IRRADIATION-INDUCED CHANGES IN PHENYLALANINE AMMONIA-LYASE ACTIVITY AND PHENOLIC COMPOUNDS IN GRAPEFRUIT FLAVEDO

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Irradiation is being evaluated as a quarantine treatment of grapefruit (Citrus paradisi, Macf.), but it can cause damage to the fruit. We wanted to determine if pre-irradiation heat treatments would improve fruit tolerance to irradiation as they improve tolerance to low temperature injury. 'Marsh' grapefruit were harvested from interior and exterior canopy positions and irradiated at 0 or 1.0 kGy at a dose rate of 0.148 kGy/min prior to storage for four weeks at 10 ?C. Following storage, pitting of flavedo tissue was the most evident condition defect noted as a result of irradiation. Pitting was noted on 15 and 27% of irradiated interior and exterior canopy fruit, respectively, whereas there was no pitting on non-irradiated fruit. Temperature conditioning prior to irradiation decreased the susceptibility of fruit to damage. Pitting was 26, 19, and 17% when fruit were held two hours at 20 (ambient), 38 or 42 ?C, respectively. There was a marked increase in phenylalanine ammonia-lyase (PAL) activity following irradiation. Maximum activity (ca. 18-fold increase) was attained 24 hours after irradiation. Irradiation-induced PAL activity was reduced significantly by temperature conditioning at 38 or 42 ?C. Exterior canopy fruit flavedo contained higher levels of total phenols, including flavanols and coumarins compared with interior canopy fruit. The deposition of lignin was not related to canopy position. Neither irradiation nor heat treatment had an effect on total phenols or lignin deposition. It seems that irradiation causes a stress condition in the fruit, which leads to pitting of peel tissue. Heat treatment prior to irradiation reduced the damaging effects of irradiation.