## Low-temperature storage regulates the expression of genes related to peel pigments of grapefruit

Emmanuel Aispuro-Hernández, Araceli Minerva Vera-Guzmán, Irasema Vargas-Arispuro and Miguel Ángel Martínez-Téllez

Scientia Horticulturae 254: 208-214. (2019)

## Abstract

Grapefruit fruit (Citrus paradisi Macfad) are sensitive to postharvest temperature variations. In red grapefruit cultivars, peel color is a characteristic and important quality parameter that may undergo changes during storage due to alterations in the content of pigments. So far, it is not clear if the postharvest peel color variations in grapefruit are regulated at the transcriptional level due to storage conditions. The objective of this work was to investigate the effect of postharvest storage temperature (2 and 13 °C) on the relationships between peel color, chlorophyll (Chl) and carotenoid contents and the expression of genes related to the synthesis and degradation of these pigments in the flavedo of 'Rio Red' grapefruit grown in Northern Mexico. Fruit were harvested at breaker stage with a maturity index of 4.8 and stored for 42 days at 2 and 13 °C. Pigments, transcript levels, color index (CI) and ethylene production were periodically evaluated through storage. Pearson's correlations between CI and Chl, lycopene, and  $\beta$ -carotene contents were evaluated. Storage at 13 °C increased lycopene content and CI and decreased Chl content. In fruit stored at 2 °C, the CI and content of  $\beta$ -carotenes remained almost unchanged. In contrast, the lycopene content increased at this temperature, but to a lesser extent than at 13 °C. The ANOVA showed the expression of  $\zeta$ -carotene desaturase (ZDS), two types of lycopene cyclases (carotenoid biosynthesis pathway genes) and the pheophorbide a oxygenase gene (involved in Chl breakdown), was significantly influenced by the storage time-temperature interaction. The expression of the ZDS gene was significantly higher in fruit stored at 13 °C than in fruit stored at 2 °C, suggesting that lycopene biosynthesis is transcriptionally regulated by storage temperature. The lycopene levels showed a positive relation with the ZDS transcript levels and CI, indicating this pigment is implicated in the red coloration of the 'Rio Red' grapefruit flavedo during postharvest.