

Title Low oxygen levels and light exposure affect quality of fresh-cut Romaine lettuce
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Abstract

Modified atmosphere packaging (MAP) has the potential to extend the shelf-life of fresh-cut lettuce mainly by limiting the oxidation processes. However, exposure to light conditions has been described as causing browning and quality loss. The influence of O₂ partial pressures (pO_2) and light exposure during storage on the shelf-life of fresh-cut Romaine lettuce was studied. Fresh-cut lettuce was exposed daily during storage to different light conditions: light (24 h), darkness (24 h) and photoperiod (12 h light + 12 h darkness). Changes in respiration rate, headspace gas composition, sensory quality, colour, electrolyte leakage, stomatal opening, water loss, texture and compositional constituents related to browning such as vitamin C and individual and total phenolic compounds were evaluated. Different weight samples (75–275 g), packaged with an initial pO_2 of 0.5–2.0 kPa balanced with N₂, reached pO_2 from 0.1 to 1.5 at the steady-state. Atmospheres with low pO_2 (0.2–0.5) at the steady-state preserved lettuce quality by the control of browning and the prevention of off-odours and off-flavours. Light exposure during storage positively influenced the number of open stomata (74% in light vs 24% in darkness) which contributed slightly to weight loss. Consumption of O₂ in samples exposed to light differed significantly from those stored in photoperiod or darkness (10.6 ± 7.0 , 18.3 ± 3.5 and 25.8 ± 8.6 nmol O₂ kg⁻¹ s⁻¹, respectively). Packages exposed to light showed higher pO_2 compared with packages stored in darkness while those exposed to photoperiod had intermediate values. Moreover, location of the packages in the shelves affected package headspace gas composition and thus, packages near the front of the shelves showed higher pO_2 than those at the back. The different light conditions did not influence the content of vitamin C or the individual and total phenolic compounds. This study shows that under light conditions respiration activity was compensated by photosynthesis resulting in a higher pO_2 . Thus, browning of fresh-cut Romaine lettuce can be promoted by light exposure during storage as it increases headspace pO_2 .