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Central Valley POSTHARVEST newsletter

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http://www.uckac.edu/programs/Postharvest_for_fruits_and_nuts/

Also visit:

http://postharvest.ucdavis.edu
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TRIBUTE TO F. GORDON MITCHELL

Carlos H. Crisosto, Dept. of Plant Sciences, UC Davis

As we were preparing this issue of the Central Valley Postharvest Newsletter, we learned that Dr. Mitchell had passed away on February 10.

I developed my professional career working from the F. Gordon Mitchell postharvest laboratory at the Kearney Agricultural Center (Parlier, CA) donated to the University by his good friend Mr. Leroy Giannini.

I did not have the privilege to be his student, but my wife (Ms. Gayle Ullrich), my college roommate (Mr. Riccardo Gatti),) and many other peers and industry members were. I was still blessed to be his apprentice. Two years after I took my position at the Kearney Agricultural Center, Gordon and I started developing a relationship that started by having the same goal. Our mission was to develop an applied research and an active outreach program to our fruit grower community in the San Joaquin Valley and other places. Gordon always envied me as I had more time to spend with our clientele and his friends in the San Joaquin

Valley. During those days he visited me frequently, helped me to develop a strong research and outreach program, and therefore, gain the respect from our industry.

Gordon was a smart, patient, experienced, and knowledgeable man that trained me by letting me create my program, make my decisions, but minimize my potential mistakes. I still hear inside my head his comments and stories when I drive around the valley, along highway 99 or walk into a packinghouse. His "soft jokes" during our long conversations after dinner still make me smile, and they will be with us forever as I pass them to the next generation.

Gordon was a great educator; his students are shining and became leaders in their different industry positions all over the world. As a Chilean I should point out that the highly competitive Chilean industry still sees Mr. Gordon Mitchell as one of their founders. There is so much that I can talk about Gordon, but the most important is that he was a reliable friend. His teaching went beyond the technical; he taught by his actions on the way to live our lives, his respect for others, and his love for his wife Bea and his church. These are examples that we should all learn from and follow.

The picture of Gordon that I would like to keep in my mind is Gordon smiling with Bea and surrounded by friends.

F. GORDON MITCHELL – 1924-2012

This tribute was written by family members and available at his memorial service.

On February 5, 1924, Frank Gordon Mitchell was born into a family of farmers (Marjorie Sprecker and F. Wilbur Mitchell were his parents) who ran their own orchard, one that had been in his family for generations. Even after Gordon eventually left the farm to pursue his career, farming was still in his blood; he went into the field of pomology, the study of fruit. Here, he found a niche quite his own, one that enabled him to utilize his many skills to their utmost, both professionally and personally.

Gordon was a smart man – one of the most intelligent that many would ever come across. Able to produce solutions for a myriad of problems, he tackled all with a measured resolve. Perhaps this is why he was referred to as "The Brain" in high school. With his determination and intelligence, Gordon was able to be extremely successful in his career. He was a leader in his field – even receiving the honor of having a building named after him – and he traveled around the globe advising countries and companies on their fruit packaging and handling processes.

F. Gordon Mitchell (left) and Carlos H. Crisosto, upon the dedication of the F. Gordon Mitchell Postharvest Center at the Kearney Agricultural Center.

For all that Gordon loved his work, his work did not define him as a person; his love for his wife did. Gordon was married to his wife, Bea, for 62 years before she passed away in April 2011. Gordon was singularly devoted to her. Caring for her as she became ill after decades of failing health, he never left her side. When once encouraged to take a "personal day" and not make the drive to visit Bea in the convalescent

home, he responded emphatically, "My number one responsibility is to love and support my wife."

Gordon was supported in his endeavors by his strong faith in God and by his extended family – both were pillars of strength in his daily life. Lengthy discussions with his pastor buoyed his spirits, as did prayer. But time with his family raised his countenance most regularly; he revered his loved ones and extended to them his unfailing love and support.

Regardless of his personal accolades, it is this love that will remain in our hearts as an extension of Gordon for the remainder of our lives. That he was able to wring so much devotion and joy from a single life is an inspiration to us all. A person of such commitment, intelligence, love, and faith rarely comes in a single package. Those who knew Gordon are better people and lead more fruitful lives because of his singular influence.

20 YEAR MILESTONE REACHED FOR CVPN

This Introduction *from May 1992 was the first article in Vol. 1, No. 1 of the Central Valley Postharvest Newsletter. The issue you are reading today marks the 20-year anniversary of this publication.*

Introduction

F. Gordon Mitchell, Pomologist Emeritus, UC Davis

This is a new newsletter designed especially to address the postharvest concerns of fruit growers, packers and shippers in the California San Joaquin Valley.

It is planned to release two issues each year, with one emphasizing stone fruits and the other covering apple, kiwifruit, table grape, Asian pear, citrus and other subtropicals. In initiating this newsletter, Dr. Carlos Crisosto, a Postharvest Pomologist, University of California, Davis located at the Kearney Agricultural Center, and Dr. Mary Lu Arpaia, a Subtropical Horticulturist at the University of California at Riverside, hope to better reach the fresh fruit industries with current postharvest information, drawing on work done here and elsewhere.

This newsletter is only part of an expanded effort by the University of California to better meet the postharvest horticulture needs in the San Joaquin Valley. Dr. Crisosto was the first UC Postharvest Research and Extension appointment at the Kearney Agricultural Center. The first phase of a major postharvest horticulture laboratory is currently under construction through the generosity of a UC benefactor. When this is operational we will have the capability of a world-class laboratory in the center of the fruit growing area. As the UC budget allows we hope to see more personnel assigned to this program. The first two of what we hope will be many postharvest meetings were held at the Kearney Agricultural Center this spring, one on stone fruits and one on refrigeration.

I am personally delighted to see this program underway. I have seen this as a long-term need. In recent years it has become more important for us to have this capability at the Kearney Agricultural Center as the fresh fruit industry has been growing, especially in the San Joaquin Valley, as the importance of fresh fruit in the diet has increased consumption, and as opportunities for export shipments are expanding. With these changes we have challenges to extend the market life while reducing losses, and to maintain or improve fruit quality, including flavor, nutritional value and safety. This postharvest horticulture center located in the heart of the fresh fruit industry can help us to meet these challenges.

FRUIT FREEZING INJURY

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Occurrence

Freezing injury can be encountered in fruit that are purposely stored at near their freezing point or some accidental exposure to subfreezing temperatures because of some malfunction in the refrigeration system. Injury can occur whenever fruit are exposed to too low temperatures whether during cooling, storage, transport or in distribution centers.

Importance

Occasionally freezing can occur in any type of fruit. Decay development occurs faster on freeze injured fruit.

Symptoms

Freezing injury occurs when ice crystals form in the tissues. Cultivars, locations, and growing conditions may affect the freezing point. An approach to avoid freezing is to use the highest temperature at which freezing of a specific commodity may occur as a guide for recommending the optimum storage temperature. More detailed discussion of freezing points and factors affecting them can be found in **http://postharvest.ucdavis.edu**.

Freezing injury will appear as glassy, "water soaked" or translucent areas in the flesh. With time these injured areas will dry leaving open "gas pockets" in the flesh. The freeze injured tissue of most fruits will begin to brown as a result of enzymatic oxidation of phenols released by the injured tissue. When freezing occurs at the fruit surface, the glossy or browning symptoms may be visible without cutting.

Often when injury is seen it is necessary to determine whether it is indeed from freezing or whether it is from some other cause.

Similar symptoms can be associated with injury from other causes. Water core in apples and some senescent breakdown problems can cause flesh translucency. Many disorders can cause internal tissue browning or even the development of gas pockets. Surface browning may be confused with scald disorders in apples, Asian and European pears, or even chemical or mechanical injuries on many fruits.

Freezing will occur on the most exposed fruit, i.e. near box openings located on the sides and corners of the pallet. Damage may be worse on the exposed surface of the fruit, and there will be no relationship between freezing injury and the soluble solids content (SSC) patterns within or among fruits.

Freezing injury should thus be seen first in the lowest SSC portions of the fruit and in the lowest SSC fruit within a lot. Each fruit has a typical SSC pattern. For pears and apples that we have evaluated, the lowest SSC is in the core area, and the highest SSC is in the outer flesh near the blossom end of the fruit. For kiwifruit the lowest SSC is in the flesh nearest the stem end, and the highest SSC is in the core and flesh tissue near the blossom end. While we would expect to see freezing injury appear first in the core area of a pear, for example, we should verify the relationship between SSC and injury with refractometer measurements.

Causes

A fruit freezes because of prolonged exposure to a temperature just below its freezing point, and the injury pattern should relate to the pattern of soluble solids content (SSC) of the fruit. This is because low SSC fruit will freeze at a higher temperature than high SSC fruit.

Control

Maintain temperatures just above freezing. This requires good equipment and careful management. Of equal importance is accurate monitoring of soluble solids content (SSC) of fruit as a basis for estimating the freezing point of the tissue. The relationship between SSC and the freezing point for stone fruit is presented in Table 1. To safely utilize temperatures near the freezing point of fruits, one must know the SSC variability within fruits.

Table 1. Relationship between stone fruit soluble solids content (SSC) and the freezing point.

SSC	Safe Freezing Point	
(%)	(^{o}F)	(^{o}C)
8.0	30.7	-0.7
10.0	30.3	-0.9
12.0	29.7	-1.3
14.0	29.4	-1.4
16.0	28.8	-1.8
18.0	28.5	-1.9

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FIELD INKING OR BLACK STAINING

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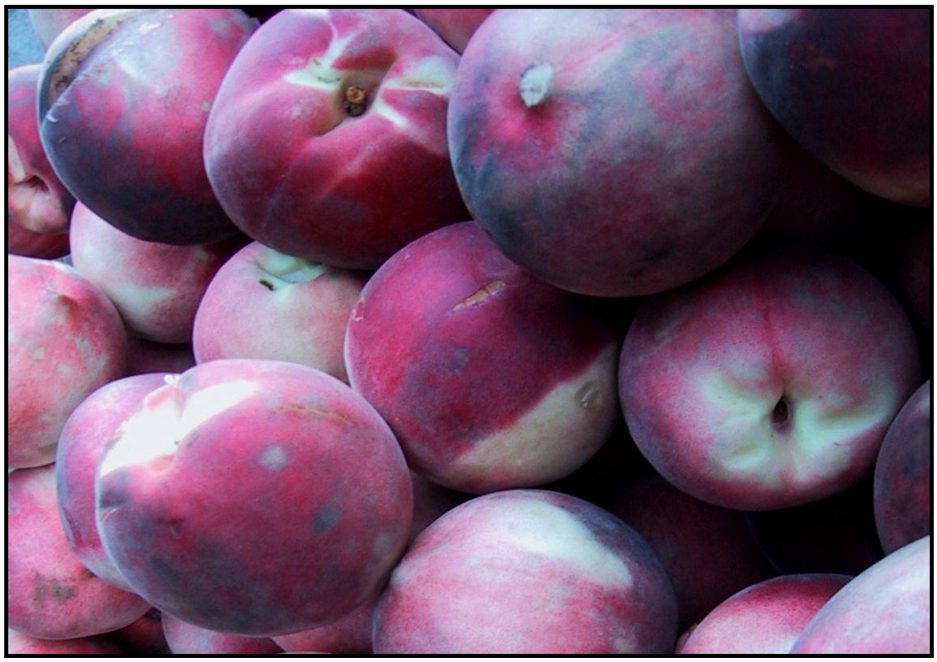
Importance: Field inking or black staining is a type of skin discoloration and a frequent problem in California, Washington, Georgia, South Carolina, New Jersey, and Colorado, as well as in other production areas in the world such as Italy, Spain, New Zealand, Australia, Argentina, and Chile. Rejections due to skin discoloration can reach up to 50%.

Symptoms: Field inking symptoms appear as brown and/or black spots or stripes that are restricted to the skin. Symptoms become evident within 48 hours after harvest. However, inking symptoms are triggered during harvest and during transportation to the packinghouse. Field inking usually begins in the field, although symptoms may take more time to become apparent.

Causes: Abrasion damage in combination with heavy metal contamination is required for inking development. The skin cells, where the anthocyanin/phenolic pigments are located, collapse and their contents react with heavy metals turning their color dark brown/black. Iron, copper and aluminum are the most deleterious contaminants. Only 5-10 ppm iron is enough to induce inking at the physiological fruit pH (~ 3.5). This contamination can occur in the field within 15-20 days before harvest or during harvesting operations. Foliar nutrient, fungicide and insecticide pre-harvest sprays which contain the above-mentioned metals in combination with abrasion damage have the capacity to induce inking on peach and nectarine fruit when applied close to harvest.



Examples of field inking or black staining.

Control of field inking

- Reduce fruit abrasion damage by treating fruit gently and avoid long hauling.
- Reduce fruit contamination by keeping picking containers dirt free and clean; avoid dust contamination on fruits.
- Check your water quality for contamination with heavy metals (Fe, Cu & Al).
- Test your pesticides for presence of heavy metals (Fe, Cu & Al) early in the season.
- Do not spray foliar nutrients or pre-harvest fungicides containing Fe, Cu, or Al within 21 days of predicted harvest.
- Chemical manufacturing companies should attempt to identify and remove from their products any potential sources of contaminants that may contribute to inking formation, and to develop safe pre-harvest spray intervals (PHI) for foliar nutrients, fungicides, miticides, and insecticides.
- Growers need to know the composition of the chemicals commonly used in their tree fruit pre-harvest and post-harvest operations and understand how they may affect inking incidence.
- In orchards where inking is a problem, delay packing for ~48 hours so you will be able to remove fruit with field inking before placing fruit in the box.
- Fine tune your post-harvest fungicide application to assure that your residues are above the effective minimum recommended, but well below the maximum residue limit (MRL) or tolerance.

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SKIN BURNING

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Importance: Skin burning is a type of skin discoloration that has become a frequent problem in the last five years in California on specific susceptible peach and nectarine cultivars. Rejections due to skin burning can reach a very high incidence. Our results from several years indicate that field inking and skin burning peach and nectarine skin discolorations are triggered by the combination of physical damage during harvesting-hauling combined with different post-harvest stresses. However, although field inking and skin burning disorders have similar symptoms, they have different triggers and different biological mechanisms of development, and therefore it is important to understand the differences between both cosmetic skin disorders.

Symptoms: Skin burning symptoms appear as brown and/or black areas that are restricted to the skin. In contrast to field inking, these symptoms are mainly triggered during packing operations, principally at the brushing-washing point, although abrasion which occurred previously will also contribute to its development. Symptoms can be observed very soon after packing and especially after cooling, but the symptoms increase during cold storage due to dehydration. In fact, it was brought to our attention that most of the skin damage observed was on the exposed part of the fruit above the tray receptacle and no damage occurred under the price-look-up sticker.

Causes: Skin burning is the skin damage mainly observed after fruit 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 velocity forced air cooling. The incidence of this skin disorder increases significantly after the post-harvest operations (washing, handling and cooling). Different susceptibilities to skin burning have been observed among peach and nectarine cultivars, depending mainly on their skin phenolic composition.

Control of skin burning

- Minimize 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.
- In a standard packing operation, washing water pH in the brushing-washing or hydrocooling operation should be continuously maintained around 6.5-7.0. The installation of automated systems (ORP) to monitor and/or adjust active/effective chlorine and pH levels is critical to increase disease control effectiveness and decrease potential skin burning development.
- Based on our current results, we recommend dry packing (without brushing and a chlorine rinse) for the very susceptible peach or nectarine cultivars.
- Avoid the fast cooling air velocities for the skin burning susceptible peach or nectarine cultivars. For these susceptible cultivars, we suggest cooling the fruit by room cooling, without forced air.

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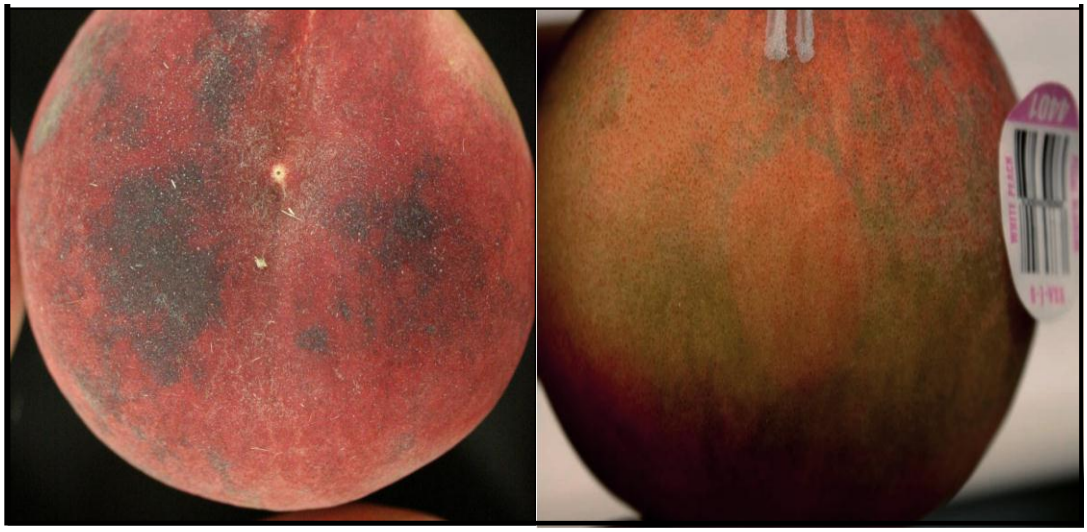
Examples of skin burning.



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