Abstract

Controlled atmosphere (CA) storage and modified atmosphere packaging (MAP) are beneficial tools for extending the postharvest life of fresh fruits and vegetables, but specific tolerance levels to gas composition must be determined in order to apply these techniques. Perforation-mediated modified atmosphere packaging (PM-MAP) for sweetcorn utilizing impermeable containers with a diffusion window was designed to establish 15, 20 or 25% CO_2 atmospheres at 1 and 10°C. The desired CO_2 concentrations were obtained at 1°C, but were about 3-5% lower than expected at 10°C. It took about 5 d to reach the equilibrium atmospheres at 1°C, and about 2 d at 10°C. Sweetcorn cobs in CA tolerated 2% O_2 and up to 25% CO_2 alone for 2 weeks at 5°C, but elevated respiration suggested that they may be damaged by the two gas levels in combination, although no significant ethanol or acetaldehyde production was detected in any CA or PM-MAP treatment. The best atmosphere composition tested for maintaining sweetcorn quality was 2% O_2 plus 15% CO_2. The CA reduced sweetcorn respiration, maintained higher sugar concentrations, reduced loss of husk greenness, and improved silk and kernel appearance. This CA also maintained the highest concentration of dimethyl sulfide (DMS), the main characteristic aroma component in sweetcorn.

The potential for storing and handling fresh-cut sweetcorn kernels was also examined. Fresh-cut sweetcorn kernels are extremely perishable. Successful handling requires low storage temperature and optimum maturity stage. Quality was maintained for 10 d in air at 1°C or in CA (2% O_2 plus 10% CO_2) at 5°C, but brown kernel discoloration after cooking limited shelf life in air at 5°C especially in the more mature kernels. The CA reduced fresh-cut sweetcorn respiration, inhibited sugar loss, and, most importantly, prevented after cooking browning. After cooking browning was not due to typical Maillard reaction (5-hydroxymethylfurfural was not present) nor due to changes in soluble phenolics. Higher aerobic microbe counts were associated with increased after cooking browning but not with a specific species. A water soluble brown pigment precursor was isolated from kernel juice but was not identified.