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Development of residual biomass mulch for seedling growth in the Amazon region

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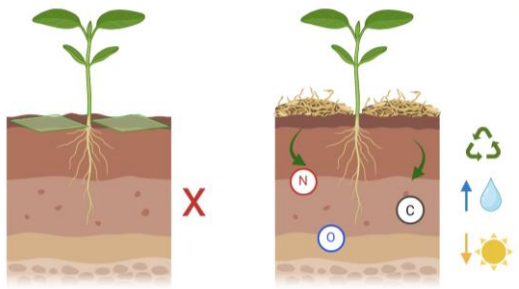
Introduction

Soil: clayey and dry
poor in nutrients

Climate: high temperatures
low humidity



Mulching

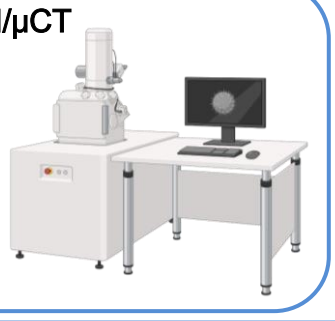


Objective

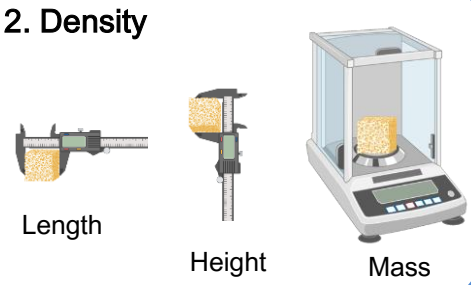
Evaluate the potential of renewable mulch produced from residual and local biomass to be used as soil cover in the Amazon region, focusing on the material's water retention and thermal insulation properties.

Methodology

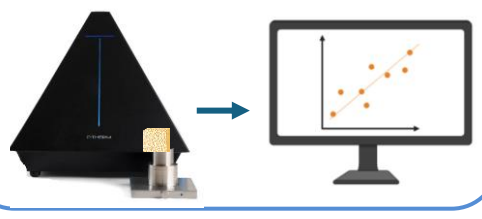
1. SEM/µCT



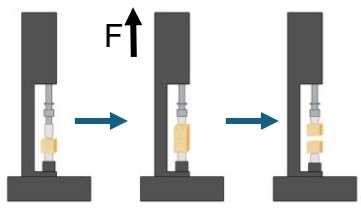
2. Density



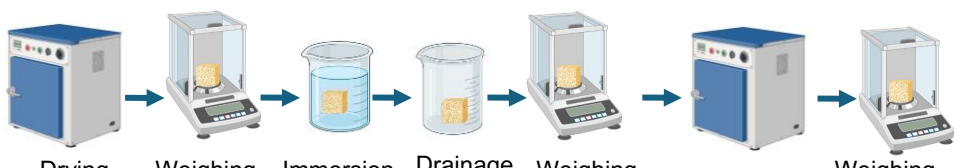
3. Thermal conductivity



4. Mechanical resistance



5. Water retention capacity



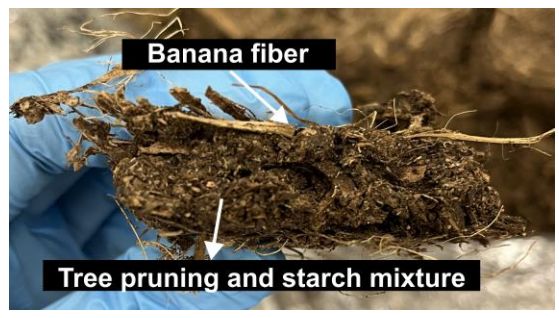
Conclusions

- The composite material exhibited low apparent density, insulating character and a heterogeneous structure;
- High water retention capacity was observed due to its porosity. The effects of water presence on thermal conductivity were found to be reversible, recovering its property after drying;
- The heterogeneous structure with differences in the orientation of banana fibers and component distribution influenced the material resistance, leading to a non-uniform mechanical performance;
- The material structure and composition will be adjusted to improve mechanical resistance, water retention capacity and thermal isolation suitable for Amazon region to be applied as a green mulch material.

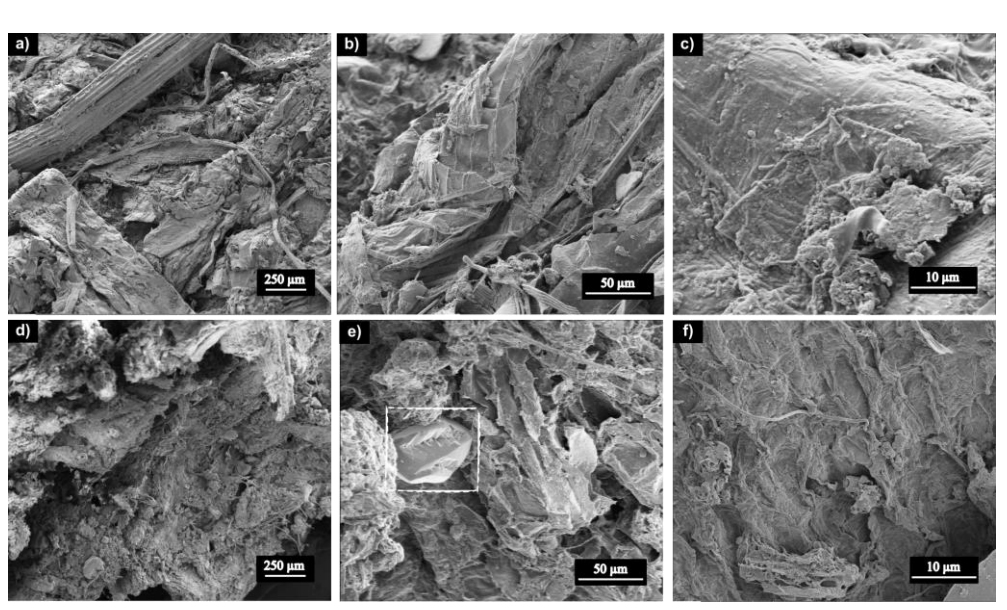
Results and Discussion



Top view



Side view



Heterogeneous structure
Presence of cracks

Folded banana fibers
Presence of mineral particles

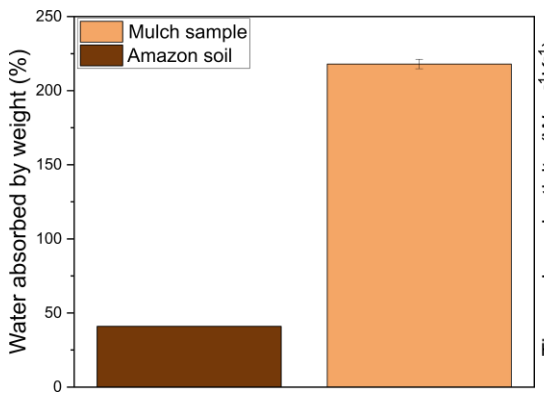
Low porosity



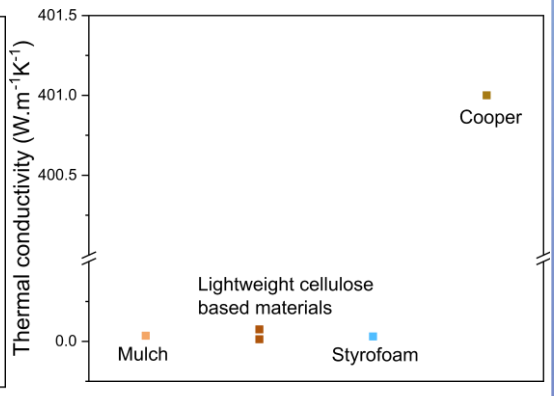
Presence of banana fibers, structural defects and mineral particles.

Material	Density (g.cm^{-3})
Mulch	0.26 ± 0.05
Lightweight cellulose-based materials	0.0002 – 0.49
Cellulose	1.5

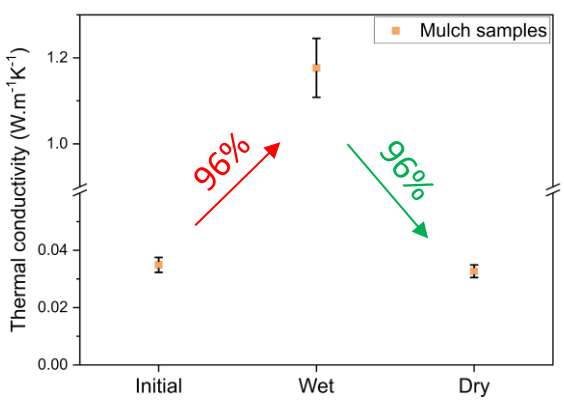
Low density contributes to water retention capacity and thermal insulation.



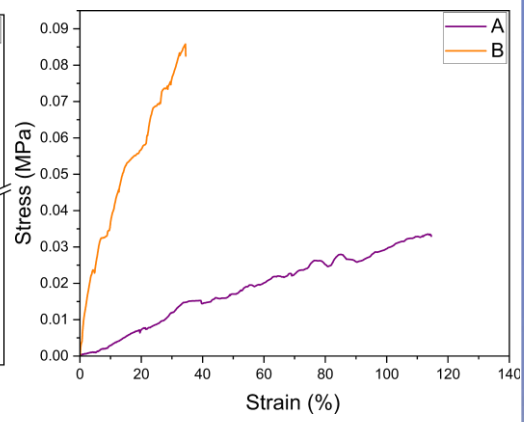
Mulch retains significantly more water than Amazonian soil.



The low thermal conductivity indicates good insulating performance.



There is a reduction in the insulating capacity of the material, which is recovered after drying.



Differences in tensile behavior are associated with the heterogeneous distribution of banana fibers in the material.

References and Acknowledgments

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