

The Study on Enhanced Micro Climate of the Oyster Mushroom Cultivation House with Multi-Layered Shelves by Using Computational Fluid Dynamics Analysis in Winter

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Abstract : Oyster mushrooms are one of the ingredients that Koreans prefer. The oyster mushroom cultivation house has multiple layers in order to increase the mushroom production per unit area. However, the growing shelves in the house act as obstacles and hinder the circulation of the interior air, which leads to the difference of cultivation environment between the upper part and lower part of the growing shelves. Due to this difference of environments, growth distinction occurs according to the area of the growing shelves. It is known that minute air circulation around the mushroom cap facilitates the metabolism of mushrooms and improves its quality. This study has utilized the computational fluid dynamics (CFD) program, that is, FLUENT R16, in order to analyze the improvement of the internal environment uniformity of the oyster mushroom cultivation house. The analyzed factors are velocity distribution, temperature distribution, and humidity distribution. In order to maintain the internal environment uniformity of the oyster mushroom cultivation house, it appeared that installing circulation fan at the upper part of the working passage towards the ceiling is effective. When all the environmental control equipment - unit cooler, inlet fan, outlet fan, air circulation fan, and humidifier - operated simultaneously, the RMS figure on the growing shelves appeared as follows: velocity 28.23%, temperature 30.47%, humidity 7.88%. However, when only unit cooler and air circulation fan operated, the RMS figure on the growing shelves appeared as follows: velocity 22.28%, temperature 0.87%, humidity 0.82%. Therefore, in order to maintain the internal environment uniformity of the mushroom cultivation house, reducing the overall operating time of inlet fan, outlet fan, and humidifier is needed, and managing the internal environment with unit cooler and air circulation fan appropriately is essential.

Keywords : air circulation fan, computational fluid dynamics, multi-layered shelves cultivation, oyster mushroom cultivation house

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