Abstract

Modified Atmosphere Packaging (MAP) has proven to be efficiency to extend the shelf-life of fresh fruits and vegetables. The beneficial effect of MAP is obtained by altering the gas conditions around the product, and generally by reducing the oxygen level as it is responsible for oxidation of food constituents and thus for deterioration of the packaged food. According to the literature, modified atmosphere composed of 3-4% of oxygen and 4-5% of carbon dioxide ensures good endive quality preservation. This study focus on active MAP containing individual oxygen scavenger sachet. The experimental system was composed of endives packaged in a low-density polyethylene pouch (a conventional film used in agro alimentary) with or without a commercial iron-based scavenger. The design of active MAP for vegetables was studied by developing a new mathematical model predicting gas changes. This model was based on the following independently evaluated parameters: vegetable respiration rate, film permeability, oxygen absorption kinetics of the scavenger and was solved with the logiciel Matlab®. A step-by step model validation was performed at 20 and 5°C and the low root mean square errors values successfully validated the model proposed. Oxygen scavengers reduce by half the transient period duration (50 hours compared to 100 hours without gas scavenger) and reduce the carbon dioxide peak during this transient period. They never change the gas equilibrium composition compared to passive MAP. The gas changes influence on endive quality was then studied. The natural flora was identified and followed during the storage in active, passive MAP and storage under "Unmodified Atmosphere Packaging" (UAP) (obtained with a macroperforated film). Both active and passive MAP reduced the total aerobic mesophile, yeast and mold population growth compared with UAP stored endives. Moreover, active MAP accelerated and improved the inhibition of *Pseudomonas* spp. and Enterobacteriaceae respectively. The detrimental color changes of endives was evaluated by sensorial and image processing analysis. Compared to UAP, passive MAP slightly delayed the greening of endives' leaves and basal part browning. The MAP benefit was significantly increased by using an oxygen scavenger which reduce the endive's head opening and lead to quite inhibition of greening and browning even after 7 days of storage at 20°C. This work emphasized the potential interest of using oxygen scavenger in MAP to accelerate the steady-state design and improve the vegetable quality during post-harvest storage.