Title Cloning and functional analysis of 9-*cis*-epoxycarotenoid dioxygenase (NCED) genes encoding a key enzyme during abscisic acid biosynthesis from peach and grape fruits

Author Mei Zhang, Ping Leng, Guanglian Zhang and Xiangxin Li

Citation Journal of Plant Physiology, Volume 166, Issue 12, 15 August 2009, Pages 1241–1252

Keywords ABA; Ethylene; Grape; NCED gene; Peach

Abstract

Ripening and senescence are generally controlled by ethylene in climacteric fruits like peaches, and the ripening process of grape, a non-climacteric fruit, may have some relationship to abscisic acid (ABA) function. In order to better understand the role of ABA in ripening and senescence of these two types of fruits, we cloned the 9-*cis*-epoxycarotenoid dioxygenase (NCED) gene that encodes a key enzyme in ABA biosynthesis from peaches and grapes using an RT-PCR approach. The NCED gene fragments were cloned from peaches (*PpNCED1*and *PpNCED2*, each 740 bp) and grapes (*VVNCED1*, 741 bp) using degenerate primers designed based on the conserved amino acids sequence of *NCED*s in other plants. *PpNCED1* showed 78.54% homology with *PpNCED2*, 74.90% homology with *VVNCED*1, and both showed high homology to NCEDs from other plants. The expression patterns of *PpNCED1* and *VVNCED1* were very similar. Both were highly expressed at the beginning of ripening when ABA content becomes high. The maximum ABA preceded ethylene production in peach fruit. ABA in the grape gradually increased from the beginning of ripening and reached the highest level at 20 d before the harvest stage. However, ethylene remained at low levels during the entire process of fruit development, including ripening and senescence. ABA content, and ripening and softening of both types of fruits, were promoted or delayed by exogenous ABA or Fluridone (or NDGA) treatment. The roles of ABA and ethylene in the later ripening of fruit are complex. Based on results obtained in this study, we concluded that *PpNCED1* and *VVNCED1* initiate ABA biosynthesis at the beginning of fruit ripening, and that ABA accumulation might play a key role in the regulation of ripeness and senescence of both peach and grape fruits.