UNIVERSITY OF LINCOLN

United Scientific Forum

Exploring Efficient Sterilization Methods for Mushroom Picking Cups in Automated Picking Technology

Dr Taghread Hudaib, School of Pharmacy, Associate Professor Bashir Al-Diri, School of Computer Science

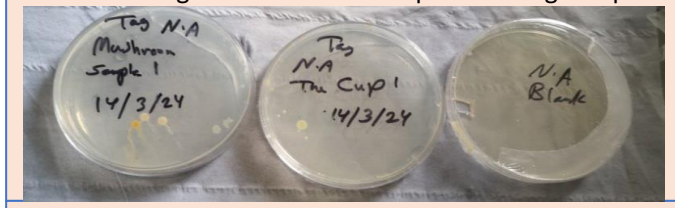
Abstract

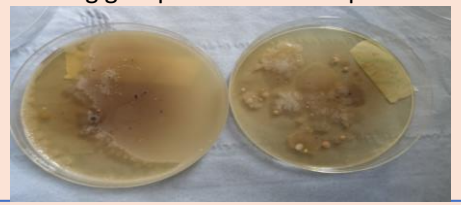
The critical consideration of sterilizing mushroom picking cups within the framework of automated picking technology, with a focus on efficiency and efficacy, were examined. Ensuring hygienic conditions is crucial in robotic crop harvesting, especially when utilizing techniques like picking cups. This is essential for safeguarding product quality and consumer health. Various sterilization methods, including heat, chemical, and air jet cleaning, are evaluated for their suitability and practicality.

The importance of selecting the most effective sterilization approach while considering factors such as cost, scalability, and safety is highlighted . By optimizing sterilization protocols, the aim is to enhance food and fruit harvesting processes, fostering advancements and productivity enhancements within the food industry.

Methods

Nutrient Agar (NA) and Sabouraud Dextrose Agar (SDA) plates were inoculated with swabs taken from the mushroom surface and picking cup surface both before and after cleaning with the Isopropyl Alcohol station, followed by the air-jet drying station. The fungal and bacterial contaminant growth between the pre-cleaning and post-cleaning groups was then compared.





References

[1] Chatterjee, A. and Abraham, J., 2018. Microbial contamination, prevention, and early detection in food industry. In Microbial contamination and food degradation (pp. 21-47). Academic Press.

[2] Suada, I.K., Sudarma, I., Kim, B.S., Cha, J.Y. and Ohga, S., 2015. Fungal contaminant threaten Oyster mushroom (Pleurotus ostreatus (Jacq. ex Fr.) Kummer) cultivation in Bali.

[3] Piasecka, J., 2010. Molecular and microbiological methods for the detection and measurement of dry bubble disease caused by Lecanicillium (Verticillium) fungicola on mushroom farms (Doctoral dissertation, National University of Ireland Maynooth).

Background

Automated mushroom picking using robotic cups can introduce contamination from bacteria or fungi present on the mushroom surface, equipment, or environment.

Bacterial contaminants such as Pseudomonas spp. and Listeria monocytogenes can cause spoilage and contamination [1], while fungal contaminants like Trichoderma spp., Penicillium spp. [2], and Verticillium fungicola [3] can lead to mold, deformities, and yield loss. Contamination sources include unsanitized equipment, the cultivation environment (air, water, substrate), and human interaction during maintenance and operation, underscoring the need for strict hygiene and sanitation practices.

Our prevention measures include establishing regular cleaning and sterilization stations as integral parts of the automated picking process. This ensures that all components of the system, particularly those that come into direct contact with the mushrooms, are thoroughly sterilized. This approach aims to mitigate contamination risks from bacteria and fungi, maintaining the hygiene and safety of the harvested mushrooms.

Results and conclusion

The number of contaminated plates after treatment with the two sterilization stations has significantly dropped from 60% to 10%, where the aim was to achieve 100% elimination of bacterial and fungal contamination after picking several mushrooms (Fig. 1).

In conclusion, additional sterilization measures and more effective methods are still needed during the robotic picking process to ensure complete elimination of contaminants.

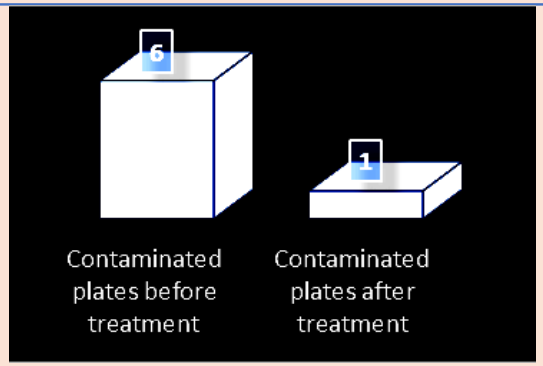


Fig. 1 The number of contaminated plates after treatment with the two sterilization stations