Abstract:

The importance of maintaining high quality of intact and fresh-cut fruits and vegetables during the distribution chain has led to the use of modified atmosphere packages (MAP), and alternative materials and packaging systems are being investigated for this purpose. Perforation-mediated MAP relies on the use of perforations (tubes) of different dimensions to control package O_2 and CO_2 exchange in order to create the desired atmosphere for preservation of intact and fresh-cut fruits and vegetables. This is a promising technique for bulk packages that require rigid containers. The design of a perforation-mediated MAP for preservation of fresh fruits and vegetables requires knowledge of the O_2 and CO_2 exchange rates through perforations. The air circulation surrounding the package and the draft induced by multiple perforations are important factors that should be studied. In this work, a set of experiments was performed to analyze the influence of tube location and number, as well as package geometry, on the O_2 and CO_2 mass transfer coefficients and the μ ratio. Top and side tube locations, different locations on the same side of the package, and different package geometries were found to influence the mass transfer coefficients. Two perforations tripled O_2 and CO_2 exchange, showing the importance of draft effects, but the relative position of the tubes did not show a significant effect on the process. The μ ratio was not significantly different for all the conditions tested.