Postharvest Quality and Physiology of ‘Fuji’ Apples Subjected to Phytosanitary Irradiation

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Postharvest Quality and Physiology of ‘Fuji’ Apples subjected to phytosanitary Irradiation

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Introduction

In the state of California, apples are harvested almost a month before Washington’s apple harvest, therefore, California has a time advantage in exporting apples overseas. However, quarantine restrictions require that California apples either be fumigated with methyl bromide or be kept at 0°C for 40 days or at 3.3°C for 90 days to prevent spread of Light Brown Apple Moth and Oriental fruit moth (1, 2). Both treatments have some disadvantages. Methyl bromide is ozone depleting and with cold treatment, California loses its time advantage in comparison to Washington state. Irradiation is an effective treatment to sterilize and destroy insect pests on apples and was recently approved for apples exported to Mexico from California (3). However, the impact on quality and shelf of the apples is not known.

Objective

To investigate the influence of the irradiation on physicochemical properties of Fuji apples after harvest and compare the quality of irradiated apples with those treated with cold storage and fumigation. The specific goals are to:

1. Determine the tolerance of apples to irradiation at 400 and 800 Gy.
2. Conduct a comparative evaluation of irradiated, fumigated, and cold treated apples

Experimental Method

Apples sourced from a single farm were obtained from a distributor and shipped to an electron beam irradiation facility where they were irradiated at 0, 400, 800 Gy. Apples kept 7 days in cold temperature for simulating the refrigerated transportation of the apples from California to Mexico. Then, the apples were placed in ambient temperature for 7 days in order to simulate the retail condition.

Results and Discussion

One day after treatment
Day 7
Day 14

POD Enzyme Activity During Storage Time

Chemical Analysis

POD Enzyme Activity During Storage Time

Figure 1. Respiration rate of the apples during storage. Irradiation increase respiration rate.

Figure 2. Ethylene production rate during storage- Irradiation decrease ethylene production rate.

Figure 4. Electrolyte Leakage of the apples during storage. Irradiation increase EL.

Figure 6. Browning index of different treated apples during storage time. No significance difference

Figure 7. Peroxidase enzyme activity during storage time

Figure 8. Shikimic acid during storage time.

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References