Abstract

Development of Solid-State Fungal Fermentation for Production of Alternative Protein Based on Agro-Industrial Side Streams

The transition toward more sustainable food systems requires the development of nutritionally adequate and climate-friendly protein alternatives. In this study, we developed a mycelium-based deli product using solid-state fermentation (SSF) of plant-based substrates, with particular focus on valorization of Danish agro-industrial side streams.

A major substrate investigated was the fiber- and protein-rich byproduct from potato starch production, representing a substantial and underutilized resource in Denmark. The objective was to explore the feasibility of producing a minimally processed, nutritionally improved, and sensorially appealing alternative to conventional meat-based cold cuts.

A systematic screening of substrates—including legumes, cereals, and root vegetables—was conducted, alongside optimization of key fermentation parameters such as oxygen availability, pH, fermentation time, and substrate thickness.

Fermentations were evaluated based on fungal growth performance, texture development, and sensory characteristics. Compared to submerged fermentation, SSF offers advantages including reduced water and energy requirements and the ability to ferment side streams without extensive pre-treatment.