

Title Microbial ecology of mushroom casing soils and preharvest strategies to enhance safety and quality of fresh mushrooms

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Abstract

Agaricus bisporus mushrooms of good quality immediately after harvest normally develop brown blotches at retail. Food safety is another important issue of concern to the mushrooms industry. The first objective of this research was to evaluate soil pasteurization and crop irrigation with antimicrobial additives as preharvest practices to reduce bacterial populations on fresh mushrooms and enhance quality. Crops were grown using commercial mushroom growing practices except for the treatments to the casing soil or irrigation water. Mushrooms were aseptically sampled from the growing beds for enumerating microbial populations. Casing soil pasteurization enhanced mushroom quality but reduced crop yields by 11%. Mushrooms irrigated with water (control) had 7.3 log CFU of aerobic bacterial populations per gram of fresh tissue. Compared to the control, irrigation with 0.75% H₂O₂ and 0.3% CaCl₂ reduced bacterial populations on fresh mushrooms by 87% to 6.4 log CFU/g. The irrigation treatment significantly enhanced mushroom whiteness following harvest as well as 6-days of postharvest storage at 12°C, and had no significant effect on crop yield.

The second objective of this research was to understand the microbial ecology of the casing soil and determine the survival of *L. monocytogenes* and *Salmonella* sp. in casing soil. Indigenous casing soil microflora comprised predominantly of the *Pseudomonas* and *Pantoea* bacterial genera, the *Streptomyces* genera from the actinomycetes group, the *Penicillium* fungal genera, and a high population of native yeast. Inoculated population levels of *L. monocytogenes* and *Salmonella* sp. remained largely unchanged in autoclaved casing soil over a period of even up to 8 weeks. However, the foodborne pathogens were rapidly destroyed in untreated casing soil. The presence of *Penicillium* sp. and *Streptomyces* sp. in sterile casing soil inhibited the growth of *L. monocytogenes* and *Salmonella* sp. Further research revealed that *Penicillium chrysogenum*, isolated from casing soil, produced the β -lactam class of antibiotics in casing soil extract. The studies demonstrate that unpasteurized casing soils do not support the survival or growth of *L. monocytogenes* or *Salmonella* sp. Growth and extended survival of the foodborne pathogens in

casing soil with no indigenous microflora emphasizes the importance of a viable and robust casing soil microflora.