

The growth of mycelium covering with sufficient oxygen permeation of PVC plastic food wrap

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ABSTRACT

Mycelium-based composite (MBC) consists of the filamentous fungi of mushrooms; mycelium, forming the network with the biodegradable agro-waste particles. MBC can be shaped in plastic molds; however, a higher density of mycelium was observed at the MBC surface exposed to the air (MBC/Air) than the MBC contact with plastic mold (MBC/Mold). Consequently, MBC was demolded to get the uniform growth of mycelium on the substrate. This study investigated the effect of the oxygen transmission rate (OTR) of two different thin film materials; PVC plastic food wrap and stencil paper, on the growth of mycelium of oyster mushrooms on the sawdust. Each thin film was covered between the MBC and polypropylene (PP) mold in the configurations of MBC/Film/PP Mold. The OTR of thin films was measured according to ASTM D3985. The results were compared with the OTR of rigid PVC tube, PET-G, and PP cast, which used a mold for shaping the MBC in previous literature. It was found that the mycelium was higher density in MBC/PVC film/PP and MBC/stencil paper/PP than the top surface of MBC/Air. OTR of stencil paper and PVC film were 11,777.78 cc-mm/m²/day and 143.88 cc-mm/m²/day, respectively, which were higher than rigid PVC tube (3 cc-mm/m²/day), PET-G (9.7 cc-mm/m²/day) and PP cast (76 cc-mm/m²/day). Despite the higher OTR found in stencil paper than in PVC film, the mycelium at MBC/PVC film/PP was denser than MBC/stencil paper/PP. This suggested that the sufficient oxygen transmission through the film contact with the MBC surface was necessary for the mycelium to grow homogeneously. Shaping the complex geometry of MBC can be possible without using the rigid plastic mold, yet only PVC plastic wrap is acceptable. The mechanical properties of MBC will be further investigated.

Keywords: Mycelium-based composite; Oxygen transmission rate; Thin film; Bio-based materials; Fungal biocomposite