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Introduction: Fresh produce is an important part of a healthy diet as it provides needed nutrients, fiber and antioxidants and increasing the consumption of produce by the U.S. consumer is desirable. Unfortunately, during the last three decades there has been an increase in the number of foodborne outbreaks due to consumption of fresh and fresh-cut fruits and vegetables contaminated with a variety of human bacterial pathogens such as *Salmonella* spp., *Escherichia coli* O157:H7, *Listeria monocytogenes* and *Shigella* spp. There is a need for new or improved cost-effective intervention technologies which when implemented can reduce the risk of produce-related outbreaks due to naturally occurring contamination or deliberate contamination. In order for effective interventions to be commercialized, product quality after treatment must be maintained. The effects of single or combined effective interventions on visual quality (e.g., color and appearance), odor, texture, vitamin content, antioxidant levels and shelf-life needed to be assessed.

Activities

Objective 2: Develop new strategies to maintain fresh-cut product quality.

2.1. Combination of Hot Water Surface Pasteurization of Whole Fruit and Low Dose Gamma Irradiation of Fresh-cut Cantaloupe (X. Fan, B. Annous, K. Sokorai, A. Burke, J. Mattheis)

Many antimicrobial sanitizers often have limited effectiveness for reducing the microbiological population on the surface of cantaloupes, partially due to the rough surface (netting). It has been shown by ERRC scientists that surface pasteurization with hot water resulted in more than 5 log CFU/cm² reduction in *Salmonella*. Ionizing radiation is an effective non-thermal technology that inactivates a number of foodborne pathogens on fresh fruits and vegetables. The objective of this study was to investigate the effect of hot water treatment of whole cantaloupe prior to cutting followed by the low dose irradiation of fresh-cut cantaloupe prepared from the treated melons on indigenous microbial population and quality of fresh-cut melon during storage at 4°C. Whole cantaloupes were washed in tap water at 20°C or 76°C for 3 min. Fresh-cut cantaloupe cubes, prepared from the washed fruit, were then packaged in clamshell containers, and half the samples were exposed to 0.5 kGy of gamma radiation. Native populations of microflora and sensory qualities were determined during subsequent storage at 4°C over a period of 7 days. Results showed that hot water surface pasteurization reduced the microflora population by 3.3-logs on the surface of whole fruits, resulting in a lower microbial load on fresh-cut cubes, compared to those from cold water treated fruit. Irradiation of cubes prepared from untreated fruit to an absorbed dose of 0.5 kGy achieved similar low microbial load of the cubes as those prepared from hot water treated fruit. The combination of the two treatments was able to further reduce the microflora population. During storage, the headspace atmosphere of the packages was not

significantly influenced by any of the treatments. Color, titratable acidity, pH, ascorbic acid, firmness, and drip loss were not consistently affected by treatment with irradiation, hot water or the combination of the two. Cubes prepared from hot water treated whole fruit had slightly lower soluble solids content. Our results showed that the combination of hot water pasteurization of whole cantaloupe and low dose irradiation of packaged fresh-cut melon can reduce the population of native microflora while maintaining quality of this product.

Objective 5: Evaluate and control unintentional and intentional microbial contamination of intact and fresh-cut produce

5.1. Effects of Negative Air Ions on *E. coli* ATCC 25922 Inoculated on Mung Bean Seed and Apple Fruit (X. Fan, W. Fett, B. Mitchell)

The effect of negative air ions on the reduction of *E. coli* ATCC 25922 inoculated on mung bean sprout seed and whole or fresh-cut apple fruit was studied. Mung bean seeds, whole “Gala” apples, and apple slices were inoculated with *E. coli* ATCC 25922 before being exposed to negative air ions for up to 18 h at room temperature (~23°C). Results showed a less than 0.5 log₁₀ reduction of *E. coli* on mung bean seed even after 18 h of exposure. The reduction of *E. coli* on the surface of whole apples increased with increasing exposure time from 0.5 to 3 h, but the maximum reduction was less than 1 log₁₀. Increasing exposure time from 3 h to 18 h did not lead to increased treatment efficacy. No reduction of *E. coli* was observed on apple slices after 3 h treatments. When the negative air ion system was applied together with acetic acid vapor, no additive or synergistic effect of negative ions on the reduction of *E. coli* was found. The results suggested that negative air ions had a very limited effect on the population of *E. coli* on mung bean seed and apples.

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