UC CE University of California Agriculture and Natural Resources Cooperative Extension

The ABCs of Keeping Produce Fresh and Nutritious after Harvest

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Guest Speaker

Dr. Beth Mitcham, UCCE Specialist in Postharvest Biology & Technology

Produce is alive! But how do we ensure these products—which usually have a high water content, are easily damaged, and which have very diverse individual requirements—stay alive and fresh until they reach the consumer? Dr. Beth Mitcham, Director for the UC Postharvest Technology Center, spoke about some of the basic principles growers can use to help fruits and veggies keep their flavor and appearance.

Harvest at the right time

Every product has a "best" time to harvest—the sweet spot in which it has good eating quality and can get to market successfully. Different products are harvested at different points along the developmental continuum—that is, the progression of a plant from seedling through rapid growth, physiological maturity and fruit ripening. For example, asparagus, broccoli and cucumbers are all harvested while the plant is rapidly growing, but tomatoes, carrots and melons are harvested during maturity. The UC Postharvest Center has developed an app where you can find info on the best time to harvest a wide range of fruits, vegetables, and ornamentals.

Factors affecting deterioration

- **Metabolic rate**—Fruits and vegetables are still alive, so they still are respiring. Products with high metabolic rates (like asparagus, peas, and sweet corn) deteriorate much more quickly. Respiration is faster at warm temperatures.
- **Water loss**—Fruits and veggies usually have a higher water content than the outside air, so they continuously lose moisture through their pores. Too much water loss makes produce less attractive. Also it weighs less, reducing yield!
- **Damage**—Bruising, impact, compression, or any kind of cut or abrasion to the skin all reduce quality and increase susceptibility to water loss and pest or pathogen invasion.

Keeping it cool

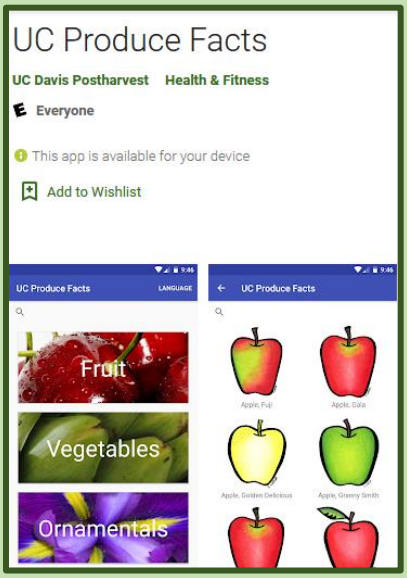
Temperature is the most important factor in helping produce stay fresh. As soon as it's picked, produce loses its natural cooling system, transpiration. Some tips:

- Pick sensitive crops early in the day, especially in summer.
- Provide shade in the field, especially for dark-colored products.
- Move to a cooling facility as soon as possible to bring down the field heat.

Some crops don't like it too cool! Tropical crops like tomatoes and squash can be damaged by very cold temperatures. Find your crop's ideal range on the UC Postharvest Center Produce Facts App.

- **Ethylene gas**—Ethylene gas is emitted by rotten or ripening fruit, and other sources like motor fumes and cigarette smoke. It can speed up produce deterioration.
- **Diseases & physiological disorders**

Find facts about the best ways to harvest and handle different fruits, vegetables, and ornamentals on the free UC Produce Facts App!



Harvesting principles

- **Train the crew** on the best ways to avoid physical damage while harvesting
- **Keep bins clean**—grit and sand can cause abrasions
- **Avoid overfilling bins**—when they're stacked, compression can damage the entire contents
- **Frequent trips to the cooler** for sensitive crops, to avoid overheating

Packing & storage principles

- **Arrange the packing station** such that it's easy for workers to handle the produce as little as possible, to see what they are doing, and to have good control as they work.
- **Sorting** out over-ripe or damaged produce keeps down ethylene gas levels
- **External packaging** should be strong enough that if boxes are stacked, the package, not the product, will be taking the weight. Avoid filling above the top.
- **Internal packaging** can help avoid water loss and physical damage. For items like peaches that might shift or roll in the package, consider including packaging that ensures physical separation between items and reduces movement. Plastic packaging can help increase the humidity and reduce water loss for items like leafy greens which lose water very quickly.
- **Store at the correct temperature and humidity**. Cool, dry environments slow respiration and water loss, but too cool can cause chilling injury in some produce. Find crop-specific info on UC Postharvest Center Produce Fact Sheets or the Produce Facts app. But what about when products with different requirements need to be stored together in a large cold storage facility? Dr. Mitcham recommends using a thermometer to identify warmer and cooler spots within the facility and allocating different crops accordingly. Having the right temperature will be more important the longer that a product is kept in storage. Cold-sensitive crops can also be stored in plastic packaging or boxes with little ventilation. Some sensitive crops like tomato may do better stored in the shade, as long as temperatures don't exceed 75-80°F.

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Winter squash: putting all the pieces together

The best **time to harvest** can be determined by the stem appearance: corking indicates maturity. In some squashes, like Kabocha, there can also be a color difference. Take care to avoid **physical damage** and **water loss**, paying especial attention to the stem. If removed, it should be done carefully to avoid tearing the skin. If kept, squash should be **packed** carefully so the hardened stems do not injure other fruit. Squash are susceptible to chilling injury, so should be **stored** between 50-60°F. **Ethylene** will speed decay, so **sort out** rotten or injured fruits and avoid exposure to motor fumes or cigarette smoke.

In summary: analyze every step from harvest to market!

Harvesting, sorting, preparation, classification, packing, palletizing, cooling, storing and transporting can all play a role in keeping produce fresh and nutritious for the consumer.

POSTHARVEST CENTER
UNIVERSITY OF CALIFORNIA
The Science and Art of Quality and Safety

The UC Postharvest Technology Center is a great resource!

- Workshops on topics including food safety for fresh cut products, fruit ripening and ethylene management, and an intensive short course on postharvest technology of horticultural crops
- Free “Produce Facts” sheets containing recommended harvest and postharvest procedures for a range of crops, including temperature, maturity index, and relative humidity
- Free “Produce Facts” app
- Library of general and crop-specific manuals available for purchase
- Monthly newsletter of current information and upcoming activities
- And much more!

http://postharvest.ucdavis.edu

Questions? Stories to share? Contact Dr. Margaret Lloyd at mglloyd@ucdavis.edu

A recording of this talk is available at:
http://ccsmallfarms.ucanr.edu/Events_and_trainings/Organic_Agriculture_Seminar_Series_for_Growers/