Ein Bild, das Schwarz, Dunkelheit enthält.

Automatisch generierte Beschreibung

**Theory Chapter**

**MyceliumTent**

**The biodegradable tent**

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# Mycelium

The development of the MyceliumTent is focused on replacing existing nylon and plastic tent fabrics with a mycelium based fabric, in order to make it biodegradable.

## 1.1 Definition

Mycelium is the underground root Network created by a mushroom organism. Fungi nourish themselves by secreting digestive enzymes to break down organic material in their surrounding and absorb it through the cell walls of the Hyphen, their root network (Moore,2024) . Various different types of fungi produce mycelium. The interest in this project is a fungus with a high growth rate, suitable for the production of biocomposites. In this case it is possible to use the oyster mushroom (Mihai Bogdan,2016).

Moore, D., Ahmadjian, V., & Alexopoulos, C. J. (October, 2024). Fungus. Encyclopedia Britannica.

Nicolcioiu Mihai Bogdan, Gabriela Popa, and Florentina Matei. "Mushroom mycelia cultivation on different agricultural waste substrates." *Scientific Bulletin. Series F. Biotechnologies* 20 (2016): 148-153.

## 1.2 Potential of mycelium

The potential of this material lies in the low carbon footprint, low energy and processing cost and the biodegradability (Alaneme, 2023, 234-250). The most common use cases in the industry so far is leather, packaging material or composits used for construction. Challenges are the lack of standardized treatment in the development of the material. This project explores especially the biodegradability, breathability, durability, water and fire resistance as needed to construct a tent fabric.

Alaneme, K. K., Anaele, J. U., Oke, T. M., Kareem, S. A., Adediran, M., Ajibuwa, O. A., & Anabaranze, Y. O. (October, 2023). Alexandria Engineering Journal, 83, 234–250. <https://doi.org/https://doi.org/10.1016/j.aej.2023.10.012>

# Environment

This chapter explores different properties of mycelium bio-composites (MBC). MBCs are “composed of an agricultural residue, a non-living material, colonized by a fungus” (Amziane et al., 2023, S. 740). As of today the full potential of MBCs has not been found and different production processes and growth combinations (types of fungi and substrates) are continuing being tested and compared.

2.1 Mycelium bio-composites

Some important properties for this product are sound absorption, thermal conductivity and moisture buffering value. These properties highly differ depending on substrate-fungus combination. Research of fifty unprocessed MBCs has found that the sound absorption coefficient differs from 0.5 to 0.95 depending on the frequency, showing they are a good sound absorber. (Amziane et al., 2023, S. 749). The thermal conductivity value was found to be between 0,057–0,085WM−1k−1 and the mean moisture buffering value 1.632 (Amziane et al., 2023, S. 749). However no clear values of water resistance could be found, although it is possible to coat the MBC in biodegradable Polyurethanes or beeswax for extra water resistance.

2.2 Mycelium-based leather

One of the products of MBCs in use today is mycelium-based leather (MBL). Research has shown that the order of polyporales fungi, specifically the fomitella fraxinea, in combination with a substrate made of sawdust and rice bran, is best suitable for the production of MBL (Raman et al., 2022). After harvesting, the composites are plasticized (with a biodegradable mixture) and hot pressed making a leather like material. These processes increase the tensile strength, elongation percentage and reduces the water absorption. MBL has a mean tensile strength of 8.49 MPA, can elongate up to 58.86 % and has a water contact angle of up to 129.63°, making it hydrophobic (Raman et al., 2022).

2.3 Biodegradability

Depending on the used fungi and substrate, the duration of the biodegradation can vary. For example using Pleurotus ostreatus on a bamboo-based substrate coated with beeswax for increased water resistance, shows a mass reduction of 64.13% after two months. (Gan et al., 2022). However due to insufficient research done on biodegradability of other MBCs no definite information can be given on the biodegradability of class sharing fungi like polyporales.

Amziane, S., Merta, I., & Page, J. (Hrsg.). (2023). *Bio-based building materials: Proceedings of ICBBM 2023*. Springer.

Gan, J. K., Soh, E., Saeidi, N., Javadian, A., Hebel, D. E., & Le Ferrand, H. (2022). *Temporal characterization of biocycles of mycelium-bound composites made from bamboo and Pleurotus ostreatus for indoor usage.* Scientific Reports, *12*(1), 19362. <https://doi.org/10.1038/s41598-022-24070-3>

Raman, J., Kim, D.-S., Kim, H.-S., Oh, D.-S., & Shin, H.-J. (2022). *Mycofabrication of Mycelium-Based Leather from Brown-Rot Fungi.* Journal of Fungi, *8*(3), 317. <https://doi.org/10.3390/jof8030317>

# Structure and Setup

There are several construction options available for tents. To determine the most suitable option for our purposes, this section evaluates the advantages and disadvantages of the most common tent designs. Hilleberg, a manufacturer of high-quality expedition tents, prioritizes ease of use, which aligns with the criteria important for our product. Therefore, their approach to tent construction serves as a relevant reference for this analysis. Hilleberg categorizes its tents by label, with the Yellow Label being the most applicable to our needs, as these tents are designed for use during snow-free months and in protected environments, or in warmer climates (Hilleberg, accessed October 12, 2024). <https://hilleberg.com/eng/discover/our-label-system>

The two most common constructions are Tunnel Tents and Dome Tents.   
Tunnel tents provide the best space-to-weight ratio, making them ideal for mobile journeys where the tent is frequently set up and taken down. Their lighter overall design is advantageous for users who carry their gear during the day. However, tunnel tents are less stable in windy or snowy conditions and typically require pegging to remain upright.

In contrast, dome tents offer greater stability, particularly in adverse weather conditions such as snow or high winds. They are better suited for base camp setups, where they can remain stationary for extended periods. Some dome tents are freestanding, which eliminates the need for pegging and makes them useful in terrains like rocky or gravelly soil. Despite these advantages, dome tents tend to be heavier and provide less space for the weight they add.

<https://hilleberg.com/eng/discover/choosing-the-right-tent> (accessed October 12, 2024)

In addition to tunnel and dome tents, instant tents represent another construction option that has gained popularity in recent years due to improvements in ease of setup. These tents combine features of both tunnel and dome designs, offering a balance between spaciousness and stability. Instant tents are particularly advantageous for users seeking quick and simple setup, often requiring minimal effort. However, they are generally not designed to withstand harsh environmental conditions such as strong winds or heavy snow, making them more suitable for mild weather and less extreme environments   
Outdoor Life. (May, 2024). The best instant tents of 2024, tested and reviewed. [https://www.outdoorlife.com/ gear/best-instant-tents/](https://www.outdoorlife.com/gear/best-instant-tents/)

# Marketing

The analysis of the marketing of camping tents and outdoor equipment is based on the use of strategies leveraged to reach and engage consumers globally, in Europe and Switzerland. Nowadays, the use of social media is a key focus for product promotion and customer loyalty through targeted advertising and influencers.

## 4.2.1 Worldwide Market

In 2022, the global camping tent market reached a total value of USD 2.65 billion. The future of this market is positive; in fact, it is set to grow further to USD 4 billion by 2028. This positive outlook is possible due to the increase in outdoor recreation and nature tourism.

Expert Market Research. (October, 2023). Global camping tent market report and forecast 2023–2028. [https:](https://www.marketresearch.com/Expert-Market-Research-v4220/Global-Camping-Tent-Forecast-35387212/)

[//www.marketresearch.com/Expert-Market-Research-v4220/Global-Camping-Tent-Forecast-35387212/](https://www.marketresearch.com/Expert-Market-Research-v4220/Global-Camping-Tent-Forecast-35387212/)

## 4.2.2 European Market

According to reported projections, by 2029 the European camping tent market will grow significantly, reaching a value of USD 1.50 billion. The analysis covers various product categories, materials, and capacities, highlighting the increasing demand for innovative and practical solutions in line with new camping trends.

Arizton Advisory & Intelligence. (May, 2024). Europe camping tents market - industry outlook and forecast 2024–2029. <https://www.arizton.com/market-reports/camping-tent-market-europe>

## Swiss Market

The analysis of the camping tent market in Switzerland focuses on growth trends driven by increased outdoor activities and investment in sustainable materials. Changes in consumer preferences are also part of the analysis.

6Wresearch. (November, 2023). Switzerland camping tent market - industry outlook and forecast 2023–2030. <https://www.6wresearch.com/industry-report/switzerland-camping-tent-market>

## 4.2.3 Marketing Strategies

Key marketing strategies for outdoor brands are analyzed based on their impact on their audiences. In fact, content posted on social media is strongly considered, facilitating one’s visibility through influencers, who play a key role on product promotion and customer loyalty.

Michigan MITech News. (January, 2024). Most important strategies to market your outdoor brand effectively. <https://mitechnews.com/guest-columns/most-important-strategies-to-market-your-outdoor-brand-effectively/>

# Safety