Paper for the Planet: Development of a Novel Paper Inoculated With Wildflower Seed and Carbon-Sequestering Fungi

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Background Natural carbon capture is crucial to reduce carbon emissions. While plants store carbon, satellite data exhibits that underground fungal networks capture 36% of carbon emissions. I investigated germinating seeds and mycelium grown on a handmade cellulose-based paper to deliver to disturbed landscapes. Method Slurries of cellulose were created using Pleurotus ostreatus wildflower seeds at 1g/L. The pulp was pressed, molded, and dried into paper. Propagation Paper was re-wet, kept at a constant temperature of 20°C and neutral pH under various conditions: humidity, aeration, light, and placed in a growth chamber. Seed germination and mycelium growth evaluated every other day for a month. Analysis Mycelia Measure is a computer-generated way of measuring mycelial growth. By applying Otsu's method and grayscale thresholding, our program processed heart-shaped images to quantify mycelium growth, yielding accurate results compared to manual calculations. Results Pasteurized cellulose plus Pleurotus spawn, hand stirred at 70rpm produced the ideal pulp. Low levels of Pleurotus spawn in light with adequate aeration proved a higher yield of seed germination. Spawn left in darkness with less aeration led to greater mycelial growth. 45% humidity benefitted both plant and spore. Conclusion Planting the paper on low-nutrient soil was positive as spores and seeds naturally germinated where conditions are less managed but more selective to growth than within a lab setting. This work has implications for planting mycelium/seed paper as land remediation and as a carbon credit source, possibly optimizing space regolith, and as a food source on the International Space Station.