



Novel combination of ethylene oxidisers to delay losses on postharvest quality, volatile compounds and sensorial analysis of tomato fruit

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ABSTRACT

Ethylene is a phytohormone naturally produced by plants and fruits (especially climacteric ones) all along the growing stage. During post-harvest, it is one of the main agents involved in the ripening of tomato fruits, even leading to severe quality losses. The aim of the present study was to determine, in tomato fruit, the possible effect of two different ethylene removal through oxidation mechanisms (ultraviolet light and KMnO₄ filters) on postharvest quality, antioxidant capacity, volatile compounds and sensory analysis carried out by experts. Two temperatures were selected for the use of this system, 8 °C and 20 °C. The use of this novel combination of techniques promoted the preservation of the physical and bioactive parameters analysed. A higher presence of volatile compounds related to early stages of fruit ripening was also observed in the treatments where ethylene removal was used, especially in the one where the complete system was used. It is also noteworthy that in the sensory analysis with a panel of experts, the fruit treated with the complete ethylene elimination system received a more favourable evaluation than those that did not incorporate it.

1. Introduction

Tomato (*Solanum lycopersicum* L.) is one of the most important agricultural crops, with 186,821,216 tons of worldwide production in 2020 (FAO, 2020). The organoleptic and nutritional quality of tomatoes, as well as their shelf life, are affected by several factors related to ripening and postharvest conditions such as temperature, conservation atmosphere, and microbial diseases during post-harvest storage. Fruit ripening is a complex, genetically-programmed process that ends with strong changes in colour, texture, flavour, aroma, and bioactive capacities of the fruit (Alexander & Grierson, 2002). With respect to the control of the conservation atmosphere in post-harvest preservation of fruit and vegetables, ethylene removal is one of the most critical aspects. Ethylene is a phytohormone that is naturally produced by climacteric fruit, and which promotes ripening processes. These ripening processes, although positive at the beginning of fruit growth, eventually lead to

quality deterioration and product losses (Kader, 2011). Removing ethylene from the postharvest conservation environment could preserve important quality parameters such as pH, acidity, ascorbic acid concentration or antioxidant capacity during post-harvest conservation (Alonso-Salinas, Acosta-Motos, Núñez-Delicado, Gabaldón, & López-Miranda, 2022; Álvarez-Hernández, Martínez-Hernández, Castillejo, Martínez, & Artés-Hernández, 2021).

Ethylene removal is based on an oxidation-reduction process using an oxidising agent that dissociates ethylene into CO₂ and H₂O or blocking any pathway of ethylene signalling or production. According to Wei, Seidi, Zhang, Jin, and Xiao (2021), among the existing ethylene removal methods, the non-intrusive ones (which are those that do not come into contact with the products) are the most effective. In addition, the most important agents needed for a correct ethylene removal are classified by Wei et al. (2021) and Mansourbahmani, Ghareyazie, Zarinia, Kalatejari, and Mohammadi (2018) as follows: palladium >

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Data availability

No data was used for the research described in the article.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.lwt.2022.114054>.

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