Pre- and Postharvest Quality Problems Associated with Greening in Sweet Orange Fruits

How to take care of the soft, green/pale colored, and decay susceptible fruits

Wei Zhao, Hong Chen, Xuixiu Sun, Jinhe Bai, Greg McCollum and Elizabeth A. Baldwin*
USDA-ARS, US Horticultural Research Laboratory

1. Increased pre-harvest fruit decay (Stem-end rot as an example)

2. Increased postharvest stem-end rot
   - degreening with ethylene exacerbates decay

3. Distribution of fruit detachment force
   - GREENING fruit have loose connection with stems

4. Evidence that Diplodia entered the calyx area before harvest which cause postharvest stem-end rot and may exacerbate pre-harvest fruit drop

5. More decay related microorganisms in GREENING orange peel
   - Peel frit (OJ byproducts) were stored at 40°F for 3 months. Then cold press was applied to collect peel oil.

Diplodia negative in AS and some greening fruits

Diplodia positive in many greening fruits

Frit from greening fruit turned to sludge without separation or separated to sludge and clear liquid.

Frit from AS fruit turned to separated to three layers – bottom fiber layer, middle clear liquid layer and top plug containing peel oil.
Challenges of postharvest decay carried by GREENING fruits

Our efforts:

Spray fungicides (Strobilurin) to control Diplodia at different growth stages:

From petal fall to pre-harvest for multiple applications

Using Marsh grapefruit, Mid-sweet orange, Earlygold orange, Navel orange and Murcott

* Cupper may not work on this disease (Diplodia)

Decay and pre-harvest fruit drop

Physical properties of GREENING fruits

> Puncture force

> Pressure force – Texture Profile Analysis (TPA)

Puncture caused pre-harvest and postharvest loss

Burst test

Physio-mechanical properties

TPA

Puncture force

Integration area (IA)

Ratio of 2nd IA to 1st IA

Fruit firmness – force needed to press fruit for 12 mm

GREENING fruit are soft and low recovery capacity after pressing
- Tend to be smashed during transportation and processing

GREENING fruit have higher resistance to against puncture (good!)

- Peels of greening fruit are tougher because of the stress, but fruit are softer and lower recovery capacity once pressed, indicating segment development was retarded.

Discoloration

GREENING retarded color development

Directly after harvest

No ethylene treatment

Ethylene treated
Take home message

1. Enhance your postharvest fungicide application
2. Reconsider/re-evaluate your degreening program

Thank you