ABSTRACT BOOK

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Environmental impact on moss cultivation and biomass regulation

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Sphagnum mosses are vital for peatland ecosystems, sequestering vast amounts of carbon. However, degradation of Ukrainian peatlands necessitates active restoration through cultivation. Studies prove that *Sphagnum* cultivation accelerates natural recovery, offering a sustainable tool for climate-oriented biotechnologies in medical, agricultural, and industrial sectors.

Optimal *Sphagnum* growth requires high humidity, acidic pH, and low mineral concentration. To produce standardized biomass, axenic clonal cultures in liquid submerged media are recommended. Research shows that adding ammonium nitrate and specific sucrose concentrations (16–20 g/L) significantly boosts growth while maintaining morphological similarity to natural plants (Parsons et al., 2025).

Cultivation efficiency depends on photoperiod (ideally 16-hour light / 8-hour dark), light intensity, and hydrodynamic stability. Implementing photobioreactors can achieve a 50-fold *Sphagnum* biomass increase. Critical factors include stable CO_2 supply and optimal mixing to prevent pH fluctuations. Furthermore, transcriptomic approaches are recommended to optimize molecular growth regulation (Beike et al., 2015).

In large-scale systems, environmental factors like light, temperature, and CO_2 levels regulate morphogenesis and metabolic dynamics (Mohanasundaram et al., 2022). Additionally, maintaining species-specific microbial symbionts is crucial for heat tolerance and nutrient uptake (Živković et al., 2025).

Field experiments indicate that fast-growing *Sphagnum* species with lower N:K ratios (e.g., *S. palustre*) are most suitable for intensive bioreactor cultures. These species exhibit better flooding tolerance and higher carbon accumulation rates (Käärmelahti et al., 2023).

Integrating microbiome management with controlled photobioreactor conditions makes *Sphagnum* a powerful resource for carbon sequestration and advanced eco-technologies. Further studies are required to evaluate the impact of cold priming on the survival and establishment of lab-cultivated *Sphagnum* biomass within degraded peatlands.