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Ozonated Water Extends the Shelf Life of Fresh-Cut Lettuce

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Abstract:

The use of ozonated water as a sanitizer to extend the shelf life of fresh-cut lettuce and the effect on the antioxidant constituents (polyphenols and vitamin C) were investigated. Fresh-cut iceberg lettuce (*Lactuca sativa* L.) was washed at 4 °C using three different ozonated water dips [10, 20, and 10 activated by ultraviolet C (UV-C) light mg L⁻¹ min total ozone dose], and the dips were compared with water and chlorine rinses. Treated lettuce was packaged in air or active modified atmosphere packaging (MAP) (4 kPa of O₂ + 12 kPa of CO₂ balanced with N₂) and stored for 13 days at 4 °C. Despite its strong oxidizing activity, ozonated water did not stimulate the respiratory activity of fresh-cut lettuce. Moreover, ozonated water maintained the initial visual appearance of fresh-cut lettuce and controlled browning during storage in air. Initially, ozonated water and chlorine reduced the total mesophilic population by 1.6 and 2.1 log, respectively, when compared with water. Active MAP was effective in controlling total microbial growth, achieving 2.0 log reduction in relation to samples stored in air at the end of storage. On the other hand, active MAP caused a 2.0-3.5 reduction of coliforms on sanitized samples compared with water-washed samples. The most efficient treatments were ozone 20 and ozone 10 activated by UV-C, which were as effective as chlorine. Changes in individual phenolic compounds were independent of the washing treatments. In air, chlorogenic and isochlorogenic acid contents increased noticeably after 13 days while monocaffeoyltartaric and dicaffeoyltartaric acids remained unchanged. MAP effectively suppressed accumulation of caffeoylquinic derivatives, whereas caffeoyltartaric derivatives decreased during MAP storage to reach similar levels. The content of vitamin C (ascorbic acid and dehydroascorbic acid) decreased during storage, particularly under MAP. Ozonated water could be an alternative sanitizer to chlorine for fresh-cut lettuce due to good retention of sensorial quality and browning control with no detrimental reduction in the antioxidant constituents.

Keywords: *Lactuca sativa* L.; browning; chlorine; microbial quality; minimal processing; modified atmosphere packaging; polyphenols; sanitizers; sensory quality; vitamin C

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