Abstract

Carbon dioxide-enriched atmospheres are used to reduce the incidence and severity of decay and therefore extend the postharvest life of strawberries (*Fragaria* x *ananassa* Duch.). However, the influence of CO2 on the color of strawberry fruit and the stability of anthocyanins and other phenolic compounds, had not been considered previously. Storage in elevated CO2 atmospheres at 5°C for 10 days adversely affected flesh (internal) color, while air-treated fruit remained red. Anthocyanin concentrations were much higher in the external tissues than the internal tissues. CO 2 atmospheres had a minimal effect on the anthocyanin concentration in the external tissues but a marked reduction in anthocyanin concentration was measured in the internal tissues of fruit stored in elevated CO 2 atmospheres compared to those stored in air. Ellagic acid and flavonol. derivatives were lower in the internal tissues compared. to external tissues, while ρ-coumaroylglucose concentrations were slightly higher. Elevated CO 2 atmospheres induced an increase in pH and decrease in TA in the internal tissues.

Anthocyanin concentration increased in both external and internal tissues of 'Selva' strawberries stored at 5°C for 10 days, whereas there was little or no increase in fruit stored in 10 or 20 kPa CO_2. Flesh color was paler in fruit stored in CO_2-enriched atmospheres. The activities of phenylalanine ammonia lyase (PAL) and UDP glucose:-flavonoid glucosyltransferase (GT) decreased over 10 days of storage, and this decrease was significantly greater in both external and internal tissues of strawberry fruit stored in 20 kPa CO_2. The activities of both PAL and GT from strawberries stored in 10 kPa CO_2 were more similar to those from fruit stored in air in the external tissues, while the enzyme activities in internal tissues more closely resembled those from fruit stored in 20 kPa CO_2. Phenolic compounds increased during storage but were not significantly affected by the storage atmosphere. pH increased and titratable acidity decreased over time in storage, and these effects were enhanced in internal tissues by the CO_2 treatments.

Both the skin and flesh of 'Selva' strawberries stored at 5°C in air or 2 kPa O_2 became darker red and anthocyanin concentration increased, but these increases were reduced in fruit stored in air + 20 kPa CO_2; 2 kPa O_2 +20 kPa CO_2; 0.5 kPa O_2; 0.5 kPa O_2 + 20 kPa CO_2 (balance N_2 in all CA treatments). pH increased and titratable acidity decreased during storage, and the changes were more marked in fruit stored in high CO_2 atmospheres, especially in the internal tissues. Since pH affects color expression of the anthocyanin pigment, these changes may contribute to the observed changes in color. Citric and mafic acid concentrations were higher in the external tissues than internal times, and in both tissues there was an enhanced decrease in concentrations of organic acids after storage in high CO_2 atmospheres.

These data suggest that the observed changes in color of strawberry fruit stored in controlled atmospheres are a combination of a reduction in biosynthesis and pH-induced changes in color expression and stability of the anthocyanin pigment. Other factors that may affect anthocyanin stability, such as copigmentation and the activity of β-glucosidase in combination with peroxidase, may be affected by CA storage and warrant further research.