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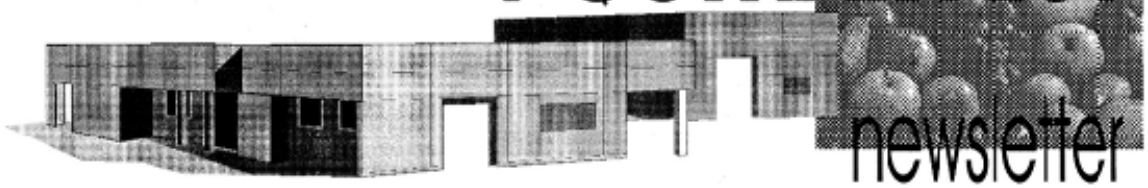
Central Valley POSTHARVEST newsletter



Contents:

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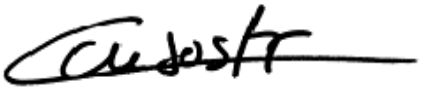

Carlos H. Crisosto, Editor

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UPDATING PEACH, NECTARINE AND PLUM INKING (SKIN DISCOLORATION) DEVELOPMENT INFORMATION

Carlos H. Crisosto

Inking has been a major skin disorder on peach and nectarine fruits for several decades (Crisosto et al., 1998). Recently, inking has frequently been reported in the stone fruit production area worldwide. Inking or skin discoloration is characterized as discolored brown-and-black spots. In most cases, it is restricted to the skin. Although inking affects only the fruit's cosmetic appearance, the disorder causes economic losses to the peach and nectarine industries each year because blemished fruit are not marketable.

Abrasion injury is one of the major precursors of inking (Crisosto et al., 1993). The other inking precursor is the metallo-anthocyanin pigments released from damaged skin cells, where they are located, that collapsed while the underlying fleshy cells (mesocarp cells) remained intact. Our previous work indicated that the presence of metallic ions such as iron (Fe), copper (Cu) and aluminum (Al) were also an important precursor for inking development. At that time, we found that at least ~10 ppm Fe was enough for metallo-anthocyanin formation that results in inking development (Crisosto et al., 1999). Foliar nutrient, fungicide, miticide,

and insecticide preharvest sprays, depending on the preharvest application interval (PHI), may act as sources of contamination for inking development.

Inking Reduction Tips

We suggest that:

1. **Check our chemical list and if you find that the chemicals that you are planning to use are not available please contact Jose Soto at (559) 646-6576 or email him at sotocx@uckac.edu) for chemical sample delivery instructions. He will provide containers and specific instructions on how to prepare samples for heavy metal determinations. As heavy metal analyses take about 2-3 weeks, a fast sample delivery is desired.**
2. Chemical manufacturing companies attempt to identify and remove from their products any potential sources of contaminants that may contribute to inking formation.
3. Chemical manufacturing companies attempt to develop safe preharvest spray intervals (PHI) for foliar nutrients, fungicides, miticides, and insecticides.
4. Producers understand the preharvest and postharvest chemicals commonly used in their tree fruit preharvest and postharvest operations and how they may affect inking incidence.
5. Reduce abrasion damage, handle fruit gently, avoid long hauling distances and keep harvest containers free of dirt.
6. Contamination of fruit can be reduced by keeping equipment clean, avoiding dust contamination of fruit, checking water quality for (Fe Al, Cu) contaminations, and avoiding foliar nutrients sprays containing Fe, Al, or Cu.
7. In orchards where inking is a problem, delay packaging for ~48 hours so you will be able to remove fruit with inking prior to placing fruit in the box.
8. Fine tune your postharvest fungicide application to assure that your residues are above the effective minimum recommended, but well below the maximum residue limit (MRL) or tolerance (Adaskaveg personal communication, 2008).

Postharvest Fungicide		Stone Fruit Residues (ppm) for Domestic and International Markets	
Chemical Names	**Trade Names**	**Usage Residue***	**Tolerance (MRL)**
Fludioxonil	Scholar	0.5-1	5
Fenhexamid	Judge**	1-3	10
Propiconazole	Mentor***	0.5-1	2***

* Based on application method. Improved coverage (e.g., high volume systems) allows lower residues.

** Formerly named Elevate (preharvest name).

*** Mentor 45WP was registered under an emergency registration (Section 18) for the 2006-2008 (pending for 2009) seasons and is in the IR-4 program for full Section 3 registration. International CODEX MRL is 1 ppm.

Table 1. Specific heavy metal concentrations in selected additive solutions prepared at concentrations according to their labels (100 gallons per acre rate).

Additive Names	Total (mg per liter)		
	Iron (Fe)	**Copper (Co)**	**Aluminum (Al)**
Omnis Supreme	<0.2	<0.2	<0.5
No Foam B	<0.2	<0.2	<0.5
Latron B	<0.2	<0.2	<0.5

Table 2. Specific heavy metal concentrations in selected foliar nutrient solutions prepared at concentrations according to their labels (100 gallons per acre rate).

Foliar Nutrient Names	Total (mg per liter)		
	Iron (Fe)	Copper (Co)	Aluminum (Al)
Cal Ocho	0.2	<0.2	<0.5
Vigor-Cal	<0.2	<0.2	<0.5
Agri-Trend 20-20-20	2.8	1.1	<0.5
MicroPlex	21.0	8.0	<0.5
Goemar	<0.2	<0.2	<0.5

Table 3. Specific heavy metal concentrations in selected preharvest fungicides solutions prepared at concentrations according to their labels (100 gallons per acre rate).

Fungicides Names	Total (mg per liter)		
	Iron (Fe)	Copper (Co)	Aluminum (Al)
Elite	2.8	<0.2	52.5
Orbit	<0.2	<0.2	<0.5
Indar 75	0.3	<0.2	4.6
Pristine	0.3	<0.2	13.6

Table 4. Specific heavy metal concentrations in selected miticide solutions prepared at concentrations according to their labels (100 gallons per acre rate).

Miticide Names	Total (mg per liter)		
	Iron (Fe)	Copper (Co)	Aluminum (Al)
Envidor	<0.2	<0.2	<0.5
Onager	<0.2	<0.2	<0.5
Vendex	10.2	<0.2	183
Acramite	12.4	<0.2	198
Omite	4.2	<0.2	114

Table 5. Specific heavy metal concentrations in selected insecticide solutions prepared at concentrations according to their labels (100 gallons per acre rate).

Insecticide Names	Total (mg per liter)		
	Iron (Fe)	Copper (Co)	Aluminum (Al)
Imidan	1.1	<0.2	27.0
Intrepid	<0.2	<0.2	<0.5
Success	<0.2	<0.2	<0.5
DiPel DF	0.2	<0.2	<0.5
Lannate	<0.2	<0.2	<0.5
Deliver	0.4	<0.2	<0.5
Delegate	2.0	<0.2	29.2
Pyganic	<0.2	<0.2	<0.5
Altacor	0.5	<0.2	5.1

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ETHEPHON TO ELIMINATE FIRST CROP FIGS

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The approval of the use of ethephon to eliminate first crop figs is under review by the federal IR-4 program, and it is expected to be approved prior to next season. After approval, the following protocol is suggested for those growers who want to try this program. This should reduce the first crop by about 90%. Ethephon is the active ingredient (21.7%) in Ethrel®, a registered trademark of Bayer (Bayer CropScience).

Timing: Use in early spring before the leaves are fully expanded and the biggest fruit are about 1.5-2 centimeters in diameter when measured from the sides (see picture).

Rates: Apply 300 PPM ethephon with a surfactant at 100 gallons per acre. Follow the label directions carefully for both the Ethrel and the surfactant. Good coverage is a must so keep tractor speed down.

This spring ethephon treatment should not affect the percentage of bud break, first crop weight, soluble solids content, crop load, fruit weight or ethephon residues. Currently, ethephon is included in the federal IR-4 program and residue studies are ongoing as are protocols for future registration.

For more information, contact Maxwell Norton, UC Cooperative Extension, phone (209) 385-7403 or email mnorton@ucdavis.edu; or Carlos Crisosto, UC Kearney Ag Center, phone (559) 646-6596 or email carlos@uckac.edu.

REDUCING LOSSES OF PRECONDITIONED FRUIT PROGRAMS

Carlos H. Crisosto

Currently, there are several companies that are offering delivery of preconditioned-pre-ripened peach, nectarine and plum based on our UC preconditioning protocol. This delivery system has the potential of delivering to retail stores tree fruit that is "Ready to Buy" with low occurrence of internal breakdown symptoms, and high consumer acceptance.

A recent intensive consumer quality survey (1,552 consumers) indicated that fruit softening, spoilage, and lack of taste ("sensory damaged") are the main barriers restricting California peach, nectarine and plum purchases in the USA market (Sterling-Rice Group, 2006). Thus, prevention of these postharvest quality losses (Table 1) during the cold chain could be an approach to improve tree fruit consumption, since major sensory quality problems (softening and unfavorable taste or lack of taste) occur during postharvest handling.

Table 1. Top reasons for fewer purchases of California peaches, nectarines and plums (2005).

Peaches	Nectarines	Plums
1. Too soft	1. Too expensive	1. Too expensive
2. Spoiled too quickly	2. Too soft	2. Too soft
3. Too expensive	3. Spoiled quickly	3. Not sweet
4. Overripe / threw away	4. Not sweet	4. Not enough flavor
5. Not sweet	5. Not enough flavor	5. Too tart
6. Not enough flavor	6. Inconsistent experience	6. Spoiled quickly
7. Not ready to eat	7. Overripe, threw away	7. Inconsistent experience
8. Inconsistent experience	8. Not ready to eat	8. Overripe, threw away
	9. Too tart	9. Not ready to eat
	10. Too stringy	

Sterling-Rice Group. 2006. What Are Your Customers Thinking Project: Why Not? Prepared for the California Tree Fruit Agreement, October 26.

Basic Requirements of the Preconditioning Program

There are some basic requirements necessary to successfully execute and reduce preconditioned/pre-ripening fruit losses during postharvest handling. Infrastructure such as a ripening room and forced air capacity should be available for this reliable preconditioning/pre-ripening program. Also, trained quality assurance personnel and a "ripener" are key components of this program.

Optimize your fungicide application operation.

To avoid decay incidence, be sure all sanitation practices are carried out very well. In relation to the fungicide and wax application, it should be evenly distributed on the fruit especially inside the stem cavity and check frequently for postharvest fungicide residues. Postharvest fungicide type and residues should be varied according to export markets (see below). The best option is to expose fruit to the preconditioning treatment after fungicide/wax application to protect it from decay and water losses. In some cases, for example, when packingline is being used, a short part of the 48 hours preconditioning/pre-ripening treatment can be done before packing. Because of fruit softening and decay pressure, the least amount of time in this "front" preconditioning period is the best. If this preconditioning in "front" is being used, a careful monitoring of fruit firmness and temperature is required.

Postharvest Fungicide		Stone Fruit Residues (ppm) for Domestic and International Markets	
Chemical Names	**Trade Names**	**Usage Residue***	**Tolerance (MRL)**
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Propiconazole	Mentor***	0.5-1	2***

* Based on application method. Improved coverage (e.g., high volume systems) allows lower residues.

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Source J. A. Adaskaveg, 2008.

Control fruit and chamber temperature conditions and fruit firmness evolution during the preconditioned-pre-ripening process.

Fruit temperature and firmness should be taken during ripening by a member of the quality control team. Values should be discussed with the "ripener" to determine the end point of a given lot.

Monitor and determine the end of the preconditioning-pre-ripening process.

The end point of the preconditioning/pre-ripening treatment for most of the peach cultivars should be at least 48 hours after harvest at 68ºF and/or when the weakest position on the fruit reaches a firmness of 6-8 pounds (weakest position). For example, some cultivars will be protected from internal breakdown after being exposed to 48 hours at 68ºF; after that time fruit firmness at the weakest position can still be at 10-8 pounds. Thus, a longer exposure at 68ºF to prepare fruit for immediate consumption can be applied (ripening). The pre-ripening period can be extended longer than the preconditioning time according to firmness requirements by the buyers. Maximum pre-ripening end points for domestic market are approximately 6-8 lbs for peaches, approximately 8 lbs for nectarines, and 4 lbs for plums measured in their weakest fruit position. Check and coordinate with your buyer's handling. The end point of ripening is determined by the fruit susceptibility to bruising during postharvest handling during transportation, and handling at retail store displays. Firmness should be measured on warm fruit (55-77°F) using an 8-mm (5/16") tip. Fruit firmness measurements will help to control your preconditioning treatment and assure your receiver's requirements. Fruit should be firm enough to tolerate the physical abuse during transportation and retail handling but soft enough to satisfy your buyer's request.

Slow down fruit softening after preconditioning-pre-ripening process.

Evaluation of fruit temperature and firmness should be done immediately after conditioned fruit are forced air-cooled to a range of 32°F-35°F. It is essential to keep fruit temperature down to 32ºF to extend market life of preconditioned fruit because of fruit softening. At this point, the fruit are no longer very susceptible to internal breakdown caused by temperature exposures in the "killing zone." So, typical temperatures in the postharvest handling chain such as transportation, warehousing, retailing, and consumer handling will not affect internal breakdown development.

The controlled application of this preconditioning/pre-ripening treatment should assure a premium eating quality and more adaptability to standard postharvest handling conditions.

Retail handling instruction for preconditioned fruit.

Preconditioned fruit should be transported at 32°F-35°F and ideally, retail stored at 32°F-35°F prior to transfer to dry display. Display temperature will depend on fruit firmness at arrival and retail turnover. In order to protect preconditioned fruit, display should be no more than two layers deep. Also, it is very important to let your produce managers and consumers know that this is **"preconditioned/pre ripened California fruit."**

FUTURE DATES

Upcoming events are posted on the Postharvest Calendar at the Agriculture and Natural Resources, University of California (ANR) website at: http://ucce.ucdavis.edu/calendar/calmain.cfm?calowner=5423&group=w5423&keyword=&ranger=3650&calcat=0&specific=&waste=yes

Information about the following upcoming events can also be found on the Postharvest Technology Research and Information Center website at http://postharvest.ucdavis.edu/:

Short Courses & Workshops

- **June 15-26, 2009.** Postharvest Technology Short Course (31st Annual). Enroll On-Line.
- **September 22-24, 2009.** 14th Annual Fresh-cut Workshop. Enroll On-Line.

Link to the
REFRIGERATED WAREHOUSE ENERGY TOOL
developed by Paul Singh, Ph.D.

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