

Method for Cultivating Fungal Mycelia on Liquid Substrates using Porous Ceramic

Researchers at Purdue have developed a novel, sustainable system to cultivate Basidiomycetes and Ascomycetes mycelium and sporocarps (mushrooms) without the need for solid substrates, instead using liquid culture media within reusable porous ceramic structures. Current mushroom cultivation techniques primarily involve growing mycelium within solid natural substrates and the eventual production of mushrooms from the exposed portions of the solid substrate's surface. However, these methods have several drawbacks, including unequal distribution of nutrients in the solid substrate, limited surface area, higher susceptibility to contamination, and slower colonization rate. Additionally, environmental concerns such as high energy expenditures from solid substrate sterilization, deforestation for woodchip-based solid substrate material, and heightened plastic waste from plastic bag cultivation are of great concern. The technology developed at Purdue addresses the pitfalls of conventional mushroom production methods by eliminating the need for traditional solid granular substrates, significantly reducing costs and complexity in cultivation. This novel method will be groundbreaking for the commercial mushroom production industry, plan nurseries, hydroponic farms, and even biotech and pharmaceutical companies.

Technology Validation:

The researchers successfully used the described system to grow fungal mycelium to completion in the air-phase, using only liquid media on an engineered biophysical ceramic substrate for mycelial bioproduction.

Advantages:

- Less prone to contamination
- Scalable bioproduction to manufacturing levels
- Potential for increased automation of fungi cultivation
- Increased efficiency compared to fungi cultivation using solid substrate

Technology ID

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Category

Agriculture, Nutrition, &
AgTech/Controlled Environment
Ag & Alternative Protein
Production

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- Higher mycelial growth rate
- Increased environmental sustainability
- Amenable to cultivation of diverse mushroom species
- Hydroponic cultivation method

Applications:

- Mushroom/mycelium cultivation
- Food, Pharmaceuticals, Fiber
- Bioproduction of vegan leather and vegan meat products
- Biological studies of mycelial growth and symbiotic anaerobic microbes

TRL: 3

Intellectual Property:

Provisional-Patent, 2023-10-04, United States

PCT-Patent, 2024-10-03, WO

Keywords: Hydroponic mushroom cultivation, Liquid media mycelium growth, Substrate-free fungi production, Scalable mycelial bioproduction, Sustainable mushroom farming, Automated fungi cultivation, Reusable ceramic bioreactors, Mycelium-based biomaterials, Vegan meat and leather production, Fungal biotechnology platform