Light-dependent changes in plastid differentiation influence carotenoid gene expression and accumulation in carrot roots

Fuentes, Paulina

Pizarro, Lorena

Moreno, Juan Camilo

Handford, Michael

Rodriguez-Concepcion, Manuel

Stange, Claudia

Carrot is an important nutritional crop due to the high levels of pro-vitamin A carotenoids (?-carotene and, to a lower extent, ?-carotene) that accumulate in its storage root during secondary growth. In this work we show that in carrots, contrary to that reported for aerial organs of other plant species, light has a profound effect on root development by inhibiting root thickening, preventing the differentiation of chromoplasts and eventually repressing the expression of most genes required for the biosynthesis of ?-carotene and ?-carotene and to a lesser extent genes for xanthophylls and apocarotenoids biosynthesis. We observed a correlation in the carotenoid profile and the patterns of gene expression during the development of root segments grown either in the light or in the dark, which suggests a transcriptional regulation for carotenoid synthesis during carrot root development. Furthermore, our work supports the conclusion that the differentiation of chromoplasts coincides with c