



June 2014

## News from the UC Davis Postharvest Technology Center

### Quick Links

- [Director's Update](#)
- [Postharvest Education @ UC Davis](#)
- [Featured Postharvest Bookstore Item](#)
- [Postharvest Positions](#)
- [Postharvest Specialists' Updates](#)
- [What's New on Our Website](#)
- [Postharvest Calendar](#)
- [Ask the Produce Docs](#)

### Director's Update

#### 36<sup>th</sup> Postharvest Technology of Horticultural Crops Short Course a Big Success

Our June 16-27 [Postharvest Technology of Horticultural Crops Short Course](#) has been a tremendous success this year. With nineteen instructors, and 76 participants representing twenty-six countries, there was great interaction and breadth of discussion. Our field tour will have visited more than 18 various postharvest operations by the time we are through on Friday. Check our [2014 Postharvest Technology Short Course FaceBook page](#) or our [Postharvest Postings Blog](#) for more in-depth information.

#### A few ways you can help us...

Please take a moment and write a [comment in support](#) of the proposed new **Postharvest Specialist** (cooperative extension) position which will help the Postharvest Technology Center continue its great work! The deadline for comments is July 21, 2014.

Join us for the **UC Davis Reception** at the PMA Fresh Summit in Anaheim, October 18<sup>th</sup>. The reception will be held from 5-8:30 pm, and we request your RSVP at this [webpage](#).

We're still looking for a **few more sponsors** to help provide scholarships to bring some of UC Davis's brightest and best students to the October 17-19 PMA Fresh Summit. If you would like to help by providing a \$1100 scholarship to a student, click on the "Make a Gift" button just below my picture, and from the drop-down menu, select "Postharvest Student Support." We'll make sure a top-notch student gets an opportunity to participate in this wonderful opportunity to learn more about the produce industry!

--[Beth Mitcham](#)



### Postharvest Education at UC Davis



#### September Fresh-cut Products: Maintaining Quality & Safety Workshop

Enrollments have been coming in quickly for the September 23-25, 2014 Fresh-cut Products: Maintaining Quality & Safety workshop. Organized by Dr. Marita Cantwell, it will include the most current information and some cutting edge speakers from academia and industry who will provide participants interested in the fresh-cut industry with comprehensive and up-to-date content. The enrollment price remains at \$1150 for this 3-day workshop. To learn more or to enroll, visit the [webpage](#), or contact the Enrollment Coordinator, [Ms. Penny Stockdale](#).

## Featured Postharvest Bookstore Item

### 25% Discount on 2013 Fresh-cut Products: Maintaining Quality & Safety Workshop Binder

Through the end of July we are offering a 25% discount on the course materials from the 2013 Fresh-cut Products, Maintaining Quality & Safety Workshop binder. The regular price is \$175, now on sale for just \$131.25!



Compiled and edited by Dr. Marita Cantwell, this publication includes a 473 page binder, 3 separately-bound publications, and a flash drive containing PDF files of all the binder contents. Topics include fresh-cut industry marketing and regulations, quality factors, sensory & consumer evaluation, fresh-cut product biology, product preparation & equipment, fresh-cut products & temperature, modified atmospheres & packaging and much more.

We invite you to order a copy for your library today. U.S. addresses only, please use our [online store](#). International addresses, please use our printed [order form](#). Please use the code "FC25%" to receive the discount.

[\[Back to Top\]](#)

## Postharvest Positions

### Technical Development Specialist at Valent BioSciences Corp.

Valent BioSciences has an opening for a Technical Development Specialist at their Libertyville, Illinois location. The position will identify and analyze new business opportunities for assigned product lines, will serve as the expert in understanding of market conditions, provide technical assistance and product training for the company, assist in the development of marketing materials, assist with development of new products and improvement of existing products, and work with regulatory and product registration processes. A BS or MS in agriculture or biological science is required and an advanced degree is preferred. A minimum of 5-10 years' experience in field development and/or evaluation of biorational products is required. Candidate must have both agricultural and business expertise. Position includes 30-50% travel. For the complete position description, visit [this webpage](#), or for more information contact [Pete Petracek](#).

[\[Back to Top\]](#)

## Postharvest Specialists' Updates & Other News

### Postharvest Technology Course, Wageningen UR, the Netherlands

October 14-17, 2014, Wageningen UR is offering a Postharvest Technology course which will give an in-depth view on postharvest issues for fruits, vegetables, cut flowers and ornamental plants. Participants will get an up-to-date insight on the biology of postharvest development and technologies used for storage, packaging and handling of fresh produce. This course includes lectures, demonstrations and hands-on activities. Lecturers are from Wageningen UR, and Marita Cantwell from the UC Davis Postharvest Technology Center will also give some lectures. In addition to lectures, the course also includes an excursion day-trip to selected companies. This course is specially designed for technical professional, researchers, and those active in quality control or logistics.

Interested? See the detailed course schedule and more information on the [website](#) of Wageningen Academy, Wageningen UR

### V Postharvest Unlimited Conference

Drs. Carlos Crisosto, Beth Mitcham and John Labavitch from UC Davis were keynote speakers at the V Postharvest Unlimited Conference held June 9-13 in Cyprus.

### Second Postharvest Short Course at Zamorano University

Dr. Marita Cantwell was an instructor at the [Second Postharvest Short Course](#) at Zamorano University, Honduras, June 2-5 (II curso Internacional sobre Poscosecha de Hortalizas, Frutas y Generalidades de Poscosecha de Granos). The 4 day short course had about 45 participants from Central America and was taught mainly by instructors and experts from the region.

## 1st International Congress on Trends and Innovation in Food Processing 2014 Annual Meeting, Guanajuato, Mexico

Dr. Diane Barrett was an invited speaker at this first international conference, focused on undergraduate students from 14 different universities all over Mexico. Over 500 students and faculty participated in the 3 day meeting.

## 11<sup>th</sup> World Processing Tomato Congress, Sirmione, Italy

Six hundred attendees from all of the processing tomato producing countries of the world attended this biannual conference. Dr. Diane Barrett spoke about "Future Innovations in Tomato Processing".

## Journal of Food Science Video Interview

In May, Dr. Diane Barrett was asked by the editor of the Journal of Food Science to do a 5 minute video interview speaking about the research in the paper "Effectiveness of calcium chloride and calcium lactate on maintenance of textural and sensory qualities of fresh-cut mangos". Here is a [link to the video interview](#).

[\[Back to Top\]](#)

## What's New on Our Website

### New Brief Book Review

This month, Dr. Marita Cantwell provides a brief book review of "[Improving the Safety and Quality of Nuts](#)" edited by Linda J. Harris. This 440-page book is Number 250 of the Woodhead Publishing Series in Food Science, Technology and Nutrition. This book is a comprehensive coverage of food safety concerns and controls as well as preparation, processing, rancidity and other quality aspects of important nut crops.

### New in June 2014 in the "Postharvest Publications Organized by Topic" Library

*This extensive [free postharvest resource library](#) currently offers more than 1,900 articles on a wide variety of topics.*

#### **Food Safety**

Gil, M.I., M.V. Selma, T.Suslow, L. Jacxsens, M. Uyttendaele, A. Allende, [Pre and post-harvest preventive measures and intervention strategies to control microbial food safety hazards of fresh leafy vegetables](#). Critical Reviews in Food Science and Nutrition. Aug. 2013, 60 pgs.

#### **Fresh-cut Vegetables**

Wang, Q., X Nie and M. Cantwell. 2014. [Hot water and ethanol treatments can effectively inhibit the discoloration of fresh-cut sunchoke \(\*Helianthus tuberosus\* L.\) tubers](#). Postharvest Biol. Tech. 94:40-57.

#### **Nectarine**

Cano-Salazar, J., L. López, C.H. Crisosto, G. Echeverría, [Cold storage of six nectarine cultivars: consequences for volatile compounds emissions, physicochemical parameters, and consumer acceptance](#). European Food Research Technology 237 (2013) 571-589.

#### **Peach**

Cano-Salazar, J., L. López, C.H. Crisosto, G. Echeverría [Volatile compound emissions and sensory attributes of 'Big Top' nectarine and 'Early Rich' peach fruit in response to a pre-storage treatment before cold storage and subsequent shelf-life](#). Postharvest Biology and Technology 76 (2013) 152-162

Slaughter, D.C., C.H. Crisosto, G. Tiwari, [Nondestructive determination of flesh color in clingstone peaches](#). Journal of Food Engineering 116 (2013) 920-925.

#### **Pear**

Makkumrai, W., H. Sivertsen, D. Sugar, S.E. Ebeler, F. Negre-Zakharov, E.J. Mitcham, [Effect of ethylene and temperature conditioning on sensory attributes and chemical composition of 'Comice' pears](#). Journal of Agricultural

## Postharvest Calendar

- August 17-22, 2014. XXIX International Horticultural Congress. Brisbane, Australia
- August 25-29, 2014. Small-Scale Postharvest Horticultural Technologies Short Course & Study Tour. Bali, Indonesia
- September 16-18, 2014. 19<sup>th</sup> Fresh-cut Products: Maintaining Quality & Safety. UC Davis campus
- October 14-17, 2014. Postharvest Technology Course. Wageningen, The Netherlands
- October 18, 2014. UC Davis Reception at PMA Fresh Summit. Anaheim, CA
- November 4-6, 2014. 2<sup>nd</sup> Annual Produce Safety Workshop. UC Davis campus
- November 12-14, 2014. VIII Congreso Iberoamericano de Tecnología Postcosecha y Agroexportaciones. Quito, Ecuador
- March 17-18, 2015. 21<sup>st</sup> Fruit Ripening & Retail Handling Workshop. UC Davis campus
- June 15-26, 2015. 37<sup>th</sup> Annual Postharvest Technology of Horticultural Crops Short Course. UC Davis
- September 13-17, 2015. ISHS Fresh-cut Conference. UC Davis

[Back to Top]

## Ask the Produce Docs

**Q.** We are a national retail chain interested in the proper postharvest handling of nuts. Nuts are usually held in our distribution centers (DCs) for about 3-4 weeks, but we do not have a consistent temperature zone established as a best practice. In some DCs, the nuts are stored at low temperature (34-37F; 1-3C) while in others they are stored with the dry grocery items at 65-80F (18-27C). At the store level, the nuts are displayed in non-refrigerated area. Do you have any specific temperature information to help me?

**A.** Since nuts are increasing in popularity, I reviewed the published literature to ensure the most accurate information. Three sources of information are cited below, but a more extensive reference list on nuts is available at <http://ucanr.edu/datastoreFiles/234-2753.pdf>.



Important factors for nut quality include drying to low moisture content and packaging in moisture proof bags. Since nuts in shells are often handled loose, temperature will be important to maintain quality and shelf-life as summarized in **Table 1**.

These shelf-life estimates take into account information on quality and food safety changes at different temperatures. The main quality concerns are rancidity (oxidation of lipids leading to off-flavors), darkening (related to initial drying temperature and subsequent storage conditions), mold growth (moisture and temperature dependent), brittleness (moisture content too low), insect infestation, and stale flavor (held too long under the given storage conditions). The main food safety concerns for nuts are aflatoxins produced by fungi and human pathogenic bacteria (*Salmonella* sp., *Listeria monocytogenes*); both food safety aspects are affected by the moisture content and temperature of the nut. Some nuts, especially peanuts, may cause allergic reactions in some people.

The moisture content of common nuts in refrigerated storage should be near the following percentages: almonds 6%, Brazil nuts 7%, cashew nuts 8%, coconut 20%, hazelnuts 15%, macadamia nuts 15%, pecans 5%, peanuts 7%, pistachio nuts 7% and walnuts 5%. The optimum relative humidity of storage varies from 55-70% depending on the moisture content of the nuts, and packaging in moisture-proof containers is recommended to maintain quality. The higher the temperature, the more critical is relative humidity and moisture content. Coconuts and chestnuts have high moisture contents and should be considered more as 'fresh fruits'.

Nuts in the shell have about 25-50% longer shelf-life than the nutmeats alone; this percentage can vary considerably depending on the particular nut and whether the packaging provides a moisture barrier and/or a low oxygen concentration. Pieces of nutmeats have about half the shelf-life of the intact nutmeats. Some roasted nuts have a shelf-life about one fourth that of the raw nutmeats.

In general the optimal storage temperature is 0-10C with relative humidity at 55-70%, depending upon the original moisture content of the nut.

-Marita Cantwell

**Table 1.** Shelf-life of raw nuts (in shell or intact nutmeats) stored at different temperatures. Estimates are derived from general published information and the specific references cited. If the nutmeats are packaged, it is assumed that relative humidity is controlled but that oxygen concentrations are not substantially different from air. It is also assumed the nuts were dried adequately before storage.

Nut	Type	<i>Estimated Shelf-life in months</i>					References
		-10°C (-14°F)	0°C (32°F)	10°C (50°F)	20°C (68°F)	30°C (86°F)	
Almond	Nutmeat		10	8	4		Labavitch, 2004; Cornacchia et al., 2012
	In shell		20	16	6		Labavitch, 2004 Cornacchia et al., 2012
Brasil nut	Nutmeat		6				WFLO, 2008
	In shell		12				WFLO, 2008
Cashew	Nutmeat		12		6		Soares et al., 2012; WFLO, 2008
Chestnut	In shell	Do not freeze	3	0.5	0.25		Kader, 2003; Panagou et al., 2006
Coconut	In shell, no husk		2	0.5			TIS, undated; Siripanich et al., 2011
	In green husk		2	1	0.5	0.25	Maciel et al., 1992; Siripanich et al., 2011
Hazelnut	Nutmeat		24	12			Maness, 2004
	In shell		24	12			WFLO, 2008
Macadamia	Nutmeat	24	12	12	5	0.75	Cavaletto, 2004; Wall, 2013
Peanut	Nutmeat	24	12	9	4		WFLO, 2008; Maness, 2004; Calhoun, 2013
	In shell		12	9	6		Maness, 2004; Orloff, 2009
Pecan	Nutmeat	18	10		3		Maness, 2004
	In shell	24	18	9	4		WFLO, 2008; Maness, 2004
Pine Nut	Nutmeat						
Pistachio	Nutmeat		10	3	1	0.25	Arena et al., 2013; Kader & Thompson, 2002
	In shell, split		12				Maskan et al., 1999
Walnut	Nutmeat		12		3		Mexis et al., 2009; Kader and Thompson, 2002

	In shell		12		4		McNeil, 2013
Average*		22.5	13.5	10	4	0.5	

\*The average excludes high moisture chestnuts and coconuts

Kader, A.A. and J.F. Thompson. 2002. Postharvest handling systems: Tree nuts. Ch 32, pp 399-406. In: Kader, A.A. (ed.), Postharvest Technology of Horticultural Crops. Univ. California Publication 3311.  
 Kader, A.A., E.J. Mitcham and C. Crisosto. 1998. Dried fruits and nuts: Recommendations for maintaining postharvest quality. <http://postharvest.ucdavis.edu/PFfruits/DriedFruitsNuts/>.  
 Harris, L.J. (ed.) 2013. Improving the safety and quality of nuts. Woodhead Publishing Series in Food Sciences, Tech. and Nutrition Number250, Woodhead Publishing, Cambridge, UK. 405 pp.

[Back to Top]

## End Notes and Disclaimers

**Postharvest Questions.** If you have a perplexing postharvest question you'd like answered, please send it to [postharvest@ucdavis.edu](mailto: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.

**Frequency of Distribution.** This publication is produced monthly by the UC Davis Postharvest Technology Center. For more information, we invite you to [visit our website](#) or email us.

**Subscribe/Unsubscribe.** If you or a colleague wish to receive this free monthly e-newsletter, [click here](#) to subscribe. If you no longer wish to receive this publication, please click on "reply" to this email and type "unsubscribe" in the subject line.

**Copyright/Legal Notices.** Kindly observe all [copyright and legal notices](#).

**Editorial Review.** Beth Mitcham

**Writing.** Mary Reed, Beth Mitcham, Marita Cantwell, Diane Barrett

**Layout & Design.** Mary Reed



*The University of California does not discriminate in any of its policies, procedures, or practices. The University is an affirmative action/equal opportunity employer.*

