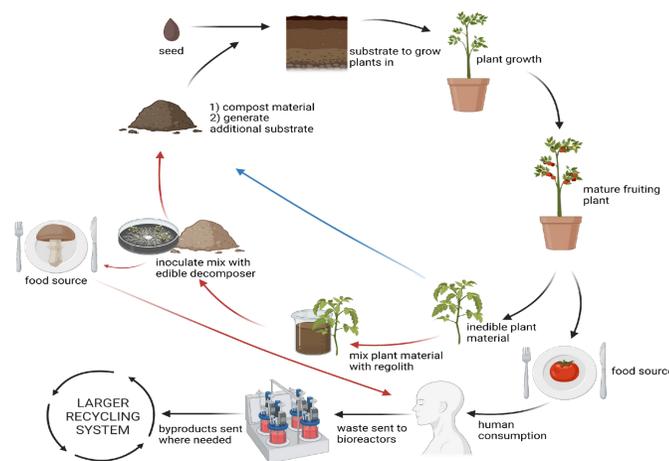


Background

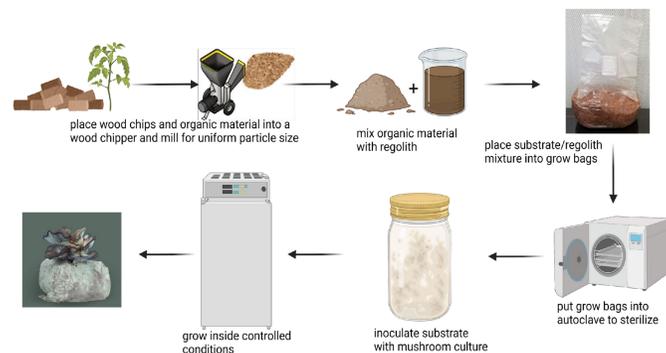
- Incorporating edible decomposers into bioregenerative life support systems could be an efficient method of recycling organic and inorganic wastes for a Martian settlement, while introducing supplemental nutrients.
- We hypothesize that a mix of Martian regolith and compostable biomass will be a suitable substrate for fungal growth and decomposition.
- Here we use *Pleurotus ostreatus* (Pearl Oyster mushroom) as a model fungi due to its ease of growth. In the present study we evaluate:
 - The ability of *P. ostreatus* to decompose organic material in the presence of Martian regolith.
 - The effect of the ratio of organic material:regolith on fruiting body development.

Figure 1. Current Agriculture Plant Waste Stream (1, Blue). Proposed Addition of Edible Decomposers to Plant Waste Recycling System for a Martian Settlement (2, Red). Image made in Biorender.



Experimental Design

Figure 2. Flowchart Showing Procedure of Preparing Substrate and Growing Mushrooms. Multiple Ratios of Organic Material to Martian Simulated Regolith are Tested. Image made in Biorender.



Results

Particle Size (mm)	% Composition
8	0
1.41	49
1	30
0.5	13
0.125	8

Figure 3. Particle Size Percent Composition of Organic Material (OM).



Figure 5. Mushrooms Growing in Varying OM: Martian Regolith Simulant (MRS).

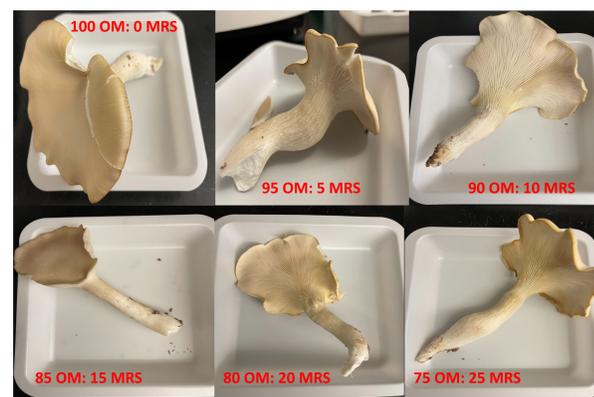


Figure 7. Mushrooms Grown in Varying OM:MRS.

Discussion

- A higher regolith:organic matter ratio results in similar sized mushroom caps and only minor signs of stress on the fungi, with a slight decrease in decomposition efficiency.
- *Pleurotus ostreatus* is a suitable edible decomposer for the suggested plant waste recycling addition and improving soil quality.

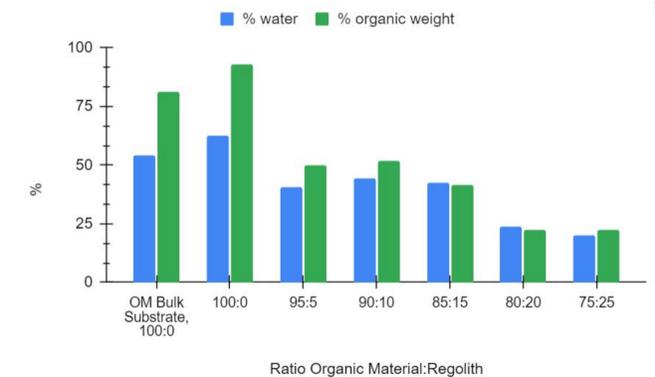


Figure 4. Comparison of Percent Hydration and Organic Weight Across Substrates. Organic Weight Determined Using Loss on Ignition.

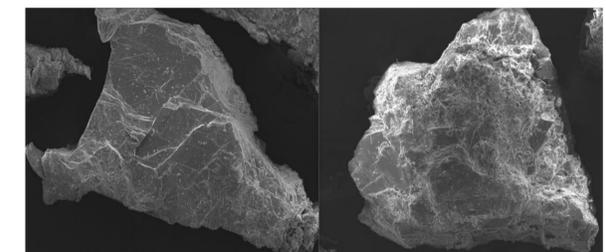


Figure 6. Scanning Electron Microscope Images. Left: MRS. Right: MRS After Mycelium Colonization.

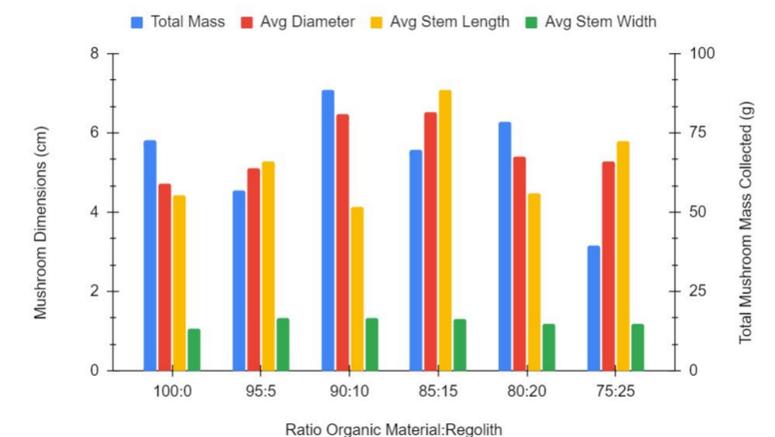


Figure 8. Analysis of Mushroom Dimensions/Mass Compared Across Different Volume Percentages of MRS.