

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

2007-2008 Activities Report

Institution: USDA/ARS Citrus and Subtropical Products Laboratory (USCSPL)

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Introduction:

Research at the USCSPL involves the improvement of quality and microbial stability of whole and fresh-cut fruits and vegetables with an emphasis on microbial stability and flavor. While most work is done on citrus and other subtropical/tropical fruits and vegetables, work is also done on small fruits (strawberry and blueberry).

Activities

Objective 1. Develop, evaluate, and standardize subjective and objective quality evaluation methods in intact and fresh-cut fruits and vegetables.

We are always looking for new ways to improve sensory and chemical evaluation of flavor.

This year we evaluated tangerine varieties from a breeding trial using the juice since there were not enough fruit available for all trained panelists to sample. The problem with the juice was sulfur aroma that is released when the fruit are juiced, but not so evident when the fruit are eaten fresh. Therefore panelists waited 5 seconds after opening sample cups before rating aroma. Panelists developed a profile with descriptors such as orange and floral flavor, sweet and fruity on one side, tangerine flavor and sour on another side, and green/fatty, bitter and grapefruit flavor on the third dimension.

For a trained tomato panel for whole fruit, each panelist received one tomato at a time from each treatment. Panelists were instructed to cut the tomato in half, longitudinally, give one half for instrumental analysis and cut the other half into eighths after removing the stem scar. Three to four eighths were placed in a 118 mL cup, with lids. Cups were closed for 3 min to allow for headspace accumulation. Panelists then opened the lids and rated samples for aroma descriptors. Then, they tasted the fruit for flavor, basic tastes, and texture. Tasting took place in isolated booths under red lighting to reduce possible bias from differences in color. Spring water and unsalted crackers were provided to rinse the palate between samples. Aroma standards, intensity standards and basic taste standards were provided at each tasting session.

Consumer panels were performed with strawberries from a breeding program. About 50 whole fruits were presented on a plate, and panelists could choose which fruit to evaluate. It was determined that a minimum of 50 panelists was necessary to find consistent differences in the preference ratings of cultivars. In another study, a panel was briefly trained to evaluate strawberry aroma. In addition, panelists were asked to rate samples for their liking (usually not done in sensory analysis). Samples that were evaluated by the consumer panel were also evaluated by the trained panel. The order of sample preference was the same in the trained and consumer panels, but the statistical differences were less in the trained panel.

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

New packaging was designed that significantly decreases weight loss of fruit and nearly doubles the fruit's shelf life in cherry, strawberry and blueberry fruit. This new clamshell includes smaller openings, and the relative humidity (RH) inside the clamshell with fruit was 5-6% higher than the commercial clamshell. The water loss rate of fruit in the new clamshell was only half in comparison to fruit in the commercial clamshell. Cherries in the new clamshell had high flesh firmness, less stem discoloration, and less incidence of pitting at 1°, 10°, and 20°C, respectively.

Objective 3. Improve understanding of biochemical, physiological and molecular mechanisms that affect fresh-cut product quality.

Objective 4. Standardize methods for recovering pathogenic and spoilage microorganisms from intact and fresh-cut produce including tree nuts.

We have debated whether it is better to wash the surface of the cut fruit or to stomach it for microbial analysis. On the one hand, the stomaching dilutes the microbial population, but includes any that have penetrated into the flesh. Washing results in less dilution, but may miss some microbes that penetrate the flesh. We usually perform surface washes.

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

New strawberry selections were evaluated for post-harvest decay. The effect of genetics on strawberry shelf-life was obvious. On the other hand, some selections, very sensitive to rain damage, could be improved post harvest by growing under protected cultivation.

Bulleted brief synopsis of each major project underway in 2008-2009

- Sanitation of blueberries after harvest
- Fresh-cut mangoes and/or papaya – we will look at the effect of surface treatments on the microbial stability of the subsequent fresh-cut product.
- We will look at antimicrobial treatments for fresh cut pieces (strawberry, tropical fruits)

Publications:

Current only for 2007-2008

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- Jouquand, C., Plotto, A., Goodner, K.L., and Chandler, C.K. A sensory and chemical analysis of fresh strawberries over harvest dates and seasons leads to a better understanding of factors that affect consumer liking. *Submitted to Postharvest Biol. Technol.*
- Bai, J., Pinshan, W.U., Manthey, J.A., Goodner, K.L and Baldwin E.A. Effect of harvest maturity on quality of fresh-cut pear salad. *Submitted to Postharvest Biol. Technol.*
- Jarret, R.L., Berke, T., Baldwin E.A. and Antonious, G. Variability for free sugars and acids in *Capsicum Chinese Jacp.* *Submitted to J. Chemistry and Biodiversity*
- Baldwin, E.A.; Goodner, K.L.; Plotto, A. 2008. Interaction of volatiles, sugars and acids on perception of tomato aroma and flavor descriptors. *J. Food Sci. (in press)*
- Lebrun, M., Plotto, A., Goodner, K., Ducamp, M.-N., and Baldwin, E. 2008. Discrimination of mango fruit maturity by volatiles using the electronic nose and gas chromatography. *Postharvest Biol. Tech.* 48:122-131.
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- Narciso, J.A., Baldwin, E.A, Plotto, A., C.M. Ference. 2007. Preharvest peroxyacetic acid sprays slow decay and extend shelf-life of strawberries. *HortScience.* 42:617-621.
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- Jarret, R.L., Baldwin E., Perkins, B. Guthrie, K. and Bushway, R. 2007. Diversity of some fruit quality characteristics in *Capsicum frutescens* L. *HortScience* 42:16-19.