Title	Microperforated active modified-atmosphere packaging (MAMA Packaging) - A Paradoxical approach to extend life of fresh produce
Author	Victor Rodov, Yakov Vinokur, Batia Horev, Genady Goldman and Svetlana Fishman
Citation	Abstracts, 10th International Controlled & Modified Atmosphere Research Conference, 4-7 April 2009, Antalya, Turkey. 80 pages.
Keyword	Microperforated plastic film; Modified atmosphere packaging; permeability

Abstract

Modified-atmosphere (MA) packaging is one of the major approaches to extend the life of fresh produce. The MA development in plastic packages is usually based on produce respiratory activity resulting in carbon dioxide accumulation and oxygen decline inside the package. Steady-state level of the two gases is determined by the equilibrium between the produce respiration rate and the permeability characteristics of the packaging material. In such system (often termed as "passive" or equilibrium MA), the buildup of a desirable atmosphere composition takes considerable time (normally 1 to 3 days, but sometimes longer). During this transient period the produce is exposed to a non-optimal atmosphere. Its microbial and/or physiological deterioration advances, so that eventual achievement of a desirable steady-state MA may be of little help, especially for highly perishable produce. The approach of active MA is based on filling the packages with optimal gas mixtures instead of air, so that the produce spoilage during the transient period is omitted. Another MA problem is the risk of oxygen depletion and off-flavor development in packages containing intensely respiring produce. The permeability values of most popular packaging materials for oxygen diffusion are insufficient for achieving desirable steady-state MA conditions for many commodities. Modern laser technology allows perforating films with tiny holes (50-100 μ in diameter) which have practically no effect on in-package humidity, do not prevent the MA buildup but avoid anaerobic fermentation. Varying the degree of perforation provides a simple way to obtain series of films with different gas transmission characteristics for tailoring packages in accordance with produce requirements. In this work we demonstrate feasibility and efficacy of a seemingly paradoxical approach when gas-flushing (active MA) is combined with the use of microperforated plastic films. Optimization of perforation level and of the gas mixture composition is critical for design of efficient microperforated active MA packages. Although this optimization may be conducted empirically, using mathematical modeling can greatly facilitate the packaging design. The efficacy of this new approach to control produce spoilage without off-flavor development is illustrated in the presentation by experimental results obtained with several types of produce, such as pomegranate arils, fresh-cut strawberries and sweet corn.