



Director's Update

After a busy week of PSA Grower Training events followed by a full week in Yuma with CPS, United Fresh, and PMA, I finally had a chance to catch up to the very patient Center staff waiting to publish the final e-newsletter installment of 2017. From late October, forward it has been an intense and nonstop series of extension activities and events. I know I am not alone in this among UC Specialists and the many and diverse stakeholders we serve.

INTELLIGENT PERISHABLES LOGISTICS

Back in October at the VI Postharvest Unlimited Conference in Madrid, one of the “hot topics” was *Intelligent Perishables Logistics*. Intelligent Food Logistics, the broader scope of applications, covers several technological solutions in ripening management, shelf life compromising or abusive cold-chain temperature exposure, and in-transit conditions affecting food safety for animal proteins, fresh fruits and vegetables, and other foods. Combining novel and more cost-effective sensor technologies with wireless data transfer and control functions, one hopeful approach to improving perishables arrival and their keeping quality, as well as reducing food waste, is ‘intelligent container’ design.

Below in our **Ask the Produce Docs** section, Dr. Irwin Donis-Gonzales (UCD Assistant Postharvest Engineering Specialist) offers a quick response to a question received by the Center on sensors for monitoring ripening in refrigerated containers. In addition to his capsule comments, consistent with the Produce Docs format, I thought some open-access resources on the topic might be of interest. Here are some links to PDFs on Intelligent Logistics and the current approaches for sensor design and deployment.

1. [Shelf life modelling for first-expired-first-out warehouse management](#)
2. [Reducing food losses by intelligent food logistics](#)
3. [Intelligent Container Project](#)
4. [Sensors for Food Freshness and Quality](#)



WILDFIRE IMPACT ON HORTICULTURAL CROPS: RESOURCES

In addition to the direct loss of natural lands, homes and property, domesticated animals, civilian and firefighter lives, especially hard hit are the communities and growers directly impacted by the devastating wildfires in the Napa and Southern California. Despite best efforts, both Linda Harris and I were hard-pressed to uncover specific and relevant information or guidance in response to multiple requests from wine grape growers, home gardeners, tree fruit growers, berry growers, and mixed cool season vegetable growers impacted by smoke, ash, and known or potential drift from fire-retardants. Increased animal intrusion into crop fields was also mentioned as a result of rapid wildfire spread. Heidi Meier of the PTC and I arrived in Ventura, CA on the evening of Monday, December 4 to conduct a Produce Safety Alliance Grower Training on Tuesday for 95 growers. We watched the wildfire, looking immediately across Highway 101, develop from an orange glow at one spot on the hillcrest to raging flames across all the peaks in both directions. We are grateful for the list of the links to information provided by Samir Assar of FDA/CFSAN, which represent at least a

starting point for some of the situational concerns. We certainly hope some more specific guidance for fresh horticultural foods and the associated production farms, high-tunnels, and greenhouse will be developed in the future.

- Food Contaminants & Adulteration (<http://www.fda.gov/Food/FoodSafety/FoodContaminantsAdulteration/default.htm>)
- FDA Compliance Policy Guides, Chapter 5 – Foods, Colors, and Cosmetics (<http://www.fda.gov/ICECI/ComplianceManuals/CompliancePolicyGuidanceManual/ucm119194.htm>)
- FDA Compliance Policy Guide Sec. 675.200: Diversion of Adulterated Food to Acceptable Animal Feed Use (<https://www.fda.gov/ICECI/ComplianceManuals/CompliancePolicyGuidanceManual/ucm074694.htm>)
- Guidance for Industry: Action Levels for Poisonous or Deleterious Substances in Human Food and Animal Feed (<https://www.fda.gov/Food/GuidanceRegulation/GuidanceDocumentsRegulatoryInformation/ChemicalContaminantsMetalsNaturalToxinsPesticides/ucm077969.htm>)

The following resources may help growers and testing laboratories determine appropriate testing methods for chemical and metal contaminants in foods:

- Toxic Elements, including cadmium, mercury, lead, and arsenic. Analytical testing methods for toxic elements can be found in FDA's Elemental Analysis Manual (EAM) for Food and Related Products (<https://www.fda.gov/Food/FoodScienceResearch/LaboratoryMethods/ucm2006954.htm>).
- Polychlorinated Biphenyls (PCBs).
For total PCB analysis, FDA recommends methods described in Volume 1 of FDA's Pesticide Analytical Manual (PAM), Chapter 3, Chapter 5, and Appendix I (<https://www.fda.gov/Food/FoodScienceResearch/LaboratoryMethods/ucm111455.htm>).
For individual PCB congener analysis, FDA recommends methods published by the US Environmental Protection Agency (EPA): Method 1668C. Chlorinated Biphenyl Congeners in Water, Soil, Sediment, Biosolids, and Tissue by HRGC/HRMS, April 2010 (<https://www.epa.gov/cwa-methods>)
- Other contaminants as appropriate to the specific wildfire and crop situation. For example, if it is known that a significant amount of pesticide products were stored at an establishment burned by the wildfire, the grower may consider testing salvaged crop for possible pesticide contamination. Analytical testing methods for pesticides can be found in FDA's Pesticide Analytical Manual (PAM) (<https://www.fda.gov/Food/FoodScienceResearch/LaboratoryMethods/ucm2006955.htm>).
- Tolerances for pesticides can be found in 40 Code of Federal Regulations (CFR) part 180 (https://www.ecfr.gov/cgi-bin/text-idx?SID=05968162fc1662ca234bf254bc344f39&mc=true&tpl=/ecfrbrowse/Title40/40cfr180_main_02.tpl).

Additional External Resources:

- U.S. Environmental Protection Agency, 2002. Emissions of Organic Air Toxics from Open Burning. Available online at: <https://nepis.epa.gov/Exe/ZyPDF.cgi/P1001G31.PDF?Dockey=P1001G31.PDF>. Last accessed on 11-07-2017.
- Arizona Department of Health Services Wildfire Emergency Response Plan. Available online at: <http://www.azdhs.gov/documents/preparedness/epidemiology-disease-control/extreme-weather/wildfires/adhs-wildfire-emergency-response-plan.pdf>. Last accessed on 11-07-2017.
- Natural Resources Conservation Service, January 2006. Management after wildfire. Available online at https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_001731.pdf. Last accessed on 11-07-2017.
- United States Department of Agriculture, Food Safety and Inspection Service. August 2013. Fires and Food Safety. Available online at https://www.fsis.usda.gov/wps/portal/fsis/topics/food-safety-education/get-answers/food-safety-fact-sheets/emergency-preparedness/fires-and-food-safety/ct_index. Last accessed on 11-07-2017.
- The Australian Wine Research Institute. Smoke Taint. Available online at https://www.awri.com.au/industry_support/winemaking_resources/smoke-taint/ Last accessed on 11-07-2017.
- Kennison, K.R., Wilkinson, K.L.; Williams, H.G., Smith, J.H., and Gibberd, M.G., 2017. Smoke-derived taint in wine: effect of postharvest smoke exposure of grapes on the chemical composition and sensory characteristics of wine. *Journal of Agricultural and Food Chemistry*, 55:10897-10901. Available online at: <http://wineserver.ucdavis.edu/pdf/attachment/1123.%20Smoke%20taint%201.pdf>. Last accessed on 11-07-2017.

- Estrellan, C.R., and Lino, F., Review: Toxic emissions from open burning. *Chemosphere*, 80(3), 193-207. Available online at <http://www.sciencedirect.com/science/article/pii/S0045653510003711>. Last accessed on 11-07-2017.
- Statheropoulos, M. and Karmaa, S., 2007. Complexity and origin of the smoke components as measured near the flame-front of a real forest fire incident: A case study. *Journal of Analytical and Applied Pyrolysis*, 78(2), 430-437. Available online at: <http://www.sciencedirect.com/science/article/pii/S0165237006001409>. Last accessed on 11-07-2017.
- Nakao, T., Aozasa, O., Ohta, S., and Miyata, H., 2002. Formation of dioxin analogs by open-air incineration of waste wood and by fire of buildings and houses concerning Hanshin Great Earthquake in Japan. *Chemosphere*, 46(3), 429-437. Available online at: <http://www.sciencedirect.com/science/article/pii/S0045653501001424>. Last accessed on 11-07-2017.

VALLEY OF THE WORLD

I was very flattered and appreciative to have received recognition at the 12th Valley of the World Awards presented by National Steinbeck Center in Salinas, CA. The agricultural, agri-business, and ag-education community of this highly productive region along the Central Coast of CA was gracious in including me in what has been an event to recognize community leaders and key contributors to the sustainability of agricultural productivity, technology transfer, and fostering developmental education and passion for careers in the diverse fabric of the agricultural sector. I was delighted to be seated next to Ed Boutonnet (Ocean Mist –retired CEO) for the evening while Joe Pezzini, President and CEO of Ocean Mist Farms, embarrassed me by recounting over two decades of my working across industry, environmental, and policy issues in fresh produce.



Recognizing Trevor at the event.



Lorri Koster, CEO of Mann Packing, and Joe Pezzini, CEO Ocean Mist Produce, present the VOW Award and Monterey County Board of Supervisors Resolution of recognition.



Karen Suslow deserves an award for putting up with him for 36 years.

LOOKING FORWARD

As we plan and prepare for 2018, I am looking forward to working with our staff and Specialists in delivering another series of our core short course and workshops (see details below). We are also working on plans and dates for a few new, shorter and more focused workshops in both quality and food safety. As the continuity of the Center relies to a significant extent on the annual interest revenue from the Postharvest Endowment, started by Professor Adel Kader, please consider a donation. Details are found below.

Happy Holidays and Best Wishes for a Productive and Safe New Year.

We would like to thank all who participated in our e-newsletter survey and send congratulations to the following recipients of the custom Postharvest Bluetooth speaker: Adam Hughes, Mark Sheehy, Jose Martinez, Patrick Archibeque, Wu Chi-tsung, R. Kelly Soth, Leonardo Hernandez, Tim Gunderson, Angie Ramirez and Eric Helge Sorensen.



Registrations Open for 2018 Workshops!



Fruit Ripening & Ethylene Management Workshop

This April 10 & 11, 2018 [workshop](#) focuses on how to ripen fruit and fruit-vegetables for fresh cut processing and for wholesale and retail sales, and delivering ready-to-eat, delicious fruits to consumers.

Key topics include: importance of ripening programs; maturity and quality relationships; biology of ethylene production; tools to control ripening and senescence; designing a ripening program; controlling physiological disorders and commodity-specific ripening protocols.

An \$885 enrollment fee for this 2-day workshop on the UC Davis campus includes all classroom instruction, lab activities, course materials, morning and afternoon coffee breaks, lunches, and an evening mixer.

Enroll now.



40th Annual Postharvest Technology of Horticultural Crops Short Course

Enrollments have just opened for the June 18-29, [2018 Postharvest Technology of Horticultural Crops Short Course](#).

This course is a one- or two-week intensive study of the biology and current technologies used for handling fruits, vegetables and ornamentals in California.

The first week will be held at the UC Davis Activities and Recreation Center (ARC), and will include lectures and demonstrations on a broad spectrum of postharvest topics.

The second (optional) week is a field tour visiting a variety of postharvest operations throughout central California. The enrollment fee is \$2350 for the 1-week session, and \$3350 (plus additional required lodging fees) for the 2-week session.

Enroll now.

Scholarship Available for Postharvest Technology of Horticultural Crops Short Course

Once again, through support from the Leonard and Marsaille Morris Trust, we are able to offer a full scholarship for the Postharvest Technology of Horticultural Crops Short Course in 2018. The goal of the scholarship is to provide an opportunity for an individual from a developing country pursuing a career in horticultural science who otherwise would not have the opportunity to participate in postharvest training in a developed country and who will take the postharvest biology and technology knowledge gained back to their home country to benefit others in the region.

Interested individuals who meet the criteria described above should apply through this [application](#) no later than 11:59 p.m. (PST) on January 31, 2018.

The selected recipient will only be responsible for air travel to Sacramento or San Francisco, personal expenses, passport, travel visa, and other related costs not described above. Course fees, on-the-ground US transportation, lodging, a food allowance and concierge services will be provided as part of the scholarship. Applications will be reviewed by a panel of postharvest specialists. The selected recipient will be notified no later than February 28, 2018.

Featured Postharvest Bookstore Item

Small-scale Postharvest Handling Practices

This manual, revised in late 2015, provides extensive information about a wide variety of crops in maintaining quality, food safety and reducing losses between harvest and consumption.

Click [here](#) to go to the Small Scale page in our bookstore. Use sale code 20SSPHP to apply your discount. For a complete listing of all our publications see our [bookstore](#).



Postharvest Specialists' Updates & Other News



Christine Bruhn Earns 2107 International Association for Food Protection's Lifetime Achievement Award

Christine Bruhn (left) is the recipient of the 2017 International Association for Food Protection's Lifetime Achievement Award. Association President Linda Harris (right) noted that this award recognizes an individual who has made a lasting impact on "Advancing Food Safety Worldwide" through a lifetime of professional achievement in food protection. Throughout her professional career Dr. Bruhn developed an internationally recognized and influential food safety program. She pioneered research on consumer attitudes toward new technologies such as food irradiation, high-pressure processing, and genetic engineering. Her work revealed consumers' handling practices related to meat, poultry, produce, and nuts. She developed educational programs that documented changes in knowledge and behavior and helped develop a physician's educational program on food allergies, as well as a booklet for the food-allergic individual.

Postharvest Technology Endowment

Adel Kader founded the Postharvest Technology Center in 1978 to help everyone from farmers to industry to consumers reduce postharvest losses and improve postharvest quality.

Shifting priorities of postharvest management in both local and global economies means the Postharvest Technology Center needs to drive internal changes to keep pace. Using the Center platform to distill, translate and disseminate emerging technology advancements to a broader industry audience is a priority. Please consider making an end-of-year gift to the [Postharvest Technology Center Endowment](#) or one of our affiliated funds to support us in broadening our function as a hub for postharvest quality and produce safety expertise, applied technology systems and instructional extension excellence.

If you'd prefer to send in a check, please download and print the [contribution form here](#).



Postharvest Technology Center
Founder Adel Kader

Postharvest Opportunities

Agricultural Plant Physiologist

Hazel Technologies is searching for an agricultural plant specialist with experience in minor crop fruits and vegetables. Candidates should have experience in extension application and a history of team based, applied research.

Responsibilities will include: new postharvest treatment development, experimental design, analysis, and technical team oversight. The ideal candidate will be able to translate the results of analytical trials and studies to our salesforce and customers.

See position description [here](#), or visit their website [here](#).

Assistant Vice President position in the area of food safety

Del Monte Fresh Produce Company (Coral Gables, FL) 33134 is seeking applications for an Assistant Vice President position in the area of food safety. Fresh Del Monte Produce is growing aggressively around the world, and as announced in the press, will be entering the QSR business in North America soon. This position reports to the VP of R&D, and will be charged with setting the standards and deployment of food safety programs in such new businesses, as well as overseeing existing ones. Details about the position and its requirements can be found in our website: <https://delmonte-hr.silkroad.com/epostings/index.cfm?fuseaction=app.jobInfo&version=1&jobid=217321>

Although we are looking for a well-seasoned individual, the years of experience should not discourage an ambitious young person with strong leadership capacities, and solid background.

On Our Website

Stay up-to-date with the Postharvest Technology Center by joining our [Linkedin Group](#).



New Publications on our Website

James F. Thompson, Michael Reid, Lucia Felix, Irwin Donis-Gonzalez, Bertha Mjawa and Jane Ambuko. 2017 [DryCard™ — A Low-Cost Dryness Indicator for Dried Products](#), AIMS Agriculture and Food, 2(4): 339-344, DOI: 10.3934/agrfood.2017.4.339

Postharvest Calendar

- April 10 & 11, 2018. [Fruit Ripening & Ethylene Management Workshop](#). Davis, CA
- May 30 & 31, 2018. [Continuing Education for Produce Safety Educators Workshop](#). Davis, CA
- June 18-29, 2018. [Postharvest Technology of Horticultural Crops Short Course](#). Davis, CA, and Central CA
- September 18-20, 2018. [Fresh-cut Products Workshop](#). Davis, CA

Ask the Produce Docs



Q. We know of a company that is interested in a sensor that is able to determine fruit ripeness and predict fruit shelf life in a refrigerated container on a ship. It would be helpful if any UC Davis researchers know of any promising technologies or developments to address this application. (P.A.)

A. I'll try to answer your question. Even though, there is a lot of interest, currently there are no commercially available systems that can accurately and economically monitor ripening during storage and/or transportation. Some electronic noses claim to be able to do this, but they are generally viewed as being overly expensive on a per-unit basis for such deployment (\$US 15K or higher). In addition, sensor use as you have suggested has several clear practical barriers.

As far as I am aware there is only one company in Cambridge, Massachusetts, called C2Sense (<http://www.c2sense.com/contact/>), which is exploring the means to overcome these barriers towards commercialization. This company was launched by an MIT professor with the initial applications of monitoring meat and poultry quality loss, fruit ripening, and other value-propositions in shipping logistics. At this time, my interactions with C2Sense have not progressed beyond the point of mutual interest to explore current sensor performance towards design enhancements. Prototype validation assessments are in progress with select customers. Currently, the studies focus on the proof of concept with inexpensive sensors to monitor ripening of apples indirectly by measuring ethylene gas and 1-MCP concentrations. I hope that these tests will direct us to future collaborations, ultimately leading to practical and cost-effective

solutions. If we have a chance to develop this third-party data you will certainly read about it here and in other channels of technology information outreach.

Irwin Donis-Gonzalez

End Notes and Disclaimers

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 monthly e-newsletter as PDF documents.

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