

Title Effect of controlled atmosphere storage, modified atmosphere packaging and gaseous ozone treatment on the survival of *Salmonella* Enteritidis on cherry tomatoes

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### Abstract

In recent years, outbreaks of infections associated with raw and minimally processed fruits and vegetables have been reported. The objective of this study was to analyse the growth/survival of *Salmonella* Enteritidis at spot-inoculated or stem-injected cherry tomatoes during passive modified atmosphere packaging (MAP), controlled atmosphere (CA) and to compare the results with those of air storage at 7 and 22 °C. During MAP, the gas composition equilibrated to 6% O<sub>2</sub>/4% CO<sub>2</sub>. CO<sub>2</sub> level was maintained as 5% through the term of CA storage at 7 and 22 °C. The results demonstrate that *S. Enteritidis* can survive and/or grow during the storage of tomatoes depending on the location site of the pathogen on fruit, suspension cell density and storage temperature. During MAP, CA and air storage, *S. Enteritidis* with initial population of 7.0 log<sub>10</sub> cfu/tomato survived on tomato surfaces with an approximate decrease of 4.0–5.0 log<sub>10</sub> cfu/tomato in population within the storage period; however, in the case of initial population of 3.0 log<sub>10</sub> cfu/tomato, cells died completely on day 4 during MAP storage and on day 6 during both CA and air storage. The death rate of *S. Enteritidis* on the surfaces of tomatoes that were stored in MAP was faster than that of stored in air and in CA. Storage temperature was effective on the survival of *S. Enteritidis* for the samples stored at ambient atmosphere; cells died completely on day 6 at 7 °C and on day 8 at 22 °C. Stem scars provided protective environments for *Salmonella*; an approximate increase of 1.0 log<sub>10</sub> cfu/tomato in stem-scar population was observed during MAP, CA and air storage at 22 °C within the period of 20 days. Cells survived with no significant change in number at 7 °C. During the research, the effect of ozone treatment (5–30 mg/l ozone gas for 0–20 min) was also considered for surface sanitation before storage. Gaseous ozone treatment has bactericidal effect on *S. Enteritidis*, inoculated on the surface of the tomatoes and can be used for surface sanitation of *S. Enteritidis* on tomatoes before storage at different conditions. Ten mg/l ozone gas treatment with different time intervals of 5 and 15 min was found to be effective respectively on low and high dose inoculum levels of *S. Enteritidis* attached for 1 h. Another variable considered during ozone treatment was the 4 h attachment time.