Flexible Fungi

Characteristics of mycelium

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Introduction

Fungi have been a topic of interest in the field of sustainability due to a list of qualities. They can be used in the form of biocomposites, vegan leather, and packing material. Research focused on only a select number of species for the before mentioned applications. However, almost no research is being done into other options.

This project will contribute to the broader research being conducted by Ilse Rovers into mycelium.

The goal of this project is to find if there is correlation between the structure and morphology of mycelium growth in different species and their mechanical properties.

Method

1. Create growth curves of 14 species (23 strains). The species are selected based on risks, diversity, taxonomy, origin, etc.
2. Determine the biomass.
3. Regrow on a membrane on the strain's preferred growth medium.
4. Perform the tensile tests on mycelium sheets using the Universal Testing Machine (UTM) to determine elasticity and strength. For the tests NEN 527-3 was edited and used.
5. View the structure of the hyphae under the Scanning Electron Microscope (SEM). Important factors include thickness, density and air cavities.

Results

The growth curves of all strains were measured and visualized in graphs. The growth on malt extract agar (MEA) can be viewed below. Based on the growth, biomass, and taxonomy three strains were chosen for further testing.

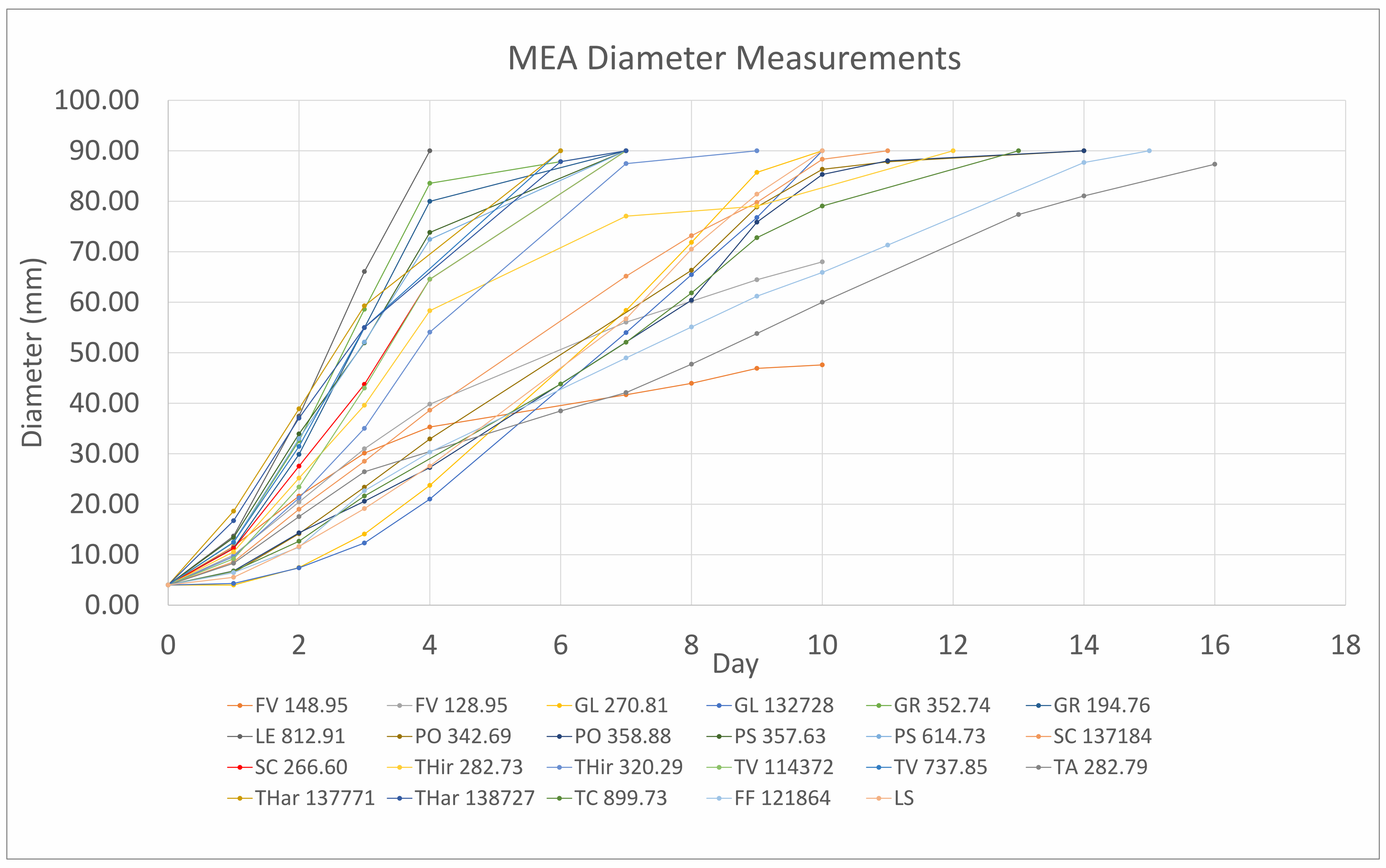

Figure 1: Growth curves of 23 strains visualized in a graph. The diameter of growth (mm) is plotted against the days.

Results

Examples of a mycelium grown at the laboratory can be viewed below. The morphology of the growth can vary depending on the medium and species.

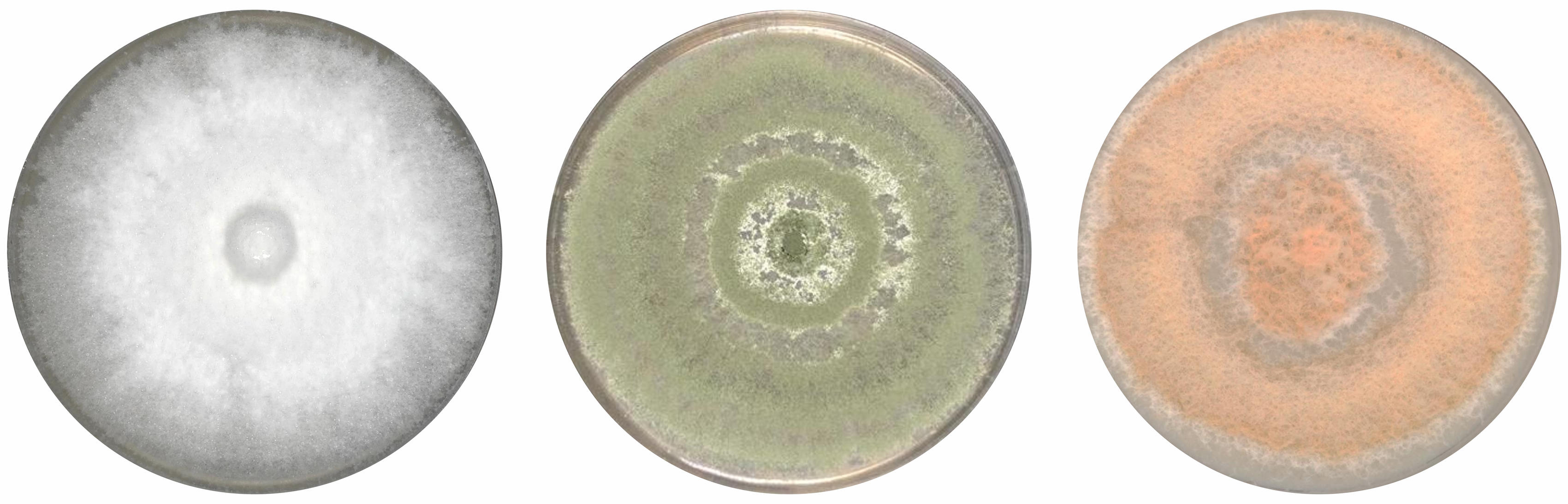

Figure 2: Mycelium of Schizophyllum commune (left), Trichoderma harzianum (middle), and Fusarium aff. venenatum (right).

The sheets are made from two layers of mycelium, which can be seen in the images below. The thickness measured is of a singular sheet, excluding aerial hyphae.

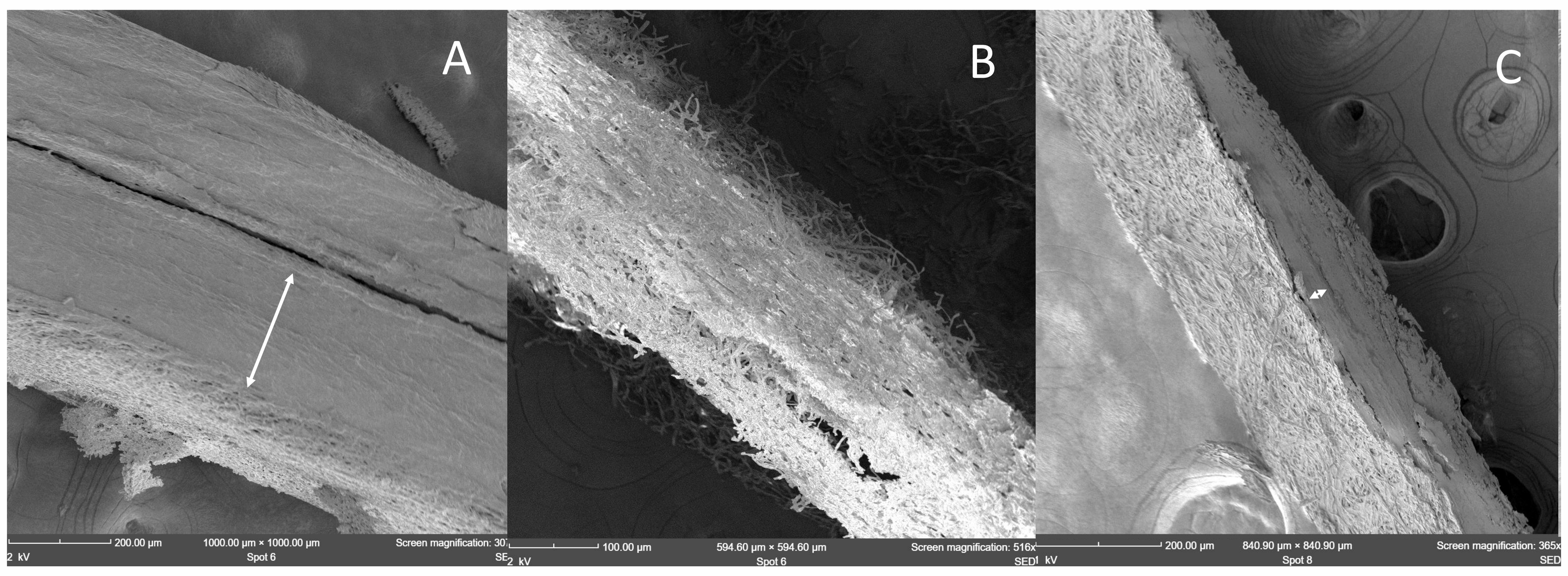

Figure 3: SEM images of mycelium sheets made from Schizophyllum commune (A, magnified 307x), Trichoderma harzianum (B: magnified 516x), and C: Fusarium aff. Venenatum (C: magnified 365x).

Table 1: Results obtained from tensile testing. The thickness was determined using the SEM images.

	Schizophyllum commune CBS 266.60	**Trichoderma harzianum CBS 137771**	**Fusarium aff. venenatum CBS 148.95**
Force (N)	7,46 ± 1,71	2,26 ± 1,10	12,69 ± 5,31
Strength (MPa)	1,71 ± 0,49	1,88 ± 1,07	15,25 ± 7,09
Thickness (µm)	217,2 ± 19,1	N/A	38,6 ± 14,3
Elasticity (MPa)	8,30 ± 3,71	6,49 ± 0,99	9,11 ± 2,79

Conclusion

Based on the current results no correlation can be found between the mechanical and microscopical properties of mycelium. It appears that the density influences the amount of force the mycelium can withstand, though it does not affect the ultimate strength. However, more work is still being done gather data and build a stronger case.

References

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