

Multistate Research Project S-294
Postharvest Quality and Safety in Fresh-cut Vegetables and Fruits

2007-2008 Activities Report

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

Retention of Quality and Nutritional Value of Thirteen Fresh-cut Vegetables Treated with Low Dose Radiation. *Fan, X. and Sokorai, K. S. B.*

The recent outbreaks associated with consumption of spinach, lettuce and tomato have resulted in much concern over the safety of fresh-cut vegetables. The industry is in need of a “kill” step to ensure the safety of fresh-cut vegetables. Many studies have demonstrated that a dose of 1 kGy radiation can achieve at least a 5-log reduction of *E. coli* O157:H7 surface inoculated on fresh produce. However, it is unclear whether all fresh-cut produce can tolerate this dose level of radiation. This study was conducted to investigate the effects of 1 kGy radiation on the quality of thirteen common fresh-cut vegetables: Iceberg, Romaine, green and red leaf lettuce, spinach, tomato, cilantro, parsley, green onion, carrot, broccoli, red cabbage, and celery. Results showed that the appearance of irradiated samples were similar as the non-irradiated ones except that irradiated carrots, celery, cilantro and green onions had higher appearance scores than corresponding non-irradiated vegetables. There was no difference in the instrumental texture between irradiated samples and non-irradiated ones for almost all vegetables. The aroma of several irradiated vegetables was significantly better than controls after 14 days storage, as these control samples decayed or senesced. The 1 kGy radiation did not affect vitamin C content of most vegetables; however, irradiated green and red leaf lettuce had 24-53% lower vitamin C contents than the controls. Our results suggest that most fresh-cut fruits and vegetables tested can tolerate up to 1 kGy radiation without significant losses in any of the quality attributes.

Development of effective treatment for decontamination of leafy greens. *Annous and Keskinen.*

Research has been conducted on the efficacy of washing Romaine and Iceberg lettuce with chlorine solutions (20 ppm and 200 ppm for 2 min), and acidic electrolyzed water containing 50 ppm chlorine (for 5, 10 or 20 min) to reduce surface contamination with *E. coli* O157:H7. None of the wash treatments studied thus far have yielded a log reduction significantly greater than that achieved by simply washing the lettuce with deionized water (0.6 ± 0.5 log CFU/g reduction). Preliminary research was conducted into the efficacy of chlorine dioxide gas to reduce surface contamination of Romaine lettuce with *E. coli* O157:H7. No significant log reduction was observed at the concentration-time tested, however less browning of treated leaves over the 8 days of treatment was observed as compared to leaves which were not treated with ClO₂. Further research is currently underway to investigate the efficacy of different concentration-time exposures with chlorine dioxide gas. Research is also underway to determine the efficacy of washing lettuce with aqueous chlorine dioxide and other commercially available sanitizer solutions.

Preliminary research was conducted on lettuce plants watered with *E. coli* O157:H7 to determine the possible uptake of the microorganism by the edible portions of the plant via direct plating and via scanning electron microscopy. It was determined that this method of artificially

contaminating plants would not be ideal for initial studies evaluating the effectiveness of inactivation of internalized *E. coli* O157:H7 due to the low numbers of bacteria that are taken up by the plant, if any (in this pilot study, no internalized bacteria were recovered by plating or visualized via microscopy.)

Projects underway.

1. Antibrowning and antimicrobial properties of acidified compounds.
2. Field validation of hot water and chlorine dioxide gas surface pasteurization of cantaloupes

Publications:

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