

Project Synopsis

Title:

Mycelium packaging products as a Sustainable Alternative to Conventional Plastic Materials.

Aim:

To grow mycelium bricks using

- vegetable compost mixed with sand as a substrate
- Using coffee grounds
- Using tea leaves
- Using a mixed organic compost.

Theory:

The fungi is a eukaryotic organism consisting of Organs, organ system and loose tissues. There are 4 major types of fungi, namely,

- Phycomycetes
 - Ascomycetes
 - Basidiomycetes
 - Deuteromycetes.
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- These four types of Fungi have **filamentous structures** which are known as '**Hyphae**' and collectively known as '**Mycelium**'. The mycelium might be uninucleated (having only 1 nucleus) or multinucleated (having more than 2-3 nuclei).
 - The **multinucleated** is known as '**Coenocytic**'.

- The nucleus might be **septate (having dividing walls)** or **aseptate (no dividing walls)**.
- Mycelium is the root network of fungi. It grows by colonizing organic matter and naturally binds particles together. When grown in molds, mycelium can form solid, lightweight structures known as mycelium bricks. These bricks are biodegradable, insulating, and require less energy to produce compared to fired clay bricks.
- **Vegetable compost** provides the nutrients needed for mycelium growth, while sand acts as an inert filler that changes density and strength. By curing (heating) the final product, the fungus is deactivated, leaving behind a solid eco-brick.
- **Tea leaves** provide a nutrient substrate. Since tea leaves contain cellulose, hemicellulose, pectin and protein, they can easily help the fungus grow better even in harsh conditions.
- **Coffee grounds** also act as a substrate for growing mushrooms. Since coffee grounds are mostly heated, they become pasteurized and the majority of the micro-organisms which are competitive in nature are removed. Coffee grounds are also rich in carbohydrates and nitrogen, so it is beneficial for mycelial growth.

Materials Required:

- Mushroom spawn (e.g., oyster mushroom)
- Vegetable compost (sifted)
- Sand (clean)

- Tea leaves
- Coffee grounds
- Flour
- Water
- Molds (plastic or wooden)
- Pressure cooker or hot-water bath (for pasteurization)
- Oven (for curing at 70–80 °C)
- Gloves, mask, 70% ethanol (for safety)
- Plastic covering
- Toothpicks (for creating ventilation)
- Weighing balance, scale, ruler

Procedure:

1. Prepare three mixtures of compost and sand in different ratios (e.g., 90:10, 80:20, 70:30).
2. Adjust moisture (~60% by squeeze test).
3. Pasteurize the mixture to reduce contaminants (heat at 70–80 °C for 1 hour). Allow to cool.
4. Mix in mushroom spawn (7–10% by weight) under clean condition with a flour slurry (3 cups of water with 4 tablespoons of flour).

5. Pack the mixture into molds and cover with breathable tape. Label samples.
6. Incubate at 24–28 °C in a dark place for 1–2 weeks until mycelium fully colonizes and binds the mixture.
7. Carefully remove bricks from molds and allow 2–3 more days for edge growth.
8. Cure the bricks in an oven at 70–80 °C for 2–3 hours to stop fungal growth and harden them.

Observations:

- Days taken for full mycelium colonization.
- Visual appearance: whiteness, surface texture, cracks.
- Mass, dimensions, and density after curing.
- Water absorption percentage.
- Compressive strength (tested with weights until failure).

Expected Results:

- Bricks with higher compost content → faster colonization, lower density, higher water absorption.
- Bricks with higher sand content → denser, stronger, but slower colonization.

- Mycelium bricks will be lighter and more eco-friendly compared to conventional fired bricks.