Pome & Stone Fruits

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Pome Fruits:
- Apples & Pears (European & Asian) & Quince

Stone Fruits:
- Peaches:
  - Freestone (melting flesh; fresh market only)
  - Clingstone (mostly non-melting flesh; and mostly processed)
- Apricot, Nectarine, Plum, Prune, Sour Cherry, Sweet Cherry

Ripening Pattern

• Climacteric:
  - Apples, European and some Asian Pears
  - Apricot, Nectarine, Peach, Plum, Prune

• Non-climacteric:
  - Cherry
  - Some Asian Pears
**Maturity & Quality Standards**

- **Internal quality attributes**
  - Sugars, acids, ratio, etc.
- **Exterior attributes**
  - Color, shape, size, freedom from defects, etc.

**Harvest**

- No mechanical harvesting of fresh produce
  - Cherries for processing or prunes for drying are commonly harvested mechanically

**Optimum Temp & RH**

- Almost all pome and stone fruit should be stored near 32°F (0°C)
- Chilling sensitive apple cultivars (incl. Yellow Newtown, McIntosh, some Jonathan, and some Grimes Golden) should be stored 34-40°F (1.6-4°C)
- Optimum RH for all is 90 to 95%
Shelf Life

• Apples: 1 to 12 (in CA) months
• Pears: 2 to 7 months
• Apricot: 1 to 3 weeks
• Nectarine & Peach: 2 to 4 weeks
• Plum & fresh Prune: 2 to 5 weeks
• Sweet Cherry: 2 to 4 weeks

MA or CA

• CA extends storage of apples and pears
  – Optimum conditions vary by variety but are often between 1-2% O₂ & 1-3% CO₂
• CA or MA of 10-15% CO₂ & 3 to 10% O₂ are used for cherries
• Responses to CA or MA of apricots, nectarines, peaches, and plums in not consistent

Ripening Control Using 1-MCP (SmartFresh™)

• Application to preclimacteric fruit delays onset of ripening significantly
  – Used alone or with CA storage for about half of the U.S. apple crop
• Its use is complicated for other fruits because results depend on:
  – Maturity/ripeness at application
  – Concentration and exposure time
  – Temperature during and following treatment
Ripening

- Ripening related changes:
  - Increased respiration and ethylene production
  - Softening
  - Increased sweetness
  - Loss of astringency
  - Development of aroma volatiles
  - Color change
- Preclimacteric fruit store better than postclimacteric fruit

- Optimum temperature for ripening are ~ 68 to 72°F (20 to 22°C) with RH of 90-95%
  - Temperature above 30°C inhibits ethylene biosynthesis
- Ethylene treatments of 10 to 100 ppm can be used to accelerate ripening

- Pears tend to become mealy if ripened on the tree
  - Use cold storage (32°F or 0°C for 2 to 8 weeks) or ethylene treatments
- Pear preconditioning treatments:
  - Bartlett – expose to 100 ppm ethylene at 68-77°F (20-25°C) for 24 hrs.
  - d’Anjou – expose to 100 ppm ethylene at 68°F (20°C) for 2 to 3 days
### Physiological Disorders

- **Apples:**
  - Scald – Diphenylamine commonly used to control. Low O$_2$ concentrations (<1%) can also control scald
  - Freezing injury
  - Chilling injury (some cultivars) – at 32-40°F (0-4°C)
  - Water core – faulty sugar (sorbitol) metabolism
  - Bitter pit – calcium deficiency
  - Different types of breakdown in different cultivars

- **Pear:**
  - Scald – same as apples
  - Senescent scald
  - Cork Spot – similar to bitter pit in apples
  - Core breakdown (internal breakdown or brown core)
  - Freezing injury – core may freeze first because of lower sugar content
  - High CO$_2$ or low O$_2$ (<1%) injury

- **Stone fruit (except cherries):**
  - Internal breakdown (CI) – symptoms include browning of the flesh, dry-mealy texture (woolliness, lack of juiciness), development of off flavors
  - Symptoms develop when stored at temperatures between ~36 and 95°F (2 to 35°C)
  - Freezing injury
  - Heat injury (above 95°F or 35°C) – pit burn; gas pockets in prunes
Internal Breakdown and Temperature

### Carnival

- Internal Breakdown
  - 0°C
  - 2.2°C
  - 8°C

4 Weeks and 2 Days at 20°C

Decay Control

- **Stone Fruits:**
  - **Brown rot** (*Monilinia*) – Does not develop during cold storage below 39 to 41°F (4 to 5°C)
  - **Rhizopus stolonifer** – It is chilling sensitive. Proper cooling and maintenance of the cold chain will reduce its growth significantly

- **Apples & Pears:**
  - **Gray mold** (*Botrytis cinerea*) & **Blue mold** (*Penicillium expansum*)
    - Best controlled through careful handling and sanitation in the field & packinghouse
    - Fungicides may also help, but resistance is occurring to TBZ-type fungicides
Decay Control

• Apples & Pears:
  - Mucor rot (Mucor piriformis) problem on Granny Smith & Fuji
  - Lives in the soil
  - Grows slowly even at 32°F (OC)
  - Fungicides & even chlorine not particularly effective
  - Best control: sanitation (keep soil out of drench & water solutions)

Special Note on Pears

• Pears are very easily bruised when ripe
  so handle ripe fruit very carefully

Postharvest Handling Selected Points

• Reducing mechanical damage
  - Use air suspension systems on trucks and bubble plastic liners and top pads in filled bins
  - Grade farm roads and restrict speeds on these roads to reduce vibrations
  - Reduce handling steps
  - Maintain clean packing equipment to reduce abrasive particles (e.g. sand)
  - Immobilize fruit within shipping containers
Harvest Accumulation

“Ranch-Pack” System for Tree-ripe Peaches

Cooling Field Bins Prior to Packing