Design and Analysis of a High-Frequency Electromagnetic Sterilization System for Mushroom Enhancing Efficiency and Quality in Mushroom Cultivation

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Abstract:

In this research, we have focused on studying the mushroom production industry, as mushrooms are a crucial source of protein and nutrients. Sterilizing mushroom blocks is a critical step in producing high-quality mushrooms for consumption. Therefore, we have designed and developed an innovative automatic mushroom block sterilization system using high-frequency electromagnetic (microwave) technology, operating at a frequency of 2.45 GHz to heat the mushroom blocks. The advantages of this technology include reducing the time required for sterilization, providing faster and more energy-efficient results, and evenly distributing heat throughout the mushroom blocks. Additionally, the system allows for precise control of temperature and time, resulting in highly effective sterilization and increased daily mushroom block production. Moreover, the system features embedded microcontroller technology that assists in automatically transporting mushroom blocks both before and after the sterilization process for storage. The system also displays operational data on an integrated screen and can be accessed and controlled remotely via the internet for convenience. This remote control feature, coupled with real-time data monitoring, enables operators to make instant adjustments and ensure optimal sterilization conditions at all times. Furthermore, the system's design emphasizes user-friendliness, with intuitive interfaces that allow operators to set and monitor parameters with ease. The integration of these advanced technologies not only enhances the efficiency and reliability of the sterilization process but also contributes to greater consistency in

mushroom production, ultimately supporting the industry's goal of meeting the increasing demand for high-quality mushrooms. This innovation represents a significant step forward in the automation of mushroom cultivation, providing a scalable solution that can be adapted to various production scales and environments.

Keywords:

High-frequency electromagnetic waves, Microwave, Thermal sterilization, Cubes mushroom.