Session Cross-cutting: April 13th 09.00 hrs

5s4a: : Waste reduction and novel resources for sustainable production of safe food or feed

Bioconversion of Wood Residue into Protein-rich, Edible Fungal Mycelium

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With a growing world population and increasing prosperity, conventional protein production based on livestock and crops appears to be climate-unfriendly, resource-intensive, and nitrogen inefficient. To feed the planet sustainably, we need alternative protein-rich food sources that are good for both environmental and human health. One of such sources is edible fungi, which have a nice protein profile (20~30% of dry matter, containing all the essential amino acids), fast growth rates, and low production costs. Fungi-based proteins are hence promised as ”the future of fake meat”.

Currently, the most common route to produce fungal protein is mushroom cultivation. However, this industry is generating a large amount of pesticide-rich substrate that often ends up as waste, hence reduces its circularity. Inspired by the solid-state fermentation technology (SSF) in food processing and waste management sectors, we hereby propose an innovative technical solution to this issue, which applies SSF to the raw woody biomass with edible fungi as the bio-converter. We hypothesize that by optimizing the fungus strain, substrate properties and reactor design, we are able to steer the process towards improved mycelium production and higher bio-conversion efficiency. The resulted wood-mycelia mixture is supposed to contain less lignin but more protein and dietary fibre, which should be safe and wholesome for human consumption (similar to tempeh). To the best of our knowledge, published research on this topic from our perspective is very few.

In this regard, we aim at developing a controlled, continuous, and contamination-free SSF system that can efficiently convert wood to nutritive mycelial biomass by the edible fungus Pleurotus Ostreatus (oyster mushroom). The focus of this specific presentation is the effects of different nutrients addition regimes on mycelial growth, lignin degradation, protein production, and bioconversion efficiency based on our first proof-of-principle experiment. The possible mechanisms of the fugal response to changes in nutrients will also be discussed. We hope by doing this research we can contribute to the

understanding of fungal physiology and provide advice on nutrient addition strategies for similar bio-engineering processes.

Keywords: wood residue, edible fungi, protein, bioconversion, solid-state fermentation