Abstract:

Fresh produce is often packaged in semipermeable plastic films with the expectations that this will extend shelf life via atmospheric modification. Surely, the success of modified-atmosphere (MA) packaging for lettuce and certain salad greens has led to new innovative products, marketing strategies, and enhanced sales of product. For lettuce, we have found that browning is retarded when O_2 is below 1 kPa, while fermentation is induced only when O_2 falls below 0.3-0.5 kPa at 5 °C. Thus, it is possible to reduce browning of lettuce without induction of fermentation between 0.5 to about 1 kPa O_2. Most importantly, sliced lettuce produces relatively little alcohol and few undesirable flavors during fermentation that reduces the quality risks associated with temperature abuse. However, the success of MA for lettuce has not readily transferred to other products. For instance, broccoli produces highly undesirable flavors and odors when O_2 falls below 0.25 kPa O2 at 5 °C, though low O_2 can retard yellowing. Thus, there is a great risk during MA packaging broccoli, since if O_2 inadvertently falls below 0.25 kPa, there will be complete loss of product. This risk is compounded since broccoli has a very high rate of respiration and a Q10 of 3 that has made selection of appropriate films based on gas diffusion characters difficult. Micro-perforated films have higher permeation rates but have relatively low temperature responsiveness. The new anti-ethylene agent, 1-methylcyclopropene (1-MCP), can retard senescence-related yellowing of broccoli and ethylene-induced russet spotting of lettuce. However, 1-MCP has not been approved for use with foods and, in fact, has its own series of risks.