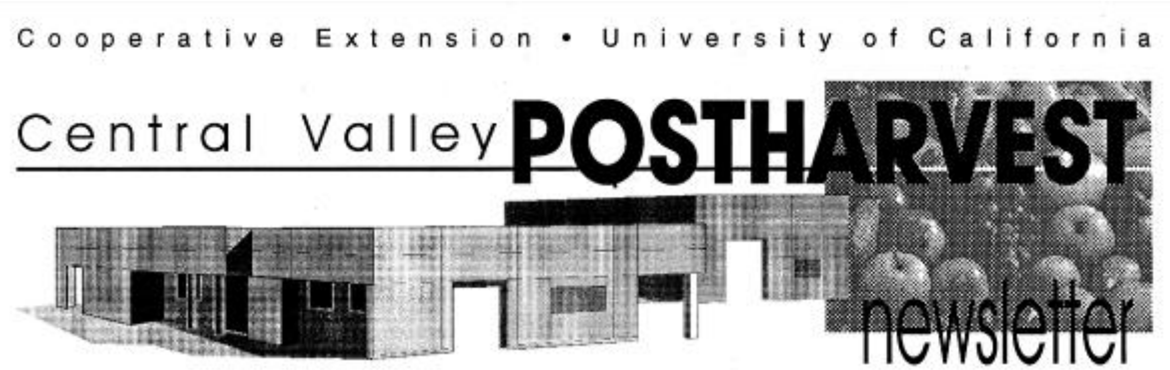

Contents:

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Carlos H. Crisosto, Editor

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RECOMMENDATIONS TO REDUCE *FIELD INKING* AND *SKIN BURNING* DEVELOPMENT IN PEACH AND NECTARINE FRUIT

Celia M. Cantin and Carlos H. Crisosto

University of California, Davis
Kearney Agricultural Center

Our results from several years seem to show that *field inking* and *skin burning* peach and nectarine skin discoloration are triggered by the combination of physical damage during harvesting-hauling combined with 'postharvest stresses'.

Our previous seasons results show that low energy physical injury (abrasion) combined with different conditions during the harvest-handling operations, will induce the development of these cosmetic disorders on the fruit skin. Although *field inking* and *skin burning* disorders have similar symptoms, they have different triggers and different biological mechanisms of development. For that reason, and as defined previously by our team, we will make a distinction between these two types of skin discoloration:

- *Field Inking* is the traditional inking developed in the field and observed at fruit harvesting. This type of skin discoloration is produced in the field, and its incidence does not increase during the postharvest operations. The traditional field inking is mostly triggered by the reaction of phenolic pigments located in the skin cells and released during physical abrasion, with iron and/or aluminum **metal contaminants** coming from foliar nutrients, fungicides or miticides applied to the field. No difference on the susceptibility to this skin disorder has been observed among cultivars.

Fig. 1. Field inking observed on a white flesh peach cultivar before packaging.

- *Skin burning* is the skin damage mainly observed after packing and handling, and is caused by the combination of pre- and/or post-harvest physical abrasion with exposure to **high pH** and/or **high forced air cooling velocity**. The incidence of this skin disorder increases after the postharvest operations (washing, handling and cooling), even though any physical damage occurred in the field will also contribute to its development. Different susceptibility to skin burning has been observed among cultivars, depending mainly on their skin phenolic composition.

Fig. 2. Skin burning observed in a white flesh peach cultivar after exposure to pH 9 (left) vs. fruit exposed to pH 7.0 (right).

Fig. 3. Skin burning observed in a white flesh peach cultivar after high speed forced air-cooling operation.

In order to reduce both types of skin discoloration, and therefore to alleviate the remarkable recent economical impact that they are having on the fruit industry, we suggest the following recommendations:

1. Reduce to the minimum the physical damage or abrasion on the fruit surface during pre- and/or post-harvest operations. Handle fruit gently, avoid long hauling distances and keep harvest containers free of dirt. This will reduce both *field inking* and *skin burning* incidence.
2. Carefully screen for Fe and Al within any preharvest and postharvest chemicals used in our tree fruit industry to reduce potential *field inking* incidence.
3. Continuously maintain washing water pH in the brushing-washing operation around 6.5-7.5, in order to avoid the development of *skin burning* on the fruit. The best compromise of activity and stability is achieved by maintaining a clean water pH between 6.5 and 7.0. The installation of automated systems (ORP) to monitor and/or adjust active/effective chlorine and pH levels is desired to increase disease control effectiveness and decrease potential skin burning development.
4. Based on our current results, to avoid potential *skin burning* development due to the combination of physical damage and exposure to high pH, we recommend dry packaging (without brushing and chlorine rinse) very susceptible peach or nectarine cultivars.
5. Avoid the fast cooling air velocities in the skin burning susceptible peach or nectarine cultivars. In these susceptible cultivars, we suggest cool the fruit by room cooling, without air velocity.
6. Detailed work will be performed during this upcoming season to find practical approaches to reduce *skin burning* incidence on peaches and nectarines.

ASSURING PROPER TEMPERATURE OF CALIFORNIA TABLE GRAPES AT ARRIVAL IN EXPORT MARKETS

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University of California,
Department of Plant Sciences
Kearney Agricultural Center

ABSTRACT: Studies to maintain table grape quality for long term storage/shipment were carried out at the F. Gordon Mitchell Postharvest Laboratory in the 1998 season. That work demonstrated that commercially transported table grapes in containers without any air exchange for up to three weeks improves SO_2 accumulation and helps to maintain temperature without reducing fruit quality. Carbon dioxide, oxygen and ethylene levels were slightly modified without reaching any dangerous concentrations for table grapes. This season will be validating the performance of closing container venting for tree fruit during transportation.

PROCEDURES

Container loading. Two 2,359 ft^3 Maersk containers were loaded for export in Bakersfield, CA. Twenty pallets (36” x 42”) of table grapes were loaded into each container. Each pallet was comprised of 77 sixteen-pound Styrofoam boxes (11 tiers, 7 boxes per tier). The grapes were packaged in cluster bags with SO_2 pads, but without box liners. There was approximately 10” of floor at the rear of the containers as well as a central channel between the pallets that was covered with plastic. The container drain holes and air exchange vent were closed for this trial. After loading, the containers were parked next to a commercial shipping facility and run for 21 days at 0ºC to simulate an export shipment.

Water loss. Boxes at the front (second row from bulkhead), middle (fourth row from bulkhead), and rear (eighth row from bulkhead, third from rear doors) pallet positions were weighed at the time of loading. These boxes were then reweighed at the end of the trial to determine rate of water loss.

Gas sampling, temperature measurement. Container O_2, CO_2, C_2H_4, and SO_2 concentrations were measured by withdrawing air samples through plastic tubing exiting the container through the drain holes. Samples were taken from return air channel at the top-center of the container. Sulfur dioxide concentration was measured with a Kitagawa pump and SO_2 detector tubes. Oxygen and carbon dioxide concentrations were measured by injecting samples into an MAPtest 2000 gas analyzer. Ethylene concentration was measured by injecting air samples into a Carle AGC-111 gas chromatograph equipped with a flame ionization detector. To monitor temperature during the experiment, Omega RD-TEMP-XT temperature loggers were placed in top, center and bottom boxes of each test pallet.

Sulfur dioxide "dose" during simulated transport was measured by placing passive dosimeter tubes in the front (second row from bulkhead), middle (fourth row from bulkhead), and rear (eighth row from bulkhead, third from rear doors) of the load. Two tubes were used for each position. One 5D dosimeter tube (0-100 ppm-h) was placed in both the third and ninth center boxes from the top of each pallet. These tubes were placed within the cluster bags that contained the fruit.

RESULTS

Water loss. The initial average gross weight of the grape boxes was 8.02 kg ($\pm$0.02 kg). After the 23-day simulated transport period, the average gross box weight was 7.87 kg ($\pm$0.07 kg). This corresponds to a loss in gross weight of 1.9%.

Gas sampling, temperature measurement. At the end of the simulated transportation period, the passive dosimeter CT values ranged from 25 to 130 (mean = 102.5, sd=39.2). Sulfur dioxide gas samples taken from within the container and within the boxes in the container never exceeded 0.6 ppm (Fig. 1). Carbon dioxide concentration rose steadily for the first five days from 0% to ~0.6%, and then remained at that level for the duration of the experiment. Oxygen levels did not vary during the course of the simulated transport trial. Fruit pulp temperatures were maintained at 0ºC ($\pm$0.5ºC) for the entire trial (Fig. 1). Container air temperatures fluctuated more widely during the defrost periods at the rear of the container than at the center and front. For this reason, we consider the top of the rear pallet positions to have the potential to be the warmest.

Decay. *Botrytis* nesting was not detected at arrival in inoculated grapes packed with SO_2 pads. Upon arrival, SO_2 pads were removed from half of the boxes from each container then the boxes were "displayed" at 20ºC (68ºF). After three days at room temperature, *Botrytis* decay as a consequence of wound or spray inoculation was still not observed in any of the treatments.

CONCLUSIONS

- Shipping containers overseas with the vents closed provided excellent fruit temperature control, accumulation of SO_2, a slight increase in CO_2 and C_2H_4, and decrease in O_2 without affecting grape quality.

- The use of SO_2 pads without box liners limited *Botrytis* nest development during shipment in a non-vented container under our experimental conditions.

- As stone fruit has a higher respiration rate than table grapes a semi-commercial test will be run to validate this technique (venting closed) for peaches, nectarine and plums.

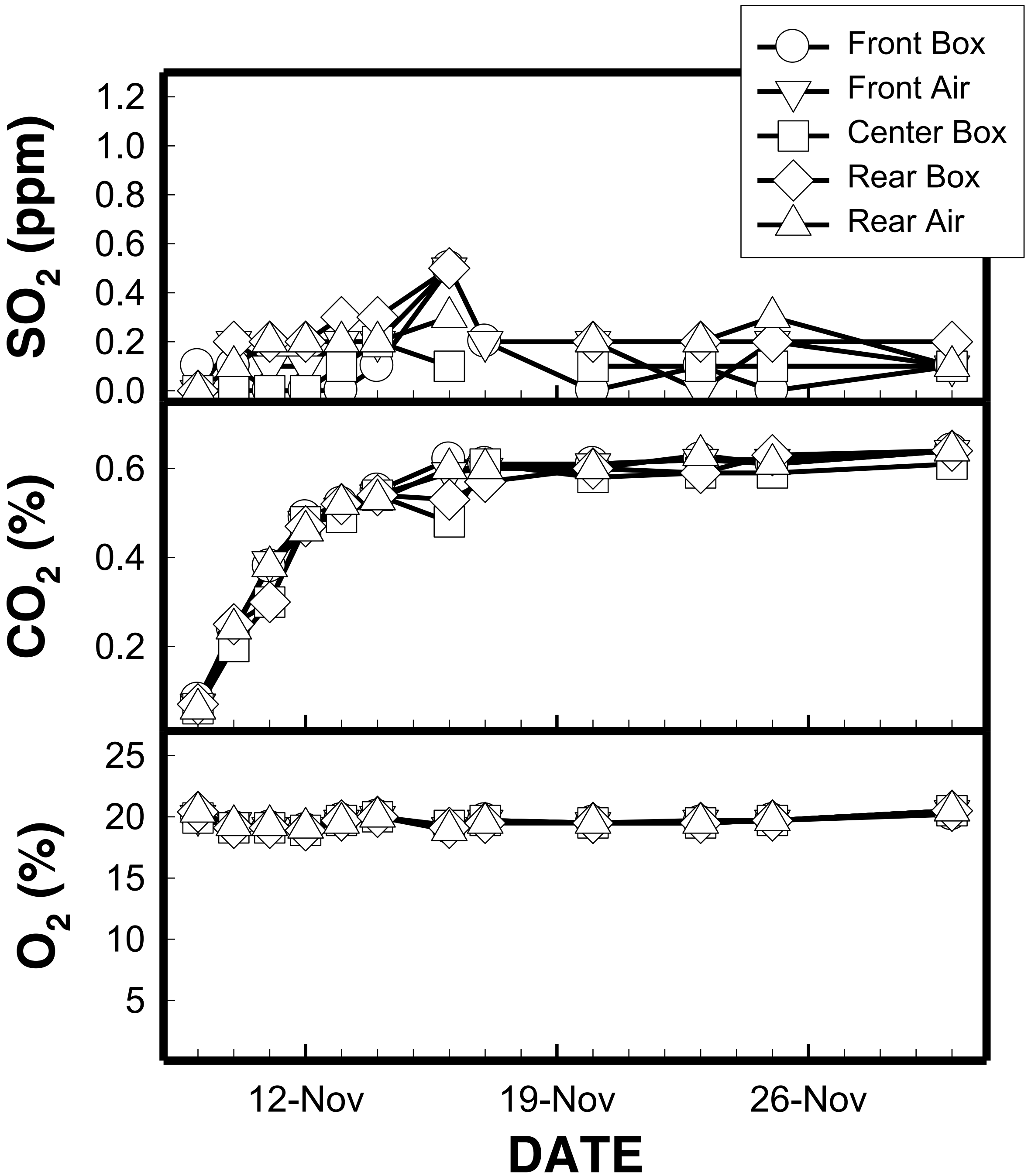


Fig. 1. Sulfur dioxide, carbon dioxide and oxygen concentrations in a closed-vent container of table grapes during a 23-day simulated shipment.

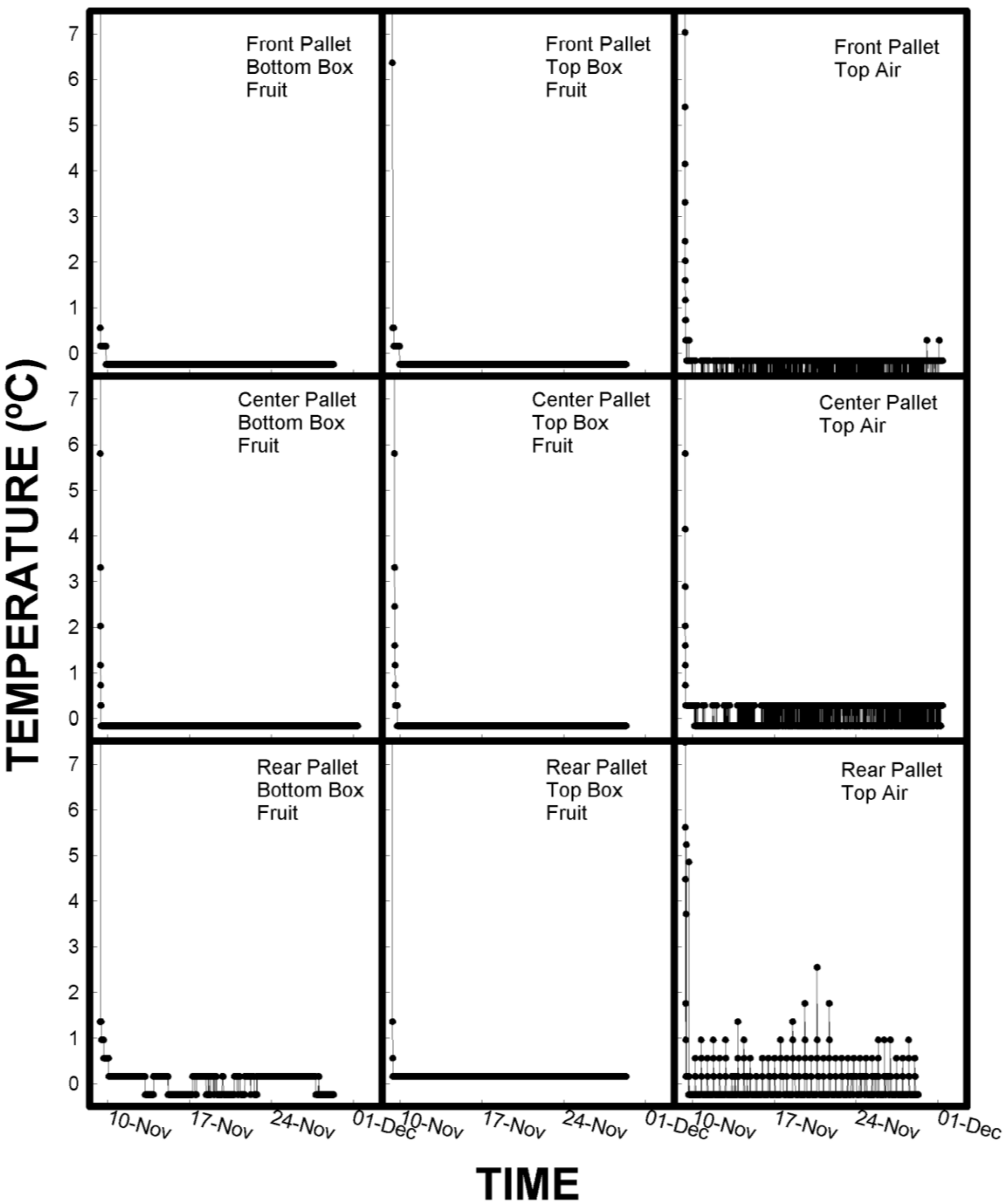
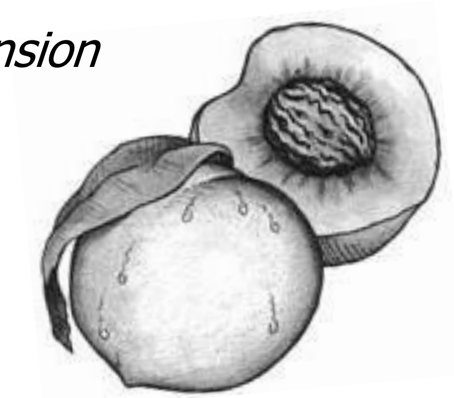


Fig. 2. Fruit pulp and air temperatures in a closed vent container of table grapes during a 23-day simulated shipment.

University of California Cooperative Extension
and the
Kearney Agricultural Center

present



2010
VARIETY DISPLAY AND RESEARCH UPDATE SEMINAR SERIES

8:00 am – 9:00 am Variety display by stone fruit nurseries, breeders, and the USDA

9:00 am – 10:00 am Research Update Topic and discussion in the field

Mark your calendars for these dates:

Friday, July 2
Friday, August 6

Topics to be discussed will include:

Stone Fruit Rootstocks, Pedestrian Orchards,
Fruit Quality, Tree Nutrition

at the

Kearney Agricultural Center
9240 S. Riverbend Avenue
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FUTURE DATES

First Winter Postharvest Short Course. February 21 to 25, 2011 at the Kearney Agricultural Center, Parlier, CA. For further information contact Carlos H. Crisosto at carlos@uckac.edu or (559) 646-6596.

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

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

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