**Abstract**

The primary objective of my dissertation was to evaluate the supposition that lipid peroxidation (LP) is involved in broccoli deterioration during postharvest storage. Broccoli florets were treated with different packaging methods and temperatures, methyl jasmonate (MJ), ozone, and free-radical scavengers. Changes in chlorophyll (Chl) and total water soluble protein (WSP) in broccoli flower buds (2-10 mg/bud) were used as markers for the deterioration of broccoli. Lipoxygenase (LOX) activity, thiobarbituric acid-reactive substances (TBA-RS) value, fatty acid composition, C-18 PUFA hydroperoxides, $C_6$-aldehydes and antioxidant defense system (ADS) activities were measured to estimate LP. We found that losses in total Chl and total WSP increased in flower buds during yellowing or deterioration of broccoli. Accumulation of TBA-RS increased, but PUFA loss, C-18 PUFA hydroperoxides, LOX activity, and $C_6$-aldehyde formation decreased with broccoli deterioration during postharvest storage. ADS activities varied with different treatments, and effects of the same treatment were not consistent with the individual antioxidant. Peroxidase activity increased and ascorbic acid contents and/or ascorbate regeneration cycle activity decreased with deterioration in broccoli buds during storage. Treatment of broccoli florets with ascorbic acid solution prevented yellowing of broccoli buds stored in microperforated films at 10 °C. MJ accelerated deterioration of broccoli buds expressed with enhanced lipid peroxidation and decreased ADS. Treatment of broccoli florets with short-term ozonated water induced Chl loss and yellowing of broccoli buds with reduced PUFA, slightly increased TBA-RS and changes in $H_2O_2$ scavenger activities. TBA-RS values were positively correlated with Chl and WSP losses; however, changes in PUFA, C-18 PUFA hydroperoxides, LOX activity, and $C_6$ -aldehyde formation are negatively correlated with Chl and WSP in broccoli flower buds during postharvest storage. Treatment of broccoli florets with LOX inhibitors or free-radical scavengers prevented broccoli florets from yellowing over low temperature storage. Our results demonstrate that LP increased in deteriorating broccoli buds during postharvest storage. Changes in LP is correlated with broccoli deterioration parameters. Either free radical- or LOX-initiated LP could resulted in broccoli deterioration during postharvest storage.