Title Development and characterization of equilibrium modified atmosphere bio-based packaging systems for blueberries (*Vaccinium corymbosum* L., Bluecrop)

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Abstract

Equilibrium Modified Atmosphere Packaging (EMAP) is an effective technology for delaying senescence and prolonging the shelf life of fresh produce. An EMA that meets the fresh produce requirements can be achieved by using microperforated materials. So far, EMAP technology has been used only with petroleum-based materials. The goals of this research were: (1) to develop the first bio-based (poly(lactic acid), PLA) microperforated packaging systems for blueberries (*Vaccinium corymbosum* L., Bluecrop), (2) to assess the effect of the number of microperforations (0, 3, and 15 perforations) and temperatures (3, 10, and 23°C) on the physico-chemical, microbiological, and sensorial properties of blueberries, and (3) to characterize barrier properties of the packaging systems. Petroleum-based (poly(ethylene terephthalate), PET) microperforated packaging systems were used as controls. Blueberry weight loss was found to be material dependent regardless of number of perforations. Non-perforated PLA and PET packages showed the highest CO_2 and the lowest O_2 levels, and therefore, exhibited less fungal growth but a development of fermentative metabolites at all temperatures. The results of headspace analysis and weight loss were supported by the permeation rate of O_2, and water vapor permeance, respectively. Based on the outcomes of this research, PLA and PET packages with 3 perforations have demonstrated potential for maintaining the quality and prolonging the shelf life of blueberries for 19 days at 3°C.