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Director's Note

We think everyone will agree that 2021 was not the year we were expecting. The pandemic maintained its grip on our lives and our economy, and many events had to be modified, cancelled or postponed. This was certainly the case for us at UC Davis and the Postharvest Technology Center. However, despite the current reality, we feel optimistic about the future and have expectations for a much better year in 2022 and at least a partial return to normalcy.

Our highly anticipated Emerging Technologies Workshop had to be postponed from January to May to allow for the planned hybrid format. We are lining up an excellent slate of speakers and panelists, and hope you will mark your calendars to join us May 23-25. We also have our Fruit Ripening and Ethylene Management Workshop in April which will also be offered in person and virtually. Registration is open for both of these workshops – see below!

If you have tried to order a book from our Bookstore in recent months, you will have encountered a two-step ordering process that was less than convenient. We are happy to report that the ordering process for our [Bookstore](#) is now fully online. Take a look at the very reasonably priced books on consumer issues, cooling and transportation, to name a few. We will be adding new books to the store later in 2022!

Finally, it is our pleasure to announce that a new staff member has joined the Postharvest Technology Center. Angela Bass will serve as digital communications specialist, handling communications, social media, event promotions, and video production. She also brings key expertise to our new hybrid course format in 2022! Welcome Angela!



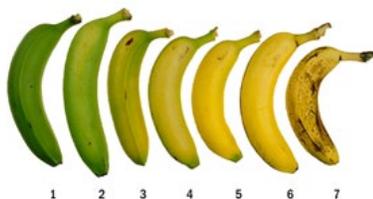
*Interim Director,
Beth Mitcham*



*Associate Director,
Irwin R. Donis-Gonzalez*

Beth and Irwin

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.**

ENROLL HERE

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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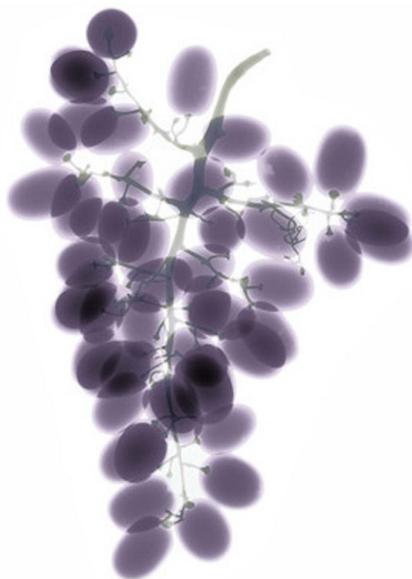
Upcoming UC Postharvest Technology Center Educational Opportunities

[Produce Professional Certificate Program](#) :: Ongoing

[Fruit Ripening & Ethylene Management Workshop](#) :: April 5-6, 2022

[Aligning the Food System Workshop: Emerging technologies to address grand challenges in the produce industry](#) :: May 23-25, 2022

[Postharvest Technology of Horticultural Crops Short Course](#) :: June 13-24, 2022



Our Website & Social Media

New Publications on our Website

Nicholas F. Reitz, Kenneth A. Shackel, Elizabeth J. Mitcham, 2021. [Differential effects of excess calcium applied to whole plants vs. excised fruit tissue on blossom-end rot in tomato](#) *Scientia Horticulturae* 290 (2021) 110514

Blossom end rot is considered a calcium deficiency disorder of tomato and pepper fruit. Application of moderate calcium concentrations to tomato plants effectively reduced blossom-end rot incidence and severity, but excess levels of calcium did not reduce incidence but further increased blossom-end rot severity compared to moderate calcium application. Calcium applied directly to excised, immature tomato fruit tissue also inhibited blossom-end rot symptom development; however, excess calcium did not induce blossom-end rot symptoms. These results are the first to indicate that excess calcium induces blossom-end rot development due to effects *at the whole plant level*, but not due to excess calcium in the fruit tissue.

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Research Highlights

Yogesh Ahlawat, Song Li, Prakash R.Timilsena, Eleni D.Pliakoni, Jeffrey K.Brecht, and Tie Liu. 2022. [Identification of senescence-associated genes in broccoli \(Brassica oleracea\) following harvest](#). *Postharvest Biology and Technology* 183.

This is a very comprehensive and interesting study of the mechanisms of senescence in broccoli. The authors used genomic tools to understand senescence and molecular signaling events in harvested broccoli florets stored at 25 or 4°C to test the hypothesis that genetic markers can be used to identify the stage of senescence or physiological age of plant tissue. They identified global transcriptional changes associated with early senescence in broccoli including 43 genes that were senescence-specific genes (SAGs). Some of those SAGs, such as SAG2 and SAG113, were previously discovered in Arabidopsis but had not previously been reported in broccoli. In future work, the authors anticipate identifying 'freshness indicators' that represent distinct stages of pre-visible senescence in broccoli and other cruciferous crops and validating their precision and robustness under different conditions that occur during postharvest storage and distribution.

Hongbin Yang, Yunqia Zou, Xin Li, Mingfei Zhang, Zhifeng Zhu, Rangwei Xu, Juan Xu, Xiuxin Deng, Yunjiang Cheng. 2022. [QTL analysis reveals the effect of CER1-1 and CER1-3 to reduce fruit water loss by increasing cuticular wax alkanes in citrus fruit](#). *Postharvest Biology and Technology* 185.

Postharvest water loss causes a decline in quality and loss of saleable weight. Cuticular wax is a key barrier against non-stomatal water loss and plays a crucial role in fruit quality maintenance. There has been limited research on the genetic basis of fruit wax development and resulting water loss. These authors studied two types of citrus, HJ (*Citrus reticulata*) and ZK (*Poncirus trifoliata*), fruit with significant differences in postharvest water loss and cuticular wax. HJ fruit had lower wax content and faster water loss. By contrast, ZK fruit had higher wax content and slower water loss. Correlation analysis revealed that fruit water loss seemed to be correlated with the cuticular wax alkane. Furthermore, CER1-1 and CER1-3 were identified as candidate genes, and heterologous overexpression in Arabidopsis revealed that they were involved in alkane synthesis and reduction of leaf water loss. In addition, coating with C28 alkane reduced postharvest fruit water loss of six citrus varieties. The authors speculated that cuticular wax alkanes might play an important role in limiting fruit water loss. The study provides new insights into the development of coating agents and breeding of citrus varieties with better storage performance.

Postharvest Calendar

- March 3-5, 2022. [Southern Exposure](#), Southeast Produce Council, Orlando, FL
- 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. Can you talk a little bit about how vacuum cooling works? Is having one a MUST for lettuce growers in California?

A. For vacuum cooling the product is placed in an air-tight chamber and the atmospheric pressure is then reduced to 4.6mm of mercury absolute pressure (typically with a rotary-vane vacuum pump), which corresponds to a water boiling temperature to 0°C or 32°F. Therefore, this reduces the boiling temperature of water and while water evaporates it cools the produce. Vacuum cooling causes a water loss equal to about 1% of produce for each 6°C or 11°F of cooling.

Plastic film covering can act as a barrier to water vapor (evaporation), so in many cases the product is packed after the vacuum cooling process. Perforated films allow enough water vapor to escape for rapid cooling, while reducing water loss. Plastic film box liners can be used, as long as the liner is only folded over the top of the product and not sealed.

Vacuum coolers are very energy efficient compared to other type of coolers. Therefore, in California, leafy green vegetables including head lettuce, are generally vacuum cooled. If available, it is highly recommended and it is considered a standard. That said, for the use of costly vacuum cooling equipment to be economically feasible, there must be consistent daily and annual output of cooled produce. The majority of vacuum coolers are trailer-mounted, so they can be used year-round. Vacuum coolers have been built small enough to cool a single pallet and large enough to cool 60 pallets per cycle. There are alternative methods of cooling lettuce. The next most commonly used cooling method for leafy greens is hydro cooling. Produce exposed to adequate water flow cools quickly with no moisture loss. The main disadvantages of hydro cooling are that recirculated water must be carefully treated (disinfected), and packed products (like lettuce, which is sometimes packaged in the field) must be in water-resistant containers (increases cost)..

Irwin Donis-Gonzalez

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.

Frequency of Distribution. This publication is produced regularly, or as special issues by the UC Postharvest Technology Center.

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Editorial Review. Beth Mitcham

Writing and Coordinating Publisher. Pam Devine, Beth Mitcham, Irwin Donis-Gonzalez

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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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