

THE EFFECTS OF OZONE AND NEGATIVE AIR IONS ON MICROORGANISMS

Authors: L. Fan, J. Song, P.D. Hildebrand, C.F. Forney

Keywords: viability, synergism, *Pseudomonas fluorescens*, *Erwinia carotovora* pv. *carotovora*, *Escherichia coli*

Abstract:

The control of microorganisms on fresh produce is very important to the food industry in order to maintain quality and ensure safety. *Pseudomonas fluorescens* and *Erwinia carotovora* pv. *carotovora* are plant pathogens that cause decay of many fresh fruits and vegetables during storage. Strains of *Escherichia coli* are pathogenic to humans and have been found on contaminated produce. In this study, dilute cell suspensions of *P. fluorescens*, *E. carotovora* pv. *carotovora*, and *E. coli* were inoculated onto potato dextrose agar (PDA) and subsequently exposed to $100 \pm 5 \text{ nl}\cdot\text{L}^{-1}$ ozone and/or 10^6 negative air ions (NAI)·ml $^{-1}$ to determine the effect of these treatments on cell viability. Treatment with NAI alone had no killing effect on any of the bacterial cells of all three species. However, ozone was effective in killing all three species and the addition of NAI enhanced this killing effect. *P. fluorescens* was most susceptible to the combined treatment; viability was reduced to 0.7% after 6 h, while 76% of the cells remained viable when exposed to ozone alone. Viability of *E. carotovora* pv. *carotovora* was reduced to 4% after 6 h in the combined treatment compared with 69% when exposed to ozone alone. *E. coli* was more resistant to the combined treatment; viability was reduced to only 40% after 11 h compared with 70% in the ozone alone treatment. Other factors, including the culture media used, influenced the effectiveness of ozone and NAI to kill bacteria and requires further study. The synergism of NAI with ozone may provide an effective method to reduce microbial contamination resulting in produce with less decay and risk of food borne disease.
