Postharvest Handling of Berries

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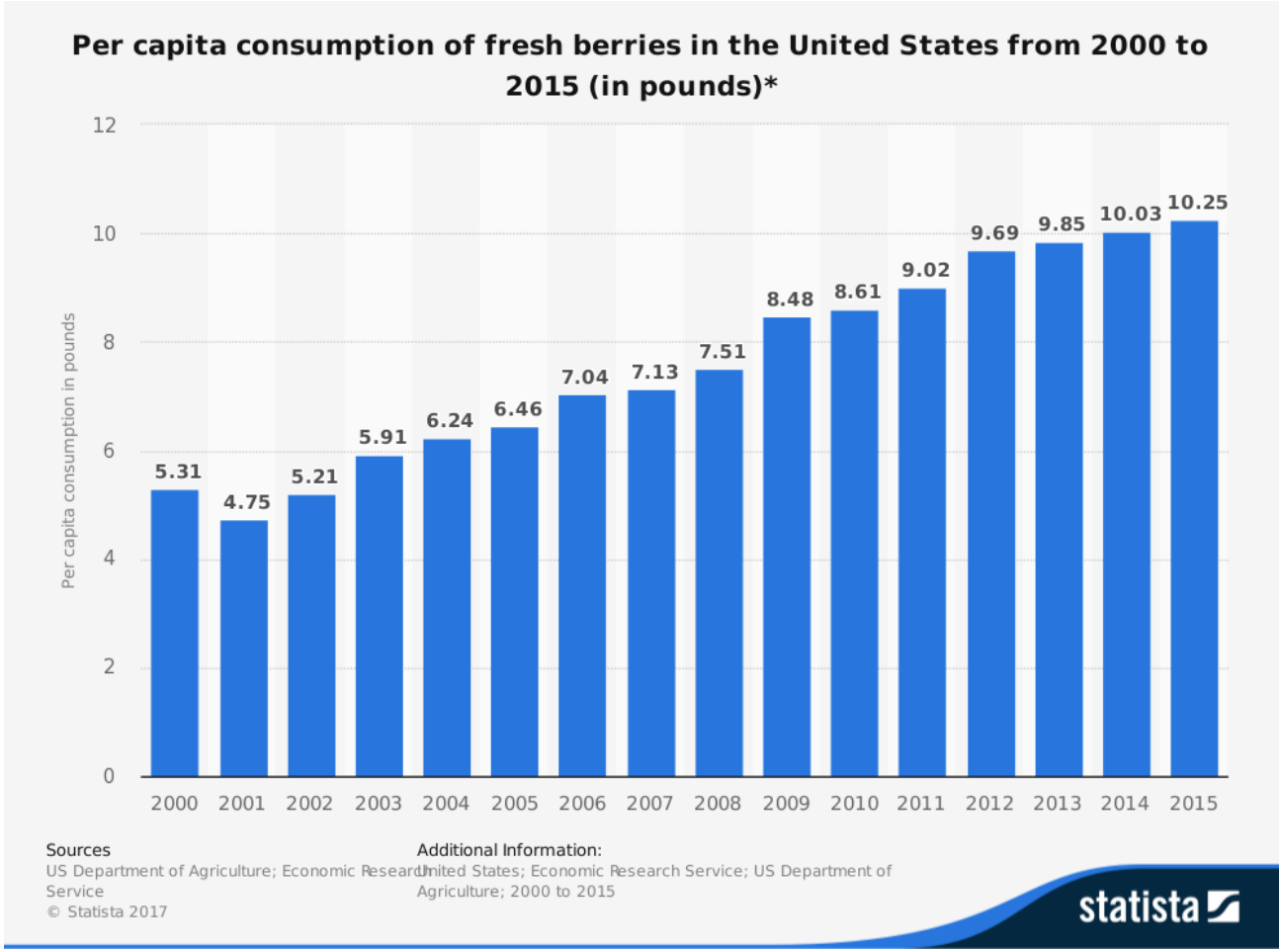
http://www.organicauthority.com/organic-berries-and-bagged-salads-top-organic-produce-sales/

Berries

- Consumption of fresh and processed berries has increased over the past decade.
- All berries have been experiencing growth in both dollar sales and volume.
- Comparison of the antioxidant capacities of different fruits, berries invariably rank high due to their high antioxidant content.
- Delicious!

Berries



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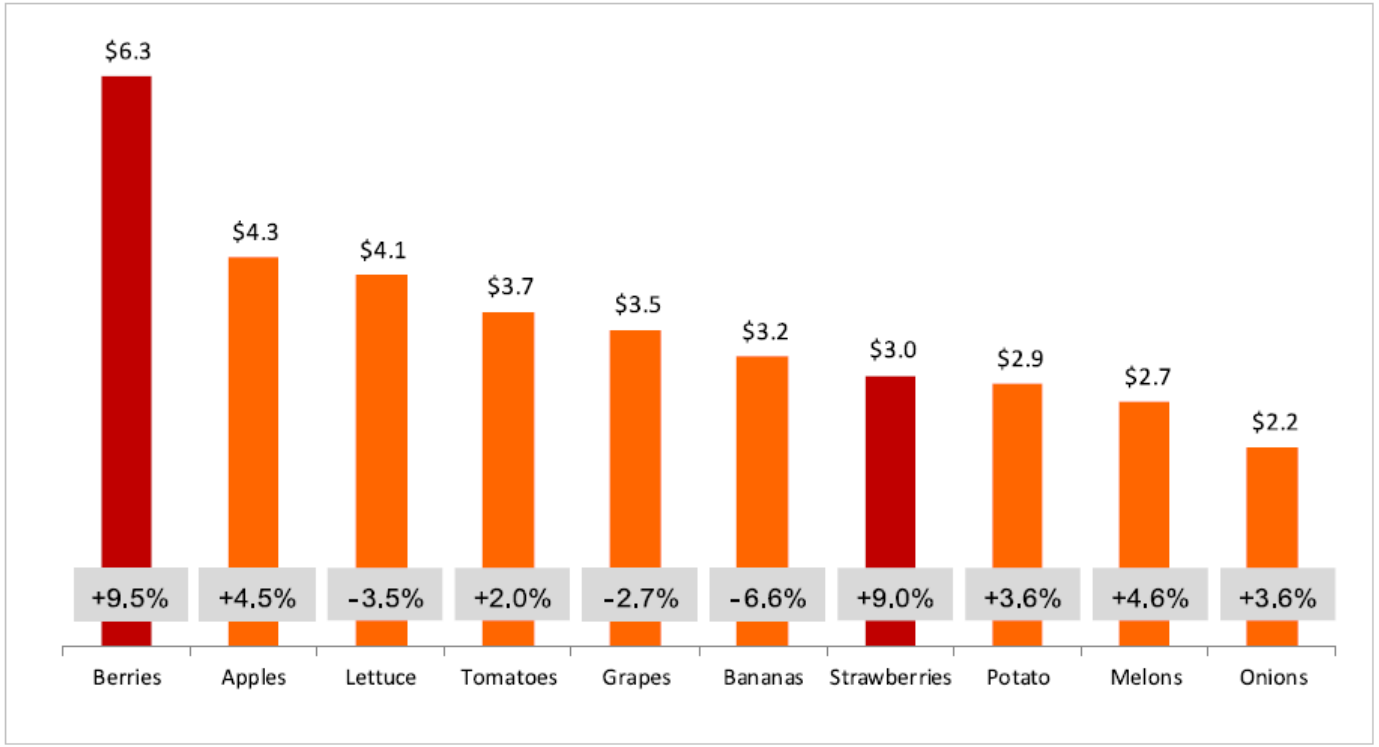
Top 10 Produce Categories - Dollars

Total U.S.

Dollars (Billions) and Dollar Share of Total Produce
Ranking of Top 10 Categories
52 Weeks Ending 1/22/17



$ Share	10.1%	6.9%	6.6%	5.8%	5.5%	5.1%	4.8%	4.6%	4.4%	3.4%

- With $6.3 billion in annual sales, the berry category ranks #1 in total produce.
- At $3.0 billion, strawberries rank #7 in produce, and 4th among individual fruits.
- Berries and strawberries contribute 10.1% (+0.5%) and 4.8% (+0.2%) to total produce sales, respectively.
- The top 10 categories account for 52.2% of total produce dollars.

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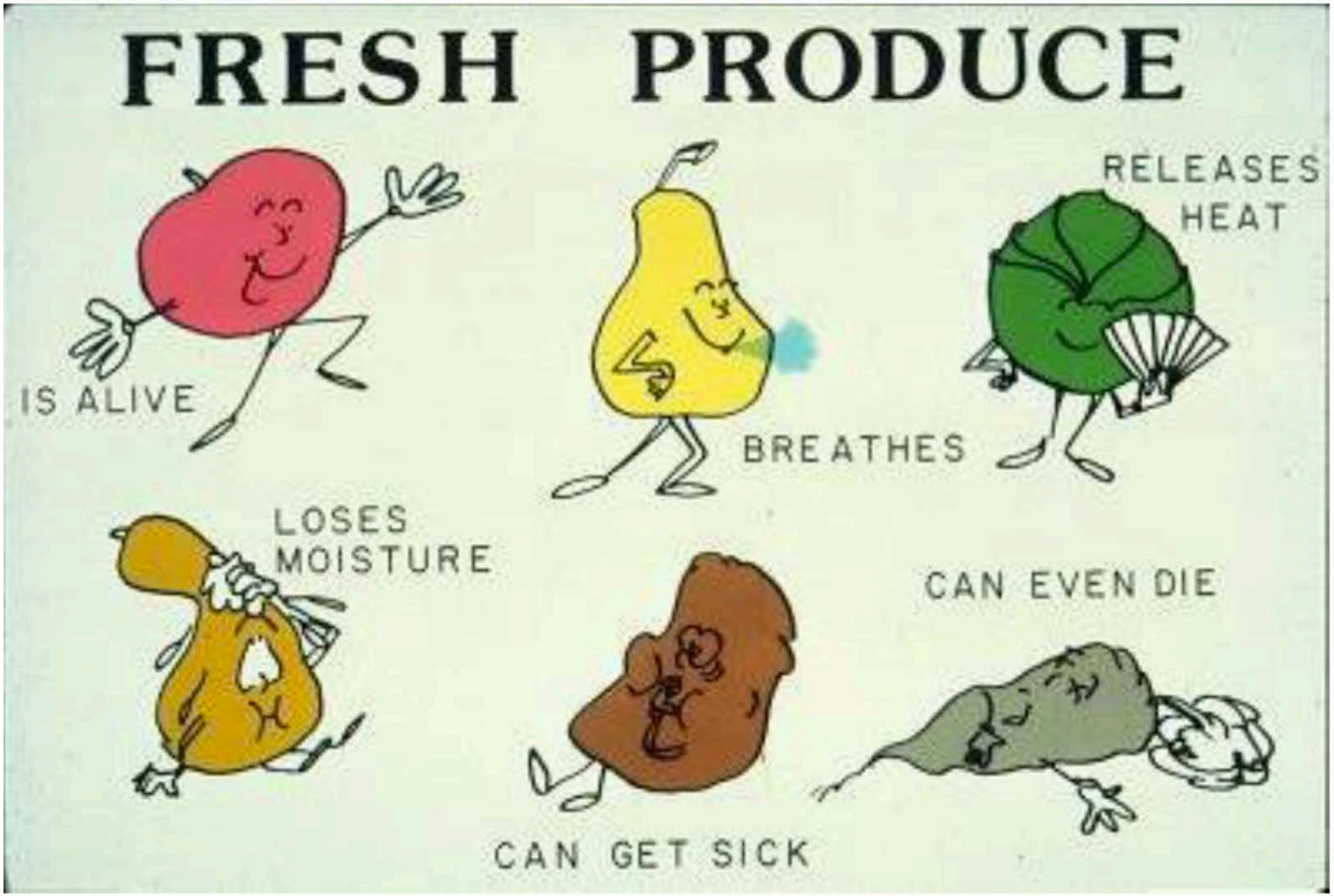
Berries

- Short Shelf Life
- Essential Handling Needs
- Quickly Lose of Value



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Postharvest challenges

- Most of berries won't continue to ripen after detached
- Have to be picked near fully ripeness
- Delicate, easily damaged
- Picked directly into final containers
- Grading and sorting is part of harvesting
- Relatively high respiration and transpiration rates
- Highly susceptible to molding
- Require rapid cooling
- Short life
- Consumer practices

Postharvest Basics

- **Respiration**
- **Transpiration (water loss)**
- Compositional changes (Color changes)
- Physiological disorders
- Changes in temperature
- **Physical damage**
- **Decay and insect infestation**
- Humidity
- Contamination

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Quality attributes for berries

- Gloss/Bloom
- Full color, usually darker
- No defects (injury, bruise)
- No decay
- Firm. Crisp
- Large size
- Sweet
- Green sepals (strawberry)
- No stems (blueberry)

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Fresh Commodities Are Still ALIVE!

- They carry out respiration:

$Sugar + O_2 \Rightarrow CO_2 + Water + Energy + Heat$

(ATP)

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Respiration Rates and Ethylene Production

Fruit	Respiration 0°C	Respiration 20°C	Ethylene 5°C
Blackberry	**22**	**155**	<0.1
Blueberry	**6**	**68**	0.1 to 1.0
Cranberry	3	18	
Raspberry	**24**	**200**	
Strawberry	**15**	**127**	<0.1
Currant	16	130	
Gooseberry	10	58	

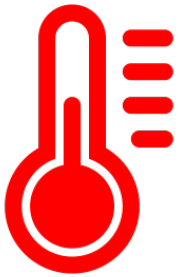
Shelf Life

- **Blackberry: 2-3 d**
- **Blueberry: 2 wk**
- Boysenberry: 2-3 d
- Cranberry: 2-4 mo
- Dewberry: 2-3 d
- Elderberry: 1-2 wk
- Gooseberry 3-4 wk
- Loganberry: 2-3 d
- **Raspberry: 2-3 d**
- **Strawberry: 1-2 wk**

HARVESTED PRODUCE ARE LIVING SYSTEMS THAT "AGE"

GOAL: slow down the aging process!

Temperature

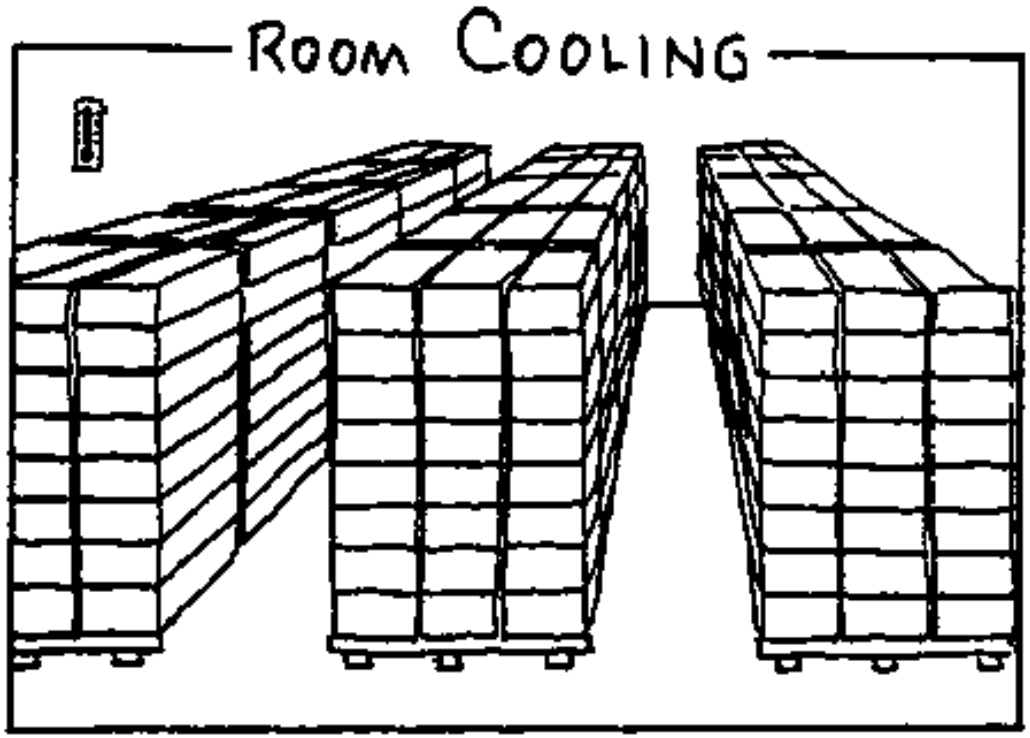


- Temperature is the most important factor influencing the postharvest life of a given commodity
  - Dictates the speed of chemical reactions (including respiration)

- Typically, for every 18 ^{o}F (10 ^{o}C) increase, respiration increases between 2 and 4 fold

Slowing Respiration

- Room Cooling



Slowing Respiration

- Forced-air cooling

Slowing Respiration

Cool and Ship : A low –cost portable forced-air cooling unit

https://content.ces.ncsu.edu/cool-and-ship-a-low-cost-portable-forced-air-https://

Maintain the cold chain

The “KoolKat”mobile refrigerated unit, of K-state Olathe Horticulture Research and Extension Center

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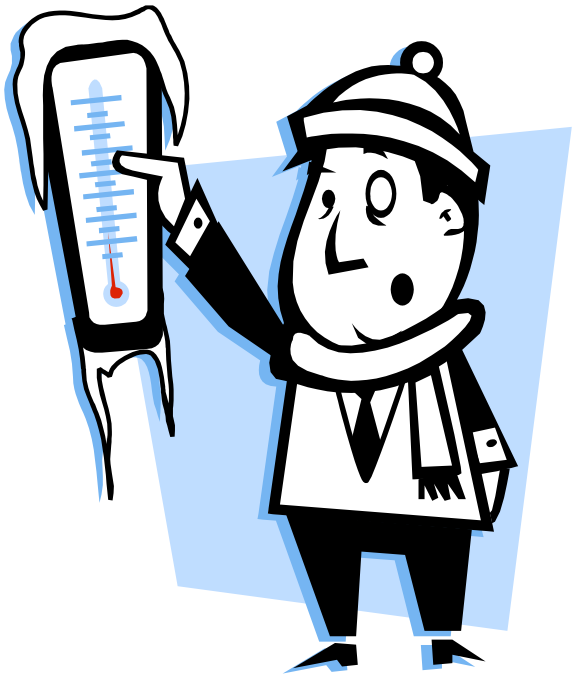
Water Loss

- Besides resulting in direct loss of salable weight, it is also an important source of quality loss
  - Appearance quality - wilting, shriveling, accelerated development of injury symptoms
  - Textural quality – loss of crispness, juiciness, etc.
  - Nutritional quality – e.g., vitamins A & C

How we prevent water loss

- Control relative humidity
- Lower temperature
- Reduce air movement
- Protective packaging



Nesting of *Botrytis* Rot
One Bad Berry can Destroy the Whole Tray

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Harvest, Sort, and Pack in the Field

- Harvest only fully red (ripe) berries, and pick every three days.
- Cut by the stem; do not pull the berry
- Mechanical harvesters exist but main problems are:
  - inability of the machines to differentiate between ripe and unripe fruit
  - rough handling of the fruit

Rules for Berry Pickers

- Keep hands clean
- Wash your hands after each visit to the rest station
- Pick all the ripe berries on the bush before moving on
- Harvest only well-ripened fruit
- Leave immature fruit for the next harvest
- Place your hand under the clusters to avoid dropping the berries
- Avoid overfilling your hands; do not squeeze or roll the fruit
- Do not put trash or cull berries into the container
- Never allow harvested fruit to remain in the sun

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Raspberry

Strawberry

Blueberry

Blackberry

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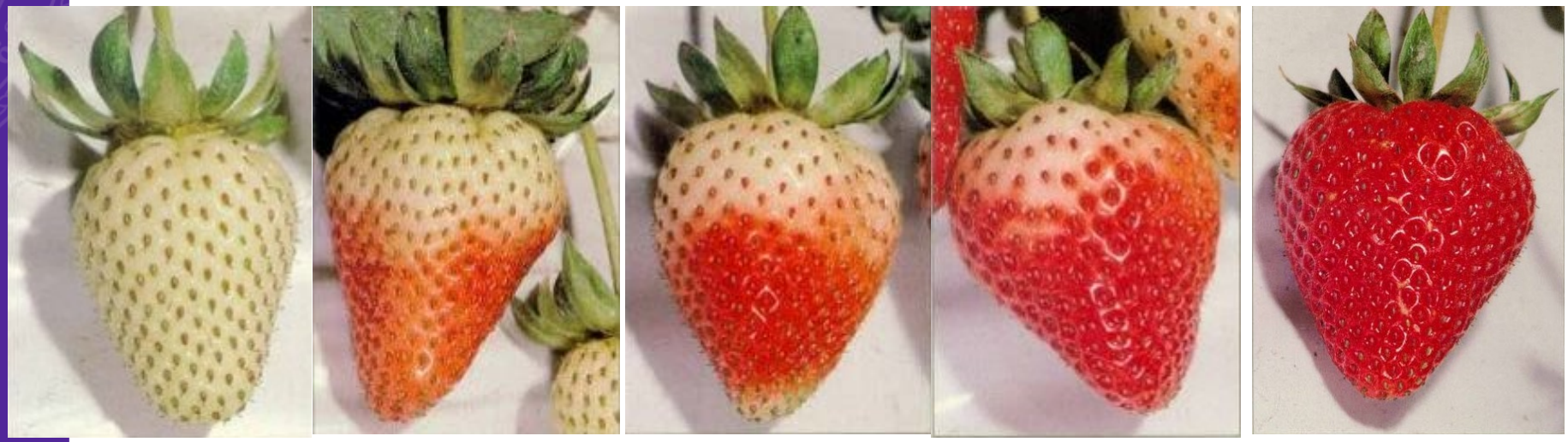
When do we harvest?



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Strawberry

- Hand harvested
- Not subject to washing at the time of harvest
- Placed directly in clamshells, then flats and loaded on trucks, within 1-2 hrs of picking,
- Transported to a cooling facility
- Cooled, usually within 1-4 hrs after harvest
- Forced-air cooled at temperatures of 1°C (34°F)
- Cooling reduces decay and prolongs the fruits shelf-life

Strawberries are shipped to the market in refrigerated trucks at 1-2°C (34-36°F)

- Controlled/Modified Atmospheres
  - Shipments with 10 to 15% CO_2 reduces the growth of *Botrytis cinerea*
  - Reduces the respiration rate of the strawberries thereby extending postharvest life
  - Use of whole pallet covers for modified atmospheres is the most common method

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Importance of Temperature to Maintain Quality

7 days

A	B	C
0°C	5°C	10°C
32°F	41°F	50°F

Cantwell, UC Davis

Modified Atmospheres

Raspberry harvest

- Gentle harvest by hand
- Harvest into small containers to avoid bruising

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Packaging at the edge of the field

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Packaging area must be in the shade!

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Blackberries

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Blueberries

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Blueberries

- Machine harvesting possible
  - Height of fall determines bruising
  - Bruising affects storage life
  - Use for berries to be processed
  - Varietal differences – stem scars
  - Needs clean up, debris removal

- Less perishable than raspberries and strawberries
  - long-distance international trade, including between hemisphere
- Can be stored at 5°C from two up to seven weeks, depending on the cultivar
- Recommended optimal temperature is 0°C

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Hand harvest of blueberries

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Reduce handling to maintain waxy bloom

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Field totes dumped onto the packing line

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Sorting by hand

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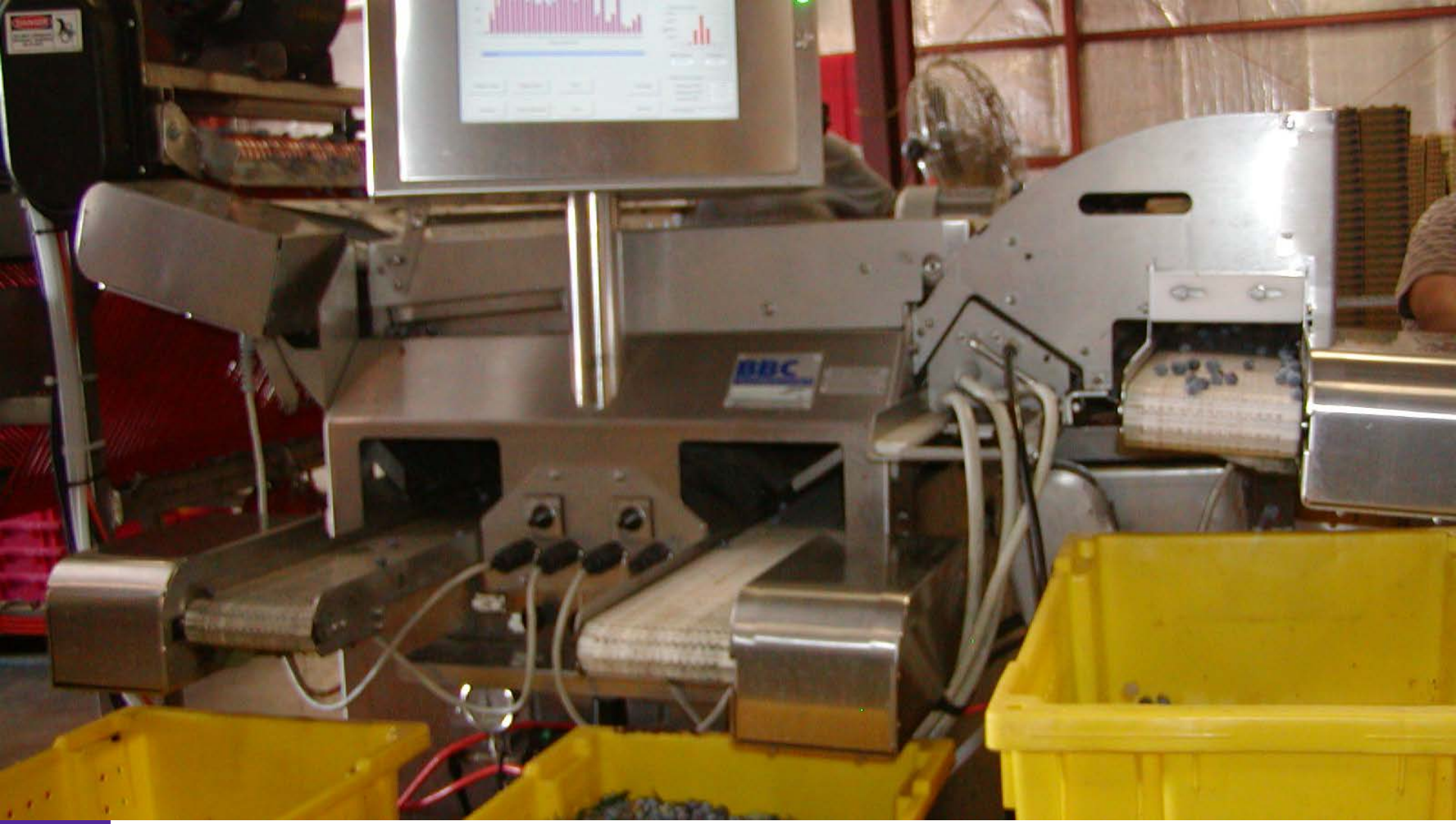

Mechanical sorting

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General Recommendation

Harvest tips

Avoid picking in heat

- Don’t pick when is wet
- Don’t pick overripe or decay fruit
- Don’t pick immature fruit
- Avoid fruit with defects
- Overfilling causes compression damage
- Clean hands and containers

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General Recommendation

Postharvest

Shaded in field and transport

Rapid cooling

Forced air or room cooling

Optimum temperatures: 32°F-35°F

Optimum relative humidity:90-95%

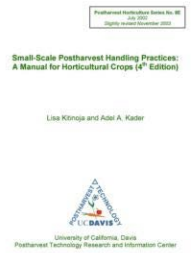
Do not allow rewarming

Use appropriate containers

Resources

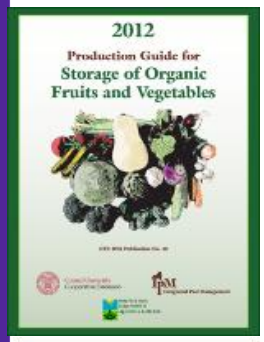
Postharvest Technology Center

http://postharvest.ucdavis.edu/



Small-Scale Postharvest Handling Practices: A manual for Horticultural Crops

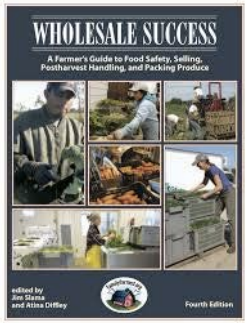
Production Guide for Storage of Organic Fruits and Vegetables



https://ecommons.cornell.edu/bitstream/handle/1813/42885/organic-stored-fruit-veg-NYSIPM.pdf?sequence=1

Post Harvest Handling Decision Tool

https://www.leopold.iastate.edu/files/pubs-and-papers/2013-11-post-harvest-handling-decision-tool.pdf



Wholesale Success: A farmers guide to food safety, selling ,postharvest Handling and packaging produce

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Thank you all for your attention

QUESTIONS ?

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