Cultivating Pleurotus ostreatus on Mixed Cloth Waste to Grow Into a Biodegradable Styrofoam Alternative

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Roughly 46 million tons of mixed-fabric waste and 5 billion tons of Styrofoam waste end up in landfills each year. These industries alone account for around 35.5% of all landfill waste. Mixed-fabric textiles are difficult to recycle because separating mixed fibers is costly. Styrofoam is rarely recycled due to contamination from food and low production costs for new material. Both contribute significantly to global plastic pollution and microplastic contamination, harming ecosystems and human health. This project explores using Pleurotus ostreatus (oyster mushrooms) to convert mixed-fabric waste into a biodegradable Styrofoam alternative. Previous studies show P. ostreatus can break down PET, the main plastic in polyester, into organic matter, and companies such as Ecovative have already produced fungi-based packaging materials from organic waste. This study tested whether fabric waste could serve a similar function. Mixed fabric containing polyester, cotton, and spandex was used for this experiment. Mycelium was cultivated on varying ratios of mixed fabric and organic matter to form composite cubes. Each sample underwent weight-bearing tests to assess structural strength, and chemical digestion (30% hydrogen peroxide) plus manual separation that quantified fabric degradation. Microscopy documented structural and morphological changes over time. Results showed that during active mycelium growth, significant amounts of fabric content was degraded. All cubes supported notable amounts of weight and absorbed similar amounts of energy to normal packing peanuts. These findings suggest that P. ostreatus can partially biodegrade mixed fabrics while creating a structurally robust material, indicating strong potential for sustainable, biodegradable Styrofoam alternatives.

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