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Director's Note

I was thinking recently about produce packaging and the changing landscape of packaging sustainability – Reduce, Reuse, Recycle. There is a lot for the produce industry to consider.

Produce packaging plays several important roles. Packaging protects products from physical injury and water loss, unitizes products for easier handling and transportation, and provides information about the product. Each of these roles is critical to successful storage, transportation and marketing of fruits and vegetables. In addition, consumer packaging inside the outer container can extend shelf life with modified atmospheres, facilitate sales by providing information to consumers, unitize products for convenience and bulk sales, reduce water loss, and protect the product from contamination.

There continues to be strong interest to reduce the use of packaging, especially plastic packaging. While there may have been a slight pause in progress towards more sustainable packaging during the pandemic, when concerns about microbial contamination were elevated, the push for more sustainable packaging is as strong as ever. The mantra of Reduce, Reuse, and Recycle is ever-present. But how does this translate for the produce sector?

For the outer container, it is challenging to reduce the amount of packaging while still protecting the product during storage and transit. The growth in use of Returnable Plastic Containers (RPCs) has allowed the industry to increase its Reuse of packaging, and Recycling of fiberboard (cardboard) boxes is a well-established practice. But when it comes to the consumer packaging inside the container, it becomes more challenging. Efforts are underway to develop paper-based materials that can replace plastic for various uses, but it is important to make sure they remain recyclable or biodegradable, and meet the needs of the product.

Single use plastics have been banned in several parts of the world. Replacing flexible plastic packaging is a major challenge. Flexible plastic packaging provides large benefits to produce, such as reducing water loss (by maintaining high relative humidity around the product) and modifying the atmosphere to maintain quality and extend shelf life of many products. Alternatives that are easily compostable, biodegradable or Recyclable, and maintain the benefits of high relative humidity and/or atmosphere modification are hard to find. More research and development is needed!

Beth

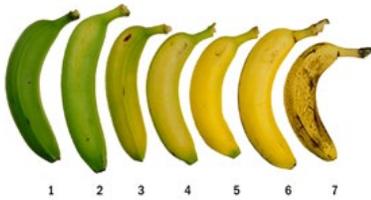


*Interim Director,
Beth Mitcham*



*Associate Director,
Irwin R. Donis-Gonzalez*

BANANA RIPENESS CHART



April 5-6, 2022

Fruit Ripening & Ethylene Management Workshop

This workshop is intended for shippers and fruit handlers (wholesale and retail), and produce managers who are involved in handling and ripening fruits and fruit-vegetables. The workshop focuses on how to increase profits by reducing losses at the receiving end, and delivering ready-to-eat, delicious fruits and fruit-vegetables to the consumer. For more information, please visit our [website](#). We do offer discounts for students, residents of developing countries and students in developing countries. Please contact Pam Devine for a coupon code at pwdevine@ucdavis.edu if you believe you qualify for a discount. **This hybrid workshop will be offered in person on the UC Davis campus and virtually.**

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May 23-25, 2022

Emerging Technologies to Address Grand Challenges in the Produce Industry

The UC Postharvest Technology Center, and The Department of Biological & Agricultural Engineering, in collaboration with the World Food Center at UC Davis, are hosting a workshop as part of the UC Davis World Food Center's Aligning the Food System Workshop Series that will bring together academics, extension experts, and industry representatives to discuss and propose solutions to challenges (labor shortages, sustainability needs, consumer demands) facing the produce industry. The purpose is to identify critical needs to address these challenges, and lay out future directions in produce-handling technology.

The event will focus primarily on emerging technological solutions, and research and development activities that have the potential to revolutionize the way fresh produce is harvested, handled, stored, transported and distributed from farm to table. The aim is to create a produce supply chain that is prepared to ensure the integrity, safety and nutritional quality consumers desire in the modern age.

The workshop will be divided into several modules following a hybrid model, including keynote speeches, interactive activities and demonstrations. Selected research academics and industry representatives will highlight cutting-edge information on current produce trends, key challenges, and potential technological solutions. In addition, a round table discussion for each module will be moderated by an extension expert that will enable a dialogue with the selected experts, with the goal of conceptualizing technological solutions to identified challenges. For more information please visit our [website](#). **This hybrid workshop will be offered in person on the UC Davis campus as well as virtually, and at a discounted registration fee thanks to support from the UC Davis World Food Center!**

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June 13-17, 2022

Postharvest Technology of Horticultural Crops Short Course

The Postharvest Technology of Horticultural Crops Short Course is an intensive study of the biology and current technologies used for handling fruits, nuts, vegetables and ornamentals in California. Learn about the latest technologies used for handling fruits and vegetables after harvest, and the underlying biology principals.

The course is designed for produce handlers, quality control personnel, service



companies, research and extension workers, and other professionals interested in current advances in produce handling, storage, transportation, safety and marketing. For more information, please visit our [website](#). We do offer discounts for students, residents of developing countries and students in developing countries. Please contact Pam Devine for a coupon code at pwdevine@ucdavis.edu if you believe you qualify for a discount. **This hybrid workshop will be offered in person on the UC Davis campus and virtually.**

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Our Website & Social Media

New Publications on our Website

New Drying Category

We recently added a new Drying category to our website under Postharvest Resources/Publications and gathered all the publications related to drying for easy reference, and added some new ones as well. Drying and maintenance of the dry chain is just as important for quality of dried products as the cold chain is for fresh products. The publication below describes the dry chain and why it is important

Kent J. Bradford, Peetambar Dahal, Johan Van Asbrouck, Keshavulu Kunusoth, Pedro Bello, James Thompson, Felicia Wu. [The dry chain: Reducing postharvest losses and improving food safety in humid climates](#). Trends in Food Science & Technology 71:84-93. <https://doi.org/10.1016/j.tifs.2017.11.002>

Controlling product dryness is the most critical factor for maintaining quality in stored dried foods. The high relative humidity prevalent in humid climates elevates the moisture content of dried commodities stored in porous containers, enabling fungal and insect infestations. Mycotoxins (e.g., aflatoxin) produced by fungi in insufficiently dried food commodities affect 4.5 billion people worldwide. The authors introduce the term “dry chain” to describe initial dehydration of durable commodities to levels preventing fungal growth followed by storage in moisture-proof containers. This is analogous to the “cold chain” in which continuous refrigeration is used to preserve quality in the fresh produce industry. However, in the case of the dry chain, no further equipment or energy input is required to maintain product quality after initial drying as long as the integrity of the storage container is preserved. In some locations/seasons, only packaging is required to implement a dry chain, while in humid conditions, additional drying is often required. The authors propose both climate-based and drying-based approaches to implement the dry chain to minimize mycotoxin accumulation and insect infestations in dry products, reduce food loss, improve food quality, safety and security, and protect public health.

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Postharvest Opportunities

Assistant or early Associate Professor in Postharvest Technologies Department of Food Science, Cornell AgriTech, Cornell University

The Department of Food Science at Cornell University's AgriTech campus in Geneva, NY, invites applications for a 9-month, full time tenure-track faculty position in postharvest management and technology at the Assistant or early Associate Professor level. Potential research areas include novel technologies to optimize the quality and ensure the safety of plant-based foods along the food chain, with a focus on newly developed or underutilized crops, digital technologies to monitor fresh produce quality and safety from farm to fork, and novel strategies for minimizing postharvest food losses and valorizing food waste in support of a circular economy. The position involves 50% research and 50% extension responsibilities. Click [here](#) for more information and to apply. Complete applications received by April 1, 2022 will be given full consideration. For questions



College of Agriculture
and Life Sciences
Food Science

regarding the position, please contact the Search Committee Chair Dr. Olga Padilla-Zakour at oiip1@cornell.edu.

Research Highlights

UC Davis Water Loss Prediction System

Research in the Mitcham lab at UC Davis, led by Dr. Nick Reitz, has resulted in development of a rapid water loss prediction system. Water loss is a major factor affecting the quality and shelf-life of many types of produce. This system accurately measures water loss rate and predicts water loss during storage. The water loss rate is calculated from temperature, pressure, and relative humidity measurements as a product is sealed in a chamber for 30 seconds. A novel model accounts for changes in water loss during storage and produces a weight loss prediction for the predetermined endpoint of storage. This nondestructive method is designed to analyze products in the storage environment for condition-specific predictions. Measurements can be made on products in or out of packaging, or with and without coatings, enabling insights into packaging effects on water loss. Analysis takes approximately 1-2 minutes per sample. The instrument can be constructed from readily available parts. This should be a great teaching tool and useful for product development labs and researchers. A detailed publication will soon be available that outlines how to build and use the UC Davis Water Loss Prediction System.

Postharvest Calendar

- April 5-6, 2022. Fruit Ripening & Ethylene Management Workshop, UC Postharvest Technology Center, Davis, CA. Offered in person and remotely.
- April 21-23, 2022 Viva Fresh Expo, Texas International Produce Association, Grapevine, TX
- May 23-25, 2022. Aligning the Food System - Emerging technologies to address grand challenges in the produce industry. UC Postharvest Technology Center. Davis, CA. Offered in person and remotely.
- May 29- June 2, 2022. ISHS International Symposium on Postharvest Pathology, Cyprus University of Technology, Cyprus
- June 13-24, 2022. Postharvest Technology of Horticultural Crops Short Course. UC Postharvest Technology Center, Davis, CA
- August 14-20, 2022. International Horticulture Congress. Angers, France
- September 20-22, 2022. Fresh-cut Workshop: Maintaining Quality & Safety, UC Postharvest Technology Center, Davis, CA
- October 25-27, 2022. Fresh Summit, Produce Marketing Association, Orlando, FL
- November 11-15, 2024. Postharvest 2024, ISHS International Postharvest Symposium, Rotorua, New Zealand

Ask the Produce Docs



Q. The idea that storing watermelons and cucumber in the fridge results in flavor loss. I'd love to clarify a few points on this: is the flavor maintained for 1-3 days in the fridge, and only lost after this time? Or is it better never to put these items in the fridge? S.Q.

A. The primary reason not to store watermelon and cucumber in the fridge is that they are sensitive to fridge temperatures. In addition, watermelon is sensitive to ethylene gas which is naturally produced by many fruit and can accumulate in the fridge. The reaction to low temperatures includes effects on flavor, texture and the rate of deterioration (faster). Cucumbers will see minimal effect of low temperatures for up to 3 days if used upon removal from the fridge. Ethylene causes mealy texture and loss of flavor in watermelon.

Beth Mitcham

Postharvest Questions. If you have a postharvest question you'd like answered, please send it to postharvest@ucdavis.edu, and we'll see if one of our specialists can help.

Archived Items. Link to a data store of all our previous "Ask the Produce Docs" questions, or link to [archived copies](#) of our e-newsletter as PDF documents.

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Editorial Review. Beth Mitcham

Writing and Coordinating Publisher. Pam Devine, Beth Mitcham

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Our answers to "Ask the Produce Docs" questions represent the best understanding of the current state of knowledge at the time of the latest update, and does not represent an exhaustive review of all research results. Answers are for guidance only, recommendations may vary from those listed because of, but not limited to, geographical differences, cultivar differences, maturity at harvest or ripeness, growing conditions, grade and quality at harvest, temperature management practices after harvest, and use of special treatments. The UC Postharvest Technology Center and individuals answering the questions are not responsible for any losses, injury to you, any other person or any property. Further, users agree to release the UC Postharvest Technology Center and individuals answering the questions from any and all claims and liability related to use of any content.



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