



# CALIFORNIA SCIENCE & ENGINEERING FAIR 2018 PROJECT SUMMARY

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<b>Project Title</b> The Effect of Mushroom Species and Substrates on the Properties of a Novel Biodegradable Material: Mycelium	
<b>Objectives/Goals</b> Mycelium is a new biodegradable, sustainable and eco-friendly material. Mycelium is the vegetative part of a mushroom, made up of cotton-like fibers called hyphae, and acts as natural glue. The goal of our project is to test the effects of various combinations of mushroom species and substrates on the properties of mycelium blocks and to grow mycelium blocks that are strong, effective at insulating heat and sound. Our hypothesis is the best mycelium blocks can outperform Styrofoam, Fiberglass, cardboard and other materials that are harmful to the environment. <b>Abstract</b> <b>Methods/Materials</b> We inoculated various substrates with the mycelium cultures of various mushroom species. We let the mycelium grow in sterilized filter bags for six weeks, and then we grew mycelium bricks and containers for another three weeks. We then tested the physical properties of mycelium blocks of various combinations of mushroom species and substrates, Styrofoams, Fiberglass and cardboard. The physical properties tested include strength (how much weight a brick can support), thermal insulation (how well a container sustains temperature under a constant heat source), and acoustic insulation (how well a container reduces noise decibels from a constant noise source). We further tested the benefits of broken mycelium block pieces on plant growth, and the biodegradability of mycelium. <b>Results</b> Our results show that the strongest brick comes from Reishi grown in sawdust substrates. The containers with the best thermal insulation performance are Reishi with woodchip substrates and Phoenix Oyster with sawdust substrates. Reishi with woodchip substrates container is also the best at acoustic insulation. Overall, there is always a mycelium block that outperforms Styrofoam, Fiberglass and cardboard for each tested category. Our results also show that mycelium material is biodegradable and benefits plant growth. <b>Conclusions/Discussion</b> Our results strongly support our hypothesis that by using the right combination of mushroom species and substrate, mycelium materials can outperform Styrofoam, Fiberglass, cardboard in strength, acoustic and thermal insulation performance. We also discovered that mycelium is exceptionally strong, lightweight, flexible, fast-growing and versatile. With further research, mycelium can replace many non-sustainable, non-recyclable, non-biodegradable, and hazardous materials that are harmful to the environment.	
<b>Summary Statement</b> We grow biodegradable, sustainable and eco-friendly mycelium materials that outperform Styrofoam, Fiberglass and cardboard in terms of strength, soundproofing and thermal insulation.	
<b>Help Received</b>	