Abstract

Postharvest rind disorders of citrus fruit may be caused by chilling but also by other stress conditions at non-chilling temperatures. The mechanisms involved in the tolerance of citrus fruit to these postharvest physiological disorders and how they are related to each other are not well understood. In the present work, we have examined changes in the activities of the antioxidant enzymes, superoxide dismutase (SOD), catalase (CAT), ascorbate peroxidase (APX), and glutathione reductase (GR), and of phenylalanine ammonia-lyase (PAL), the initial rate-controlling enzyme in phenolic synthesis, in 'Navelate' oranges and in its yellow abscisic acid-deficient mutant 'Pinalate' in relation to their susceptibility to chilling injury (CI) and to non-chilling peel pitting. 'Navelate' oranges developed CI during storage at 2 °C and very slight postharvest non-chilling peel pitting at 12 °C. By contrast, 'Pinalate' fruit did not show CI and were more susceptible to non-chilling peel pitting than 'Navelate' fruit. No important differences in the activities of the enzymes GR and APX were found in fruit of both phenotypes when stored at 2 °C or 12 °C. By contrast, 'Pinalate' fruit, the chilling-tolerant cultivar, had higher CAT activity than 'Navelate' oranges during storage at 2 °C, while it was lower at the temperature causing non-chilling peel pitting. PAL activity barely changed in response to cold stress in the mutant but increased in the chilling-susceptible 'Navelate' fruit. On the other hand, the increase in PAL occurring in 'Pinalate' fruit at 12 °C might be associated with their greater development of non-chilling peel pitting. The overall results indicate that the enzyme PAL might be a good biochemical marker for both chilling-induced superficial scald and non-chilling peel pitting and that CAT may play a role protecting 'Navelate' and 'Pinalate' fruit from conditions favoring both physiological disorders. In addition, SOD could be involved in the higher tolerance of 'Navelate' oranges to develop non-chilling peel pitting.