Waste to Worth: Developing Mycelium-Based Biodegradable Packaging From Agricultural Waste for Local Use

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The rapid increase in agricultural production produces waste that is subject to discarding, burning, and burying, causing severe environmental harm. However, a variety of eco-friendly methods for processing these byproducts are not geared towards local communities. This project addresses this issue by using agricultural waste as a substrate for oyster mushroom (Pleurotus ostreatus) mycelium growth to produce biodegradable packaging. The goal is to not only create sustainable, cost-effective packaging for local use on farms and in schools, but to also assess the sustainability of the items in real-world contexts. Discussions with local farmers also informed the design and applicability of the packaging. Agricultural waste such as corn husks, rice straw, or sugarcane bagasse were chopped, pasteurized, and mixed with commercial oyster mushroom spawn, then packed into trays, panels, and inserts, and incubated until fully colonized. After drying, some samples were coated to test water resistance in comparison to non-coated samples. Uncolonized compressed agricultural waste were molded into the same shapes, serving as the control. The fungal foam samples were then tested for compression strength, water absorption, and fit for intended items. Biodegradability was measured through soil burial tests at 2 and 4 weeks. It was shown that mycelium grown on agricultural waste produced packaging that is stronger and more water-resistant than uncolonized controls with coated samples performing the best within the tests. Overall, this project suggests that sustainable options for processing agricultural waste are possible for rural communities outside of controlled lab settings, provided they are designed to be low-cost, low-energy, and require minimal technical expertise.

Awards Won: