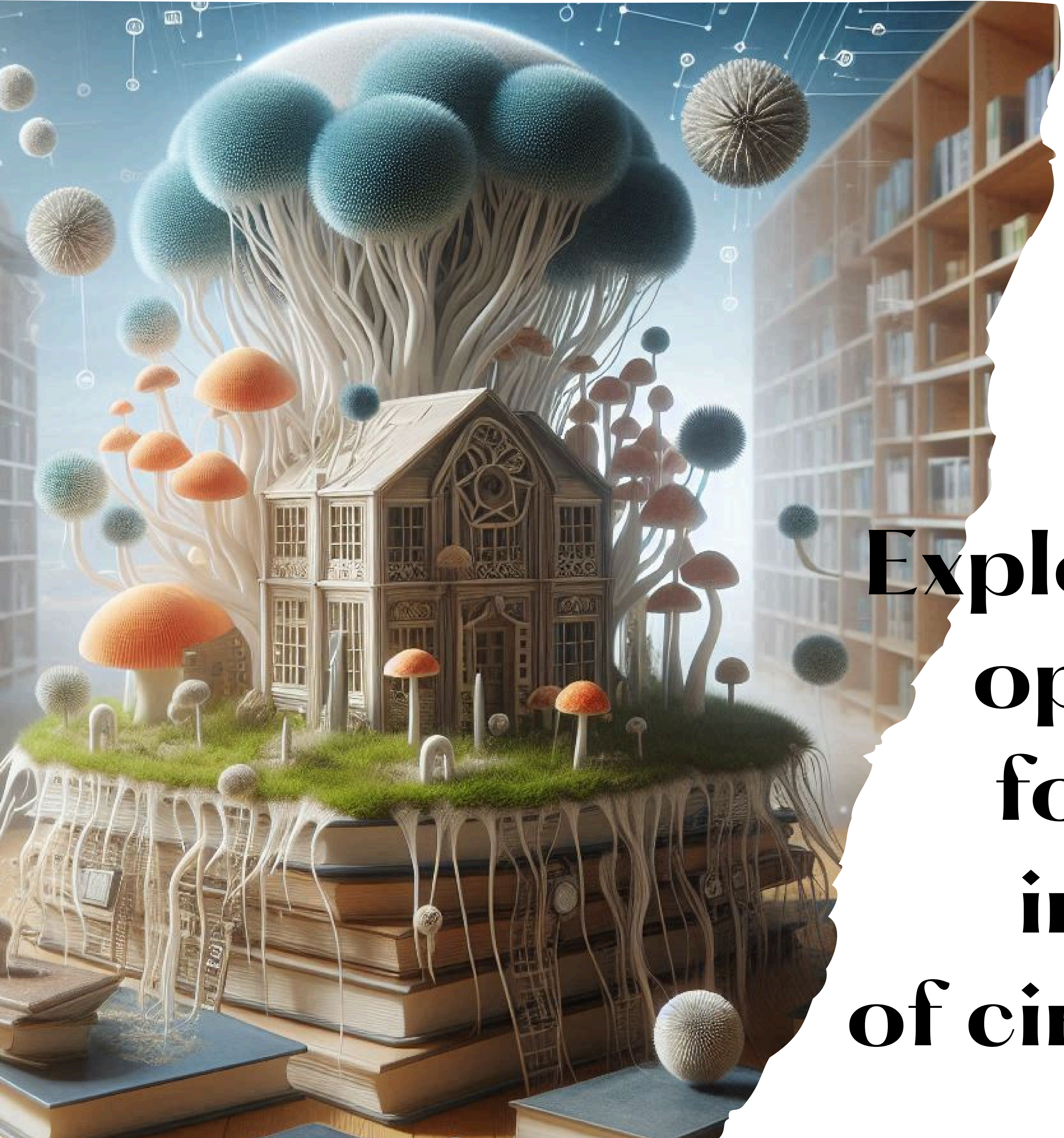
I have **sprayed** them water regularly and make sure they were not getting contaminated.

Latest update

Due to the weather conditions and humidity, the final situtation is going well.

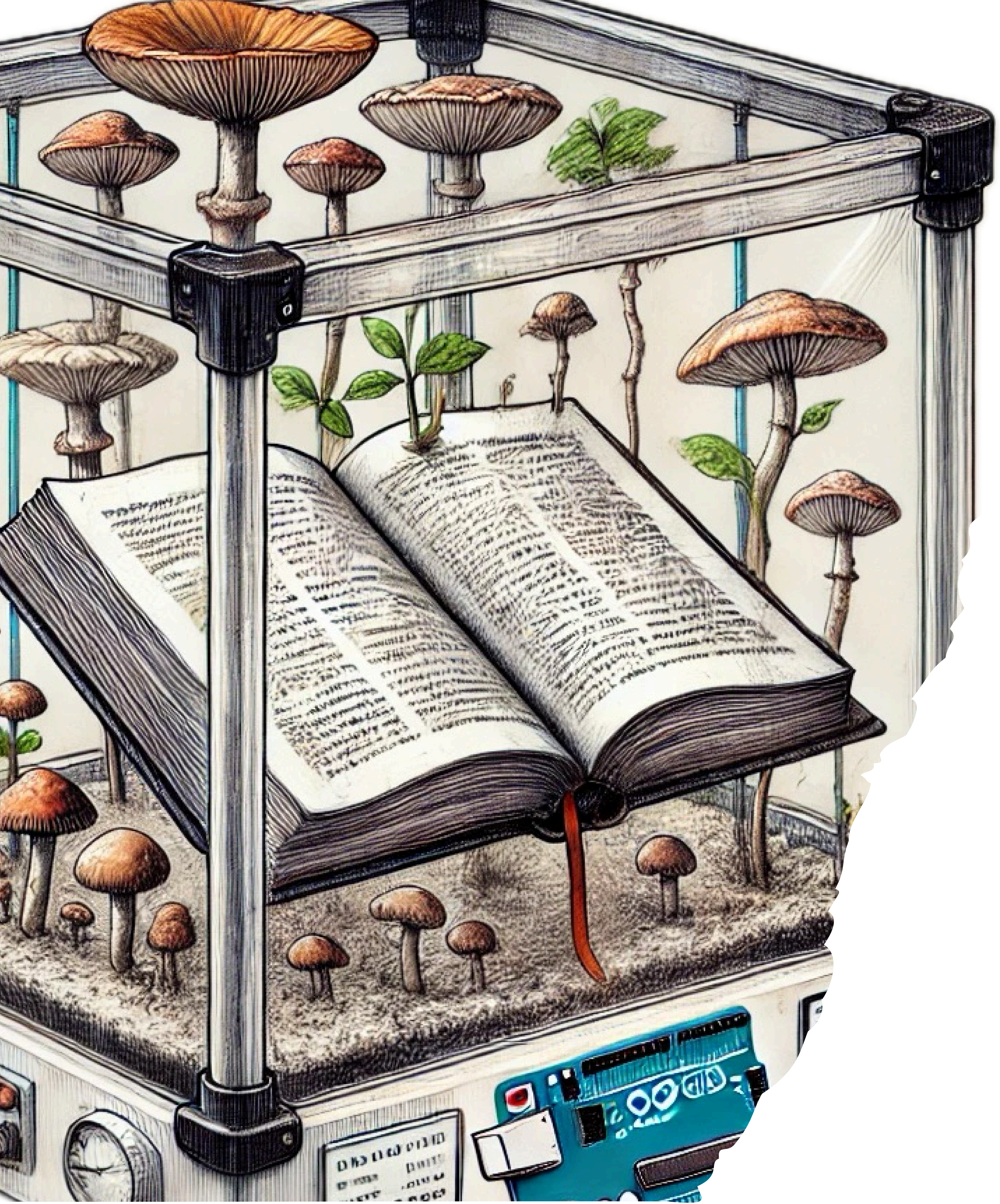
I am waiting to see mushrooms give fruit.





Looking for the future
in fungi

Exploring possible opportunities for mycelium in the cause of circular libraries.



The "Automatic" approach

For this concept, the focus was on bringing electronics together with biology in the process of turning library waste into mycelium.

- Hands-on Learning: Arduino provides a practical, interactive way for kids to understand concepts like automation, electronics, and coding. They can see how sensors and other components work together to create controlled environments for mushroom growth, sparking curiosity.
- STEM Education: Combining biology (mushroom cultivation) with technology (Arduino) integrates science, technology, engineering, and math (STEM), helping kids develop problem-solving and critical thinking skills in a fun and engaging way.
- Automation of Growing Conditions: Kids can use Arduino to automate important factors like temperature, humidity, and light, which are crucial for mushroom growth. This teaches them how automation is used in agriculture and environmental control systems.
- Creativity and Innovation: Using Arduino lets kids experiment with different setups and encourages creativity. They can design unique systems, monitor mushroom growth, and learn how technology can improve sustainable practices.
- Environmental Awareness: Arduino can help demonstrate sustainable growing techniques by showing how technology can make mushroom cultivation more efficient, minimizing waste and resource use.

Overall, Arduino adds an educational, fun, and innovative element to mushroom workshops, blending nature and technology to inspire the next generation of learners.

The "Natural" approach

For this concept, the focus was on using only natural methods to control the growing environment. The inspiration came from terrariums and how they function as small enclosed ecosystems, providing the optimal conditions for growing mushrooms with minimal human intervention.

- Ecosystem Understanding: Terrariums demonstrate how a self-sustaining ecosystem works, teaching kids about natural cycles like moisture retention, humidity control, and air circulation.
- Minimal Intervention: Since terrariums mimic natural environments, kids can see how mushrooms can grow with little human intervention, reinforcing lessons on sustainability and balance in nature.
- Controlled Environment: Terrariums provide a safe and controlled space for kids to observe mushroom growth without the need for complex tools or external equipment, reducing risk while still being educational.
- Mess-Free Setup: Unlike more open growing methods, terrariums keep everything neatly contained, making it easier to manage in a classroom or workshop setting.

- Microclimate Management: Terrariums naturally maintain the right conditions for mushroom growth (e.g. humidity and temperature) helping kids understand how microclimates work and why they're important in cultivation.
- Simplified Growing Process: The natural moisture cycle in terrariums allows kids to see how mushrooms can thrive without excessive intervention, making the growing process less intimidating and more approachable.
- Eco-Friendly Lesson: Kids learn about self-sustaining systems and how natural environments can maintain themselves with minimal external input, fostering an appreciation for eco-friendly methods.
- Designing Their Own Ecosystems: Kids can personalize their terrariums by adding different elements like plants, rocks, or even small decorations, making the experience more interactive and fun.
- Exploration of Biodiversity: In addition to mushrooms, kids can observe other organisms (like moss or small insects) that can coexist within the terrarium, expanding their understanding of biodiversity.

Final Thoughts

It was an amazing journey, at the end of which I feel we've only scratched the surface of the vast potential that lies within fungi. Whether it's the utility and innovative products that can emerge, or the educational and community-building opportunities, one thing is certain: mycelium is a powerful catalyst in opening our eyes and minds to sustainability, the environment, and ecosystems.

This humble organism has the capacity to transform the way we think about our relationship with nature, encouraging us to pursue more sustainable and regenerative practices.