Testing of ozone generating equipment to reduce ethylene during postharvest storage of fresh produce

de Chiara M.L.V.[(1)], Amodio M.L.[(1)], Simonelli R.[(2)], Colelli G.[(1)].
[(1)]*University of Foggia, Department of Science of Agriculture, Food and Environment, Via Napoli, 25 - 71122 Foggia, Italy*
[(2)]*SAIM Service S.r.l. - Ozono Sanificazione®, Via Pantanello, 19, 04022 Fondi (Latina), Italy*
Corresponding author: de Chiara M.L.V., maria.dechiara@unifg.it

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Objectives

Development of innovative and efficient methods to prolong shelf-life during storage of horticultural products is of great interest to the industry. Ethylene (C_2H_4) is a major source of deterioration for fresh produce and the search for new technologies aimed to reduce its concentration in cold storage rooms is one of the industry priorities. Among different approaches to reduce ethylene, ozone (O_3) application is a promising one given its known beneficial effects in reducing microbial contamination in the storage environment. Tomatoes and kiwifruit are very sensitive at very low ethylene concentrations, and its presence in the storage rooms should be completely avoided. Objective of the present work was, therefore, to test ozone generator equipments to reduce ethylene within storage room during postharvest life of these horticultural produce.

Methods

Ozone generator equipments were developed and provided by Ozono Sanificazione®. Preliminary trials were performed in order to optimize operational conditions of the equipments. Subsequently, tomatoes at three different ripening stages were stored up to 8 days in a closed system at 15±1 °C. Three condition were tested: i) *Ctrl*: storage in air; ii) *Eth-Oz*: storage in the presence of 2 ppm of exogenous ethylene and 1 ppm of residual ozone; iii) *Eth*: storage in the presence of 2 ppm of exogenous ethylene. Kiwifruit were stored up to approximately 4 months at 1±0.5 °C. Four condition were applied: i) *CTRL*: storage in air; ii) *Oz*: storage in the presence of 0.5 ppm of residual ozone; iii) *Eth-Oz*: storage in the presence of 1 ppm of exogenous ethylene and 0.5 ppm of residual ozone; iiii) *Eth*: storage in the presence of 1 ppm of exogenous ethylene. Firmness and other physicochemical parameters were evaluated on representative samples of the product during storage.

Results

The presence of residual ozone resulted to be able to control and reduce the concentration of ethylene up to 90%, thus making this technique an effective alternative to the use of traditional approaches for C_2H_4 reduction. The developed equipment showed good potential for indoor use within storage rooms for fruit and vegetables, without causing damage of any kind to the product. At the end of storage, tomatoes held with exogenous ethylene combined with ozone treatment, showed higher texture values and a slightly lower colour evolution. As for kiwifruit, *Eth-Oz* samples showed significantly higher firmness if compared to *Eth* treatment, demonstrating the efficacy of ozone in reducing ethylene to an extent that is perceptible by plant tissue. Further optimization studies are needed in order to make the equipment perfectly efficient in the postharvest field.