Title Radiation sensitivity of fresh-cut vegetables and its relationship with endogenous antioxidants

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Abstract

Consumption of fresh-cut vegetables in the USA has increased in recent years due to demand on convenience and freshness. Although the prevalence and the contamination level of food-borne human pathogens in fresh-cut vegetables are low, there is a concern over the microbial safety of fresh-cut vegetables. Ionizing radiation is a non-thermal technology the eliminates food-borne pathogens and extends the shelf-life of fresh fruits and vegetables. The tolerance of many common fresh-cut vegetables to irradiation is unclear. The objective of this study was to determine the radio-sensitivity of common fresh-cut vegetables and correlation between radio-sensitivity with endogenous antioxidants. Romaine, Iceberg, red leaf, and green leaf lettuce, cilantro, parsley, green onions, carrots, broccoli, endive, red cabbage, spinach, and celery were gamma irradiated at 0, 0.5, 1.0, 1.5, 2.0, 2.5 and 3.0 kGy. Electrolyte leakage of all samples, and antioxidant capacity and phenolic content of non-irradiated samples were measured. Electrolyte leakage increased linearly with an increase in radiation dose for all vegetables. The radiation dose threshold, defined as the dose at which a significant ($P<0.05$) increase in electrolyte leakage was observed, varied among vegetables, ranging from 2.44 kGy for broccoli to 0.60 kGy for carrots. The radiation sensitivity had no significant correlation with endogenous antioxidant capacity or phenolics content of the vegetables, which showed large variation among the samples. Our results indicate that radiation dose threshold may be a useful predicator of a given product's ability to tolerate irradiation.