An Experimental Study on Strength and Durability Characteristics of Eco-Friendly Mycelium Bricks

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Introduction

Mycelium is the vegetative part of a fungus, consisting of a mass of branching, thread-like hyphae. It serves as the primary mode of nutrient absorption and distribution in mushrooms, functioning like the roots of a plant. Mycelium plays a crucial role in decomposing organic matter and forming symbiotic relationships with other organisms. Mushroom mycelium is usually grown on wood chips or compost before fruiting bodies appear.

A mushroom's mycelium is integral to its growth, reproduction, and ecological significance. For mushroom cultivation, mycelium is crucial, but also for appreciating the broader ecological impact and potential applications of fungal networks in biotechnology, agriculture, and environmental remediation.

Mycelium bricks are a cutting-edge and environmentally responsible substitute for conventional building materials that have attracted a lot of interest lately. A fungus's mycelium, or vegetative portion, comprises a web of tiny threads known as hyphae. Mycelium can be blended with agricultural waste to create a strong, biodegradable substance that can be shaped into bricks. With its sustainable answer to the environmental problems connected with traditional building materials, this new technology has the potential to transform the construction sector completely.

Objectives

- An Experimental Study on Strength and Durability Characteristics of Eco-Friendly Mycelium Bricks
- Aiming to make furniture and interior design more sustainable.
- Reducing environmental impact by utilizing waste.
- Promoting eco-friendly alternatives to traditional building materials.

- Aiming for Innovation and Optimization.
- Emphasizing Economic Feasibility.
- Concentrating on Customization

Methodology

- Firstly the mushroom mycelium was grown in plastic bags. For this we need some mushroom seeds, straws and water.
- The mushroom seeds are mixed with substrates after sterilization and then some water is added and then the bag is closed and left in a cool and dark place to grow.
- A few chemicals are also added to stop the growth of microbes present in mushroom bags, so that they cannot interfere with mycelium growth.
- It will take somewhat 7 to 10 days to grow the mycelium.
- As soon as mycelium has eaten the substrate, it gets transferred into the brick mold and left for a while until it takes shape.
- In order to get the hardened brick, it must be removed from the mold and dried under the sun to kill the bacteria.

Mycelium Bag

Growing Mushroom

Mixing the Mycelium with substrates

Filling the Mold

Drying the Product

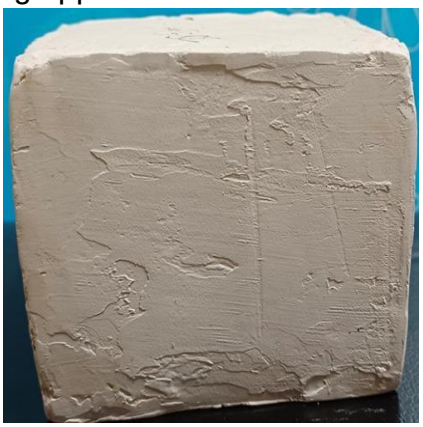
Final Product

Results and Conclusion

- The bricks produced as a result exhibit diminished Strength and durability.
- Specifically, those bricks fabricated from the initial and subsequent trails display reduced stability and binding capabilities.
- Consequently, these bricks are deemed unsuitable for construction purposes owing to their deficiency in strength and durability.
- Conversely, they may find significant applications in interior design and as materials for furnishing chairs and tables.
- In additional considerations, emphasis was placed on augmenting the strength and durability of the bricks by incorporating black soil and lime as reinforcement materials.

- The experiments were conducted to achieve superior outcomes compared to both the initial and subsequent trials, prioritizing their suitability for construction purposes over-furnishing applications.

Brick without any additives



Brick with Carbohydrates and Coated with Putty

Brick with Lime

Brick with Black soil

Conclusions

Mycelium, the thread-like network of fungal cells, serves as a fundamental component in the creation of composite materials, particularly in the realm of green construction. When combined with substrate and additives, mycelium contributes significantly to the material's properties, such as compressive strength, flexibility, and electrical conductivity. These properties are crucial in determining the suitability of a material for various construction applications. One of the key roles of mycelium in composite materials is its function as a binder. Natural fibers from mycelium intertwine with other materials in the composite, effectively binding them together. This binding action enhances the structural integrity of the material, providing it with the necessary strength to withstand external forces, such as compression and tension, making it suitable for use in construction. Mycelium composite materials exhibit a remarkable degree of flexibility. This flexibility allows for the adaptation of the material to different shapes and forms, making it versatile for a wide range of construction projects.

Additionally, the electrical conductivity of mycelium composite materials can be tailored through the incorporation of specific additives.

Innovation in the Project

First Trial:
This trail utilizes mycelium grown from mushroom seeds, that is placed in a mold and dried for a period of seven days in order to create the final brick.
The disadvantage from the first trial was that it had less strength and binding ability

Second Trial:
Using this method, mycelium is grown from mushroom seeds along with the straws. When the mixture is filled, the mycelium is combined with the carbohydrates source (maida) and placed in a mold for seven days to create the brick. Then the brick is coated with putty
When compared to the first trail, there has been a slight improvement in the strength and durability of the binding.

Third Trial:
Using this method, mycelium is grown from mushroom seeds along with the straws. When the mixture is filled, the mycelium is combined with the Black soil and placed in a mold for seven days to create the brick.
The black soil is added to enhance the sustainability and compressive strength of the bricks.

Fourth Trial:
Using this method, mycelium is grown from mushroom seeds along with the straws. When the mixture is filled, the mycelium is combined with the Lime and placed in a mold for seven days to create the brick. The compression strength of mycelium bricks can be improved by experimenting with Lime as binding agent.

Scope For Future Work

- Mycelium bricks have promising potential in sustainable construction due to their eco- friendly nature, lightweight properties, and insulating abilities.
- Investigate advanced techniques such as genetic engineering or bioprospecting to develop custom strains of mycelium with enhanced properties such as faster growth rates, higher strength, or improved resistance to environmental factors.
- Mycelium Bricks become increasingly popular as society seeks greener building materials to reduce environmental impact.
- Research and development in this area could lead to further innovations and wider adoption in the future.