POSTHARVEST CENTER
UNIVERSITY OF CALIFORNIA

AUGUST 2021

What's Key in this Issue

Director's Note

Interim Director, Beth Mitcham

Associate Director, Irwin Donis-Gonzalez

On our website, you may have noticed the tagline under our logo, "*The Science and Art of Produce Quality & Safety*". What exactly do we mean by this? Our research here at UC Davis and elsewhere develops the science behind recommended handling practices for produce items; what harvest maturity, time to cooling, temperature(s) and relative humidity, best atmosphere(s), and best practices to reduce physiological disorders and decay. You can find a summary of these recommendations in our Produce Facts Sheets on our website and in the Produce Facts App, and you can learn about these recommendations and the latest research findings at our workshops and short courses.

However, in the "real world" these recommendations must be applied, and sometimes compromises must be made. For example, imagine that your customer wants an order of fruit, but the maturity of the fruit in the field is not at recommended levels. Do you go ahead and harvest and ship some fruit to your customer even though the maturity level is insufficient and eating quality may suffer? If not, another grower may provide the product and you might lose your customer for future orders.

You learned in a UC Postharvest Technology Center course that it is best to cool strawberries within 1 hour of harvest to reduce quality and shelf life deterioration. However, an assessment of your operation showed that it is taking between 3 and 4 hours to get your strawberries cooled. You determine you can speed the process up by purchasing several smaller trucks for transporting the fruit to the cooler sooner after harvest. You wonder if your company will realize a return on this investment. These are examples where the some "*Art"* comes in.

When you have a strong foundation in the principles of produce biology and technology, the "*Science"*, you can make educated decisions when applying the "*Art"* of produce handling. The mission of the UC Postharvest Technology Center is to provide this foundation to the produce industry through our website, publications, App and courses. I encourage you to take advantage of these resources.

Beth

Postharvest Education at UC Davis

Produce Safety Program Implementation Tools – Coming November 2 and 3, 2021

This new course will incude food safety topics relevant to postharvest operations. The workshop will give an overview of produce safety, cover the U.S. Food Safety Modernization Act and its impacts on postharvest operations, and provide guidance on implementing practices to minimize food safety risks in the postharvest environment. The workshop will be targeted to industry professionals, but will also have value for educators and regulators.

Upcoming UC Postharvest Technology Center Educational Opportunities

Produce Professional Certificate Program :: Ongoing

Produce Safety Program Implementation Tools :: November 2-3, 2021

Aligning the Food Systems Workshop: Emerging technologies to address grand challenges in the produce industry :: January 18-20, 2022

Fruit Ripening & Ethylene Management Workshop :: April 5-7, 2022

Postharvest Technology of Horticultural Crops Short Course :: June 13-24, 2022

Our Website & Social Media

Highlights of New Publications on our Website

Anne Elise Stratton, John W Finley, David I Gustafson, Elizabeth J Mitcham, Samuel S Myers, Rosamond L Naylor, Jennifer J Otten and Cheryl A Palm. 2021. Mitigating sustainability tradeoffs as global fruit and vegetable systems expand to meet dietary recommendations. ***Environ. Res. Lett. 16 (2021) 055010***
This article highlights the importance of increasing consumption of fruits and vegetables for human and community health, and the need to increase production of these nutritious foods. The environmental impacts of fruit and vegetable production and handling are explored and potential strategies to reduce these environmental impacts are discussed, with avocado, leafy greens and tomato as model crops.

Neil M. Rotta, Stephen Curry, Juliet Han, Rommel Reconco, Edward Spang, William Ristenpart, Irwin R. Donis-Gonzalez. A comprehensive analysis of operations and mass flows in postharvest processing of washed coffee. ***Resources, Conservation & Recycling 170 (2021) 105554***

Sustainability analyses require information on coffee bean mass and property changes during processing, from harvest to final consumption. In this study, a detailed analysis of the washed or wet-processed method for coffee postharvest processing is provided. Mass flow data were collected through site visits, surveys, laboratory measurements, and interviews with operators in several countries, including cafes in the United States, to establish representative mass flow rates and process flow diagrams from harvest to cup. Results indicate that 100 kg of harvested coffee cherries will on average yield 2.6 kg of mass consumed by humans as exported coffee, equivalent to approximately 839 metric cups (250 ml) of drip brew coffee or 897 metric shots (30 ml) of espresso. The remaining 97.4 kg provide opportunities for development of alternative products, and other economic uses. Importantly, the data suggests that more mass is lost during de-pulping, in practice, than previously indicated by laboratory measurements. This study provides a foundation for further investigations in the fields of equipment improvement, byproduct utilization, and environmental and economic sustainability of the coffee processing and

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Postharvest Opportunities

Postdoctoral Research Associate

The Agricultural Research Service (ARS) is the United States Department of Agriculture's chief scientific research agency and one of the world's premiere scientific organizations. ARS Postdoctoral Research Associates are hired to supplement a lead scientist's research on agricultural problems of high national priority affecting American agriculture.

- The incumbent will conduct postharvest quality studies and development of light emitting diodes (LEDs) technology to enhance chilling tolerance of tomato fruit.
- Perform experiments on tomato responses to light emitting diodes (LEDs).
- Physical, chemical and sensory analysis of tomato fruit grown under LEDs and treated by chilling temperature.
- Plant physiological mechanism analysis by using molecular biological methods.
- Interpret transcriptomic and metabolomic data and write research reports.

For more information and to apply, click here.

Field Research Associate - Ag Robotics Start-up

We are a venture-backed startup based in Davis, CA, and we build robots to address some of farming's toughest tasks.

- Work daily on strawberry farms, collecting data across disciplines including agronomy, harvest economics, labor productivity, plant biology, and performance of robotic harvest technology.
- Report to our Data Scientist, helping to design and conduct experiments in the field to measure impact of changes to our robotic harvest operations.
- Coordinate with teammates in software engineering, mechanical engineering, plant sciences and farming operations to carry out tests effectively with minimal disruption to ongoing ranch operations.
- Be responsible for data entry and reporting of test results.

For more information and to apply, click here.

Data Scientist Software Engineer - Ag Robotics Start-up

We are a venture-backed startup based in Davis, CA, and we build robots to address some of farming's toughest tasks.

- Build the architecture for logging, events, and other information to support cutting edge data analysis
- Analyze collected data to spot trends in performance and reliability to inform further development by engineering, R&D, and field operations teams.
- Write reproducible data analysis that can be automated and scaled as our equipment fleet grows.
- Summarize and clearly communicate data analysis assumptions and results.
- Build dashboards and applications that engineers, business managers and customers can rely on.

For more information and to apply, click here.

Director - Manufacturing Operations & Supply Chain

The Director of Manufacturing Operations & Supply Chain leads the design, build, launch, and scale-up for various packline and manufacturing operations in Driscoll's of the Americas (DOTA). The scope includes the development of business cases and securing capital for: 1) creating in-house manufacturing and packline operations, and 2) standing up 3rd party service providers.

- Develop manufacturing and automation vision and road-map aligned to commercial strategies and fruit harvesting changes
- Partner with experts inside and outside of Driscoll's to develop new technologies for handling of fruit at high velocity without negatively impacting quality
- Build, sponsor, and execute business cases to support capital investments for manufacturing and automation
- Work with all stake holders to design new production lines and facilities. Collaborate with multiple vendors and design team to manage the project from inception to completion
- Lead staff on production line to handle heavy seasonality and the ability to shift between various berry types and packaging with minimal downtime
- Ensure equipment and structures meet food safety standards for sanitation and full wash-down environments
- Achieve operating performance targets in safety, quality, customer service, and efficiency
- Understand the importance of food safety requirement and drive compliance within automation and manufacturing
- Leverage industry best practices to enhance Driscoll's capabilities
- Follow Company policies and practices while representing Driscoll's in an ethical and business-like manner in all interactions with employees, governmental agencies, growers, vendors, customers, etc.
- Ensure the security of Driscoll's confidential and proprietary information and materials

For more information and to apply, click here.

Postharvest Calendar

- November 2-3, 2021. **Produce Safety Program Implementation Tools**. UC Postharvest Technology Center, Davis, CA. Registration will open soon.
- January 18-20, 2022. **Aligning the Food System - Emerging technologies to address grand challenges in the produce industry**. UC Postharvest Technology Center. Davis, CA
- April 5-7, 2022. **Fruit Ripening & Ethylene Management Workshop**, UC Postharvest Technology Center, Davis, CA
- 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
- November 11-15, 2024. **Postharvest 2024**, ISHS International Postharvest Symposium, Rotorua, New Zealand

Ask the Produce Docs

Q. I am a plant Engineer by profession working at a Kenyan seed company and hereby inquire about the recommended drying temperatures for ear corn seed at 35% MC. dried in a single pass dryer, also what are the effects of intermittent drying and cooling on seed quality in forced air drying. (E.K.)

A. In the US, seed corn ears are typically harvested at high moisture content - MC (up to 40% on a fresh weight basis) to prevent late injuries by frost, insect and other diseases. Subsequently, and before shelling, corn is mechanically dried through convective heat forced-air dryers to around 12% MC. The drying process is a crucial step in seed corn product, but it is also a frequent cause of seed injury (if not rapidly performed and or properly performed). Overall, the safety threshold for seed corn drying is around 40C (104F), when ears are harvested at 40-50% MC. In some instances, if the moisture content is below 25%, which is atypical, seed corn can withstand higher drying temperature of up to 50C (122F). Also, it is typical that injury of seeds occurs during the later phase of drying, when seed moisture and drying rated are reduced. Certain genotypes can withstand higher drying temperatures without injury, but poorly formed ears can also be significantly affected at this higher temperature. Therefore, I would suggest avoiding temperatures above 40C for proper corn seed drying. There are many biochemical and physiological functions that can be affected during drying. That said, it is well known that the respiration rate, and the amount of starch is significantly reduced in the embryos. Also, enzyme imbalance has also been observed, all causing seed deterioration. In addition, high relative humidity and temperature will affect seed corn germination and viability. Once dried, the storage temperature for corn seed is 2-15C (36-59F) (depends on the desired time of storage) with a relative humidity of less than 40%.

In terms of intermittent drying, seeds can be affected during this process especially during long term storage. If not properly controlled, intermittent drying can expose the seed corn to unfavorable physiological conditions (high moisture), and and/or undesirable storage conditions (high humidity, and the effect of equilibrium moisture content). So, the rule-of-thumb is to dry as quickly as possible, within appropriate temperatures for your phenotype, and once dry the corn seeds need to be kept in hermetic containers to avoid changes in properties, especially in places with high temperature and relative humidity. In some cases, which are typically dependent on environmental conditions, heat can be reduced in the last instances of drying (at around or below 15% MC) to achieve some cooling (though evaporative cooling) before permanent storage.

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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