

Title Regulation of carotenoid biosynthesis during fruit maturation in the red-fleshed orange mutant Cara Cara

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Abstract

Cara Cara is a spontaneous bud mutation of Navel orange (*Citrus sinensis* L. Osbeck) characterized by developing fruits with a pulp of bright red coloration due to the presence of lycopene. Peel of mutant fruits is however orange and indistinguishable from its parental. To elucidate the basis of lycopene accumulation in Cara Cara, we analyzed carotenoid profile and expression of three isoprenoid and nine carotenoid genes in flavedo and pulp of Cara Cara and Navel fruits throughout development and maturation. The pulp of the mutant accumulated high amounts of lycopene, but also phytoene and phytofluene, from early developmental stages. The peel of Cara Cara also accumulated phytoene and phytofluene. The expression of isoprenoid genes and of carotenoid biosynthetic genes downstream *PDS* (phytoenedesaturase) was higher in the pulp of Cara Cara than in Navel. Not important differences in the expression of these genes were observed between the peel of both oranges. Moreover, the content of the plant hormone ABA (abscisic acid) was lower in the pulp of Cara Cara, but the expression of two genes involved in its biosynthesis was higher. The results suggest that an altered carotenoid composition may conduct to a positive feedback regulatory mechanism of carotenoid biosynthesis in citrus fruits. Increased levels of isoprenoid precursors in the mutant that could be channeled to carotenoid biosynthesis may be related to the red-fleshed phenotype of Cara Cara.