



Director's Update

Revisiting Practical Considerations in the Application of Oxidation Reduction Potential (ORP) as a Water Quality Metric

Over the past two years, I have been providing talks in various workshops entitled *Dump Tanks and Other Scary Places*. In response to several recent industry meetings last month and a plethora of e-mails over the past few months, I thought it worthwhile to revisit and re-position our often cited perspective on redox potential as a standard and auditable metric for harvest and postharvest microbiological water quality management. ORP sensors measure the oxidizing or reducing potential of a solution.

The higher the ORP value, read in millivolts (mV), the greater the oxidizing action and the shorter the microbial kill time in water. In general, various market-access standards specify a redox potential critical limit of 650 millivolts (higher operating limits; often ~ 725 to 850mV) and a pH window of operation (6.5 to 7.5) to reduce the risk of cross-contamination within and among treated lots. The combined redox and pH metric are commonly referred to as an Oxidation-Reduction Potential (ORP) standard measured by in-line or handheld sensors. Technically, specifying a pH range is less critical and, when operating properly in our experience, the mV value is the sole determining criterion. Unfortunately, our extensive experience in evaluations of commercial wash water systems has demonstrated that this level of control and reliability of ORP measurements, against microbiological quality objectives, is often elusive in daily operations. Postharvest systems can be optimized to accommodate ORP as a single value control and operating standard in some but not all systems. In commercial settings, recirculated water with substantial, progressive accumulation of suspended solids and combined chlorine appear to be the most challenging to execute good process control. The result is in-line sensor saturation and diminished response time to correct for periodic deficiencies in dosing.

The current questions consider chlorine and hypochlorites in relation to an ORP standard. Therefore, this note will restrict comments to commonly used oxidizers. For brevity, operational challenges with ORP with treatments such as chlorine dioxide, ozone, and peroxyacetic acid are not discussed. [Read More...](#)



Postharvest Education at UC Davis



Fruit Ripening & Ethylene Management Workshop – April 18-19, 2017

This workshop, at the UC Davis Conference Center is intended for shippers and fruit handlers (wholesale and retail), and produce managers who are involved in handling and ripening



Just Added! Sprout Safety Alliance Sprout Grower Training Course – May 23-24, 2017

This 2-day, FDA-recognized course at the South Coast Research and Extension Center in Irvine, CA will help sprouters understand and implement the Produce Safety Rule and requirements applicable



Postharvest Technology of Horticultural Crops Short Course June 19-20, 19-23 and 26-30 (optional tour), 2017

This course at the UC Davis ARC is an intensive study of the biology and current technologies used for handling fruits, nuts, vegetables and ornamentals

fruits and fruit-vegetables. Workshop is almost full, register ASAP!

[Read More](#)

to sprout operations under FSMA compliance guidelines. [Agenda here.](#)

[Read More](#)

in California. Week two is a field tour through central California.

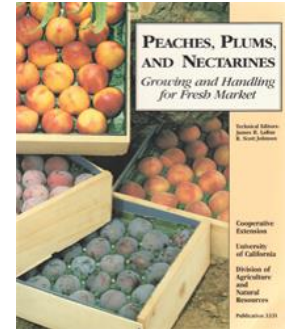
[Read More](#)

Featured Postharvest Bookstore Item

Receive 25% off this month's featured publication: **Peaches, Plums & Nectarines – Growing and Handling**

Through the end of April, we are offering a 25% discount on [Peaches, Plums & Nectarines – Growing and Handling](#). This practical guide covers topics from the orchard site selection to produce distribution. It includes 153 color photos, 36 black-and-white photos, 44 tables and charts, glossary, and index.

To order a copy, please use our [online order form](#) and note "Peach25" to receive your discount. For a complete listing of all our publications, see our [bookstore](#).



Postharvest Specialists' Updates & Other News



Archived Central Valley Postharvest Newsletter Available through the Website

This newsletter addresses the postharvest concerns of fruit growers, packers and shippers in the San Joaquin Valley of California. Published several times per year, the *Central Valley Postharvest Newsletter* distribution was to 1,647 domestic and 346 overseas growers, shippers, handlers, packers, buyers, receivers, store managers, and university personnel.

Edited by Center Specialist Carlos Crisosto from 1992-2012, the newsletter's articles are still relevant and up to date for many of today's practices in diverse production regions. Topics covered range from commodity-focused abstracts to reducing postharvest losses, optimal temperature and ethylene management and more. Use [this link](#) to access the archive.



Mary Lu Arpaia Improving Avocado Handling in Tanzania

Extension Specialists M. L. Arpaia and M. Hoddle from UC Riverside recently traveled to the Mbeya district of Tanzania to work with small-scale avocado growers. The goal of this long-term project is to enhance outreach and education and to improve overall productivity and arrival quality in Europe, thus lifting the local community. Arpaia and Hoddle are working together to help solve production and pest management issues as well as improving postharvest fruit handling protocols.





Trevor Suslow Leads Expert Panel on FSMA Produce Rule Ag-water Test Methods

Within a number of program activities and global travel for postharvest and food safety this past month, the organization and convening of an expert panel to discuss issues and solutions for both market-access and FSMA Produce Rule defined ag-water testing was certainly the most demanding. Domestic and international regulated community and affiliated stakeholder concerns over the practical limitations of current Produce Rule requirements and uncertainty surrounding recognized test methods were addressed with FDA input and assistance. Organized with the Center for Produce Safety and hosted by the Western Growers Association in Irvine, CA, the panel included experts from PMA and United Fresh, FDA, CDC, the Produce Safety Alliance, and multistate extension academia. A substantial body of data from diverse preharvest water source surveys, test method assessments, and science-based perspectives towards bringing clarity and guidance for growers on implementation and compliance with ag-water provisions was discussed. A concise report of outcomes and expert opinion is being developed and will be disseminated in the near future.

Resource Spotlight



💡 We Need Your Input by May 1, 2017! 💡

USDA SCBGP Industry Needs Assessment Survey

In an effort to align our research activities with industry needs, we'd like for you to fill out a 2-minute survey to tell us what kind of research and agricultural extension activities and programs are important to you. The USDA Specialty Crop Block Grant Program (SCBGP) has over \$60 million available in grant awards, and we'd like you to benefit from it. Please help us out and complete this [short survey](#) by May 1.

DryCard™ Developed to Help Smallholder Farmers Evaluate Moisture Content and Reduce Mold for Storage

Developed by Postharvest Specialists Michael Reid and Jim Thompson, the DryCard was born out of a trip to markets in Tanzania. Michael Reid was conducting a workshop for the UC Davis Horticulture Innovation Lab and observed inconsistencies in the moisture content of dried foods for sale in the market. It was then that lightbulb started shining a little brighter for him, so he turned to his colleague and agricultural engineer Jim Thompson.

After brainstorming and eliminating more expensive solution concepts ideas, they came up with the DryCard. With a very low price point and the relative ease of use, the DryCard is an option for anyone. The bonus is that it can be reused as long as it stored away from any moisture.

Currently two groups in Kenya are evaluating how much farmers and traders are willing to pay for the card. DryCards are available as samples in English, Swahili, Bangla, Urdu, Spanish, and French. See <http://drycard.ucdavis.edu> for additional details. See this [blog post](#) from the Horticulture Innovation Lab for more information on the new DryCard.



On Our Website

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





Produce Facts Now Available as PDF files

We are pleased to announce that PDF files of our 50 most popular Produce Facts are now available to view, download or print from the Produce Fact Sheet tab under Produce Resources.

New Publications on our Website

L. Mastrandrea, M.L. Amodio and M.I. Cantwell 2016. [Modeling ammonia accumulation and color changes of arugula \(*Diplotaxis tenuifolia*\) leaves in relation to temperature, storage time and cultivar](#). Acta Hort. 1141. ISHS 2016. DOI 10.17660/ActaHortic.2016.1141.34 Proc. III Int. Conf. on Fresh-Cut Produce: Maintaining Quality and Safety Ed.: M.I. Cantwell.

Clara Pons, Cristina Marti, Javier Forment, Carlos H. Crisosto, Abhaya M. Dandekar, Antonio Granell, 2016. [A genetic genomics-expression approach reveals components of the molecular mechanisms beyond the cell wall that underlie peach fruit woolliness due to cold storage](#), Plant Mol Biol DOI 10.1007/s11103-016-0526-z.

Postharvest Calendar

- April 18-19, 2017. [Fruit Ripening & Ethylene Management](#). UC Davis Campus
- May 24, 2017. [Sprout Safety Alliance Sprout Grower Training Course](#). Irvine, CA
- June 19-30, 2017. [Postharvest Technology of Horticultural Crops Short Course](#). UC Davis Campus and Central CA
- July 2-6, 2017. [IX International Peach Symposium](#). București, Romania.
- July 18-20, 2017. [IX Congreso Iberoamericano de Tecnología Postcosecha y Agroexportaciones](#). UC Davis campus
- September 26-28, 2017. [Fresh-cut Products: Maintaining Quality & Safety Workshop](#). UC Davis Campus
- October 17-20, 2017. [International Postharvest Unlimited Conference \(ISHS\)](#). Madrid, Spain

Ask the Produce Docs

Q I am a quality inspector and recently I saw mushrooms that were quite open. A while ago I was told that this is a sign of temperature abuse, but I am not a mushroom expert. Could you please advise me? (F.L.)

A The separation of the veil from the cap to expose the gills of a mushroom cup is a major component of quality. This quality parameter is judged at harvest and during packing operations and should determine the market use that the common *Agaricus* mushroom will be directed towards. Maturity primarily, but temperature and humidity during production all play a role in whether the cup is closed or more open as expansion results in veil separation.

If closed at harvest, a sensible possibility is that elevated temperature, lower humidity (causing water loss) and/or age would cause veil separation and increase in cup openness. There is not enough information to be definitive; however, the degree of browning and deformity of the caps evident in the images is suggestive of advanced maturity of the mushrooms during distribution which is, of course, linked to temperature and time.



Trevor Suslow

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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Editorial Review. Trevor Suslow

Writing. Pam Devine, Trevor Suslow, Heidi Meier

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