Ripening Avocados

Mary Lu Arpaia
Univ. of CA
Riverside, CA
mlarpaia@ucanr.edu

Why Ripen Avocados?
- Increase Uniformity
- Decrease Checkerboarding

Untreated, fruit ripening may range from a few days to even weeks within a carton.

What we know about the avocado and why it responds to ethylene
- A climacteric fruit showing an increase in respiration and ethylene production during ripening
- Influenced by maturity, time after harvest, temperature and atmosphere

Adapted from Eaks (1978) for ‘Hass’

Relationship between dry matter (maturity) and final peel color

Final Peel Color = 3.06261 - 0.00264DW + 0.0020DW^2

where DW = Dry weight

R^2 = 0.621 ***

Factors under your control
- Educate yourself about the potential differences between varying sources of fruit - there are differences
  - Pre-ripening inspection
  - Ripening management
  - Postripening management

Ripening Management
- Uniform heating and cooling is ABSOLUTELY ESSENTIAL
- Refrigeration needs to control the heat (6000 BTU per pallet)
- Forced air ripening is critical (1000 cfm/pallet)
- Venting (preferably flow through, keep CO2 below 1%)
- Source of Ethylene - as low as possible; physiologically you only need ~10 ppm
- Fruit needs to be easily accessible in ripening room for monitoring; especially if fruit is of varying arrival condition or multiple lots of fruit
- Keep good records
Ripening Management
When do you turn off the gas?

• You don’t need the gas until ripe; a short duration treatment will "trigger" ripening
• Fruit may soften but may not color – maturity and other factors involved
• The best way to gauge the rate of softening is with a penetrometer...not your fingertips or buttons "popping"
• Fruit maturity is an important variable

The penetrometer is a tool to judge the relative stage of ripeness

Ethylene dose considerations

• Ethylene concentration
  - >20 ppm; no more than 100 ppm
• Fruit Maturity
  - Less mature; longer treatment
• Time after Harvest
  - With increasing time after harvest; shorter durations needed

How much to apply?

Short exposures to ethylene can trigger ripening; threshold is believed to be around 10 ppm

Commercial application of 20 - 100 ppm is recommended

Time after harvest

• Ethylene has maximum benefit within 1-2 weeks of harvest
• Imported fruit if conventional shipment will need less time (24 hours or less)
• Imported fruit if CA shipped or 1-MCP treated may need longer treatment times

Even within lots of fruit there is variability in ripening – a way to control this is sorting by degree of ripeness into different categories

Suggested treatment times for California 'Hass' avocados

• Early season fruit (November - February)  36 - 72 hours
• Mid-season fruit (March - June)  24 - 36 hours
• Late season fruit (July - October)  8 - 24 hours +/- ethylene
Management Issues

Temperature Ventilation/Air exchanges

- Careful Monitoring
- Prompt Movement of fruit
- What is the proper stage of ripeness?
- Where do you ripen the fruit?

Temperature Management

- Avocados have a VERY high rate of respiration during ripening = HEAT
- Efficient warming/cooling of fruit essential
- Airflow essential to maintain proper pulp temperature (68F: 20C)

Impact of high temperatures
- Delayed/uneven ripening
- Increased decay

Temperature influences the "days to ripe" (Control = 13.93 days). All fruit ripened at 68F.

Temperature influences the incidence of body rots (Control = 6.7%). All fruit ripened at 68F.

Temperature influences the incidence of stem end rot (Control = 17.4%). All fruit ripened at 68F.

High temperatures during treatment are DETRIMENTAL
The outcome is delayed or inhibited ripening and increased decay
Keep temperatures below 70F (21C)

Ventilation

- Buildup of carbon dioxide (inhibits ethylene action)
- Airflow essential to maintain proper pulp temperature (68F)

Preliminary data suggests that short durations of high carbon dioxide (up to 3%) can be tolerated but will slow overall ripening

Managing Ripe Fruit

- Decay increases with increasing ripeness; accelerates in "overripe" fruit
- Don’t hold fruit for long periods of time that are partially ripe – increased chilling injury
- Bruising increases with advancing ripeness – Protect fruit
- Peel color at "slicing" or "guacamole" ripe does not necessarily mean the fruit needs to be completely black!

These are issues wherever fruit are ripened
The outcome of “ripe” fruit

Ripe fruit at retail level has greatly increased consumption, HOWEVER.....
• Greater challenge in temperature management
• Fruit sensitivity to damage greatly enhanced

Considerations for successful avocado ripening

• Temperature management is CRITICAL
  • Too high: ripening inhibited and increased decay
  • Too low: ripening is slowed and lose benefit
• Fruit Maturity
  ▲ More mature; less time
• Time after Harvest
  ▲ After storage; less time
• Avoids delays in marketing
• Minimize fruit handling

Checklist

Know the history of the fruit
Quality; don’t use stressed fruit
Standardize fruit size and maturity
Uniform warming and cooling
Careful monitoring; don’t overripen

Additional information

• Contact me
  mlarpia@ucanr.edu
• UC Davis Postharvest Center website
• California Avocado Commission website
  information on avocado ripening
  industry research reports (go to grower section)
• General information on avocados
  www.avocadosource.com