Implications of low-dose e-beam irradiation as a phytosanitary treatment on physicochemical and sensory qualities of grapefruit and lemons during postharvest cold storage

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Abstract

Since irradiation is a proven decontamination measure, it is essential to monitor the shelf-life and quality of agricultural produce. We evaluated the impacts of low e-beam doses (0, 0.4, 1 kGy) on quality of grapefruit and lemons directly after irradiation as well as during storage (4 °C, 20 d) to simulate transport and market conditions. E-beam irradiation doses of 0.4 kGy and 1 kGy did not alter the weight, texture, total soluble solids (TSS), titratable acidity (TA), sugars, organic acids, vitamin C, narinrutin, hesperidin, and product preference with the exception of a decrease in citric acid of grapefruit and TSS/TA in lemons at 1 kGy. Besides minimal weight loss, firmness did not change in any samples during storage regardless of irradiation doses. Values of TSS and TA remained constant during 20 d of storage in grapefruit and 1 kGy irradiated lemons. Free sugar contents significantly increased, while vitamin C content decreased in both grapefruit and lemons after 10 d. Organic acids and flavonoids underwent delayed (grapefruit) or no changes (lemons) in 1 kGy irradiated stored fruits. Overall, 1 kGy e-beam used for phytosanitation of grapefruit and lemons minimizes quality deterioration during storage.