Cost Effective Solutions for Produce Shelf-life Extension and Quality

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THE FOOD CONNECTION

Overview

- Goal: Learn how low-cost decisions at various steps of produce production can affect shelf-life and product quality
  - Preharvest
    - Variety selection and management
  - Harvest
    - Training, equipment, time of day, etc.
  - Postharvest
    - Washing, curing, packing, cooling and storage

Courtesy of www.uscooler.com

Variety selection

Consider:

- Season
  - Cold/Heat tolerance
  - DTM – days to maturity
- Disease Resistance
- What the buyer or end user is looking for
  - Size
  - Uniformity
  - Flavor
  - End use

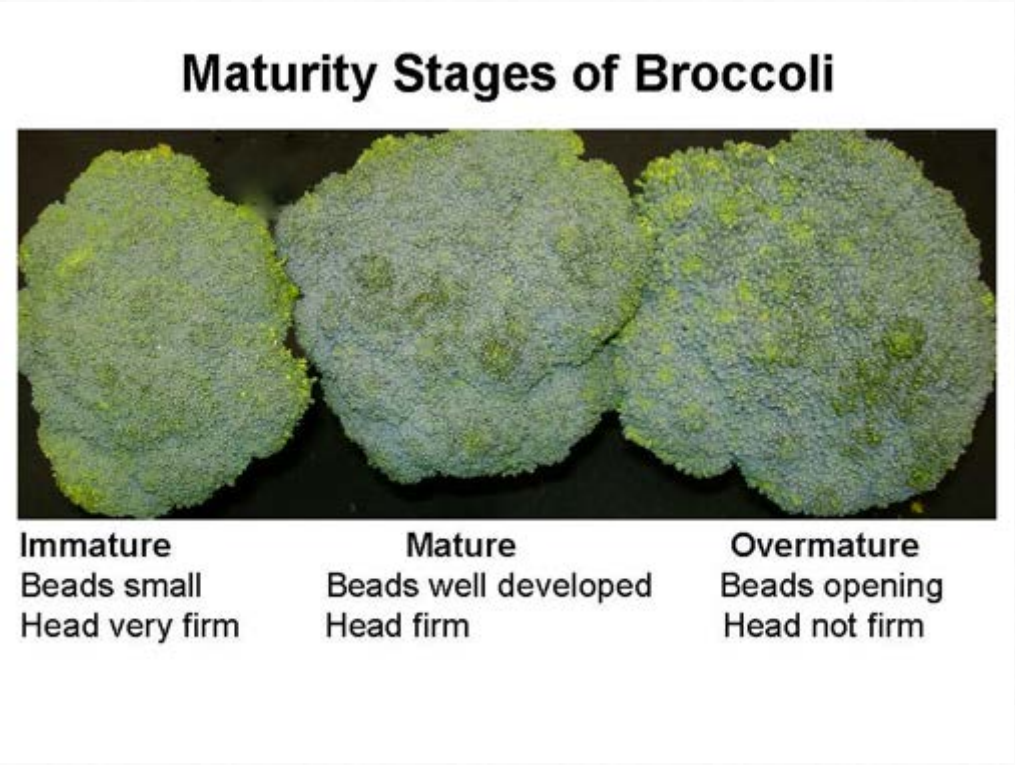
Variety *(all are hybrids)*	DTM	Comments
BROCCOLI[1]		
Packman	48	Early, production, good for spring and early fall.
Windsor	53	Large heads for crown cuts; large stems; downy mildew resistant.
Eastern Crown	55-81	Compact heads, small bead size
Emerald Crown	55-81	Uniformly green heads, small bead size
Greenpak 28	57-58	Large heads
Green Magic	60	Large, blue-green heads; downy mildew tolerant.
Millennium	60-85	Compact uniformly green heads, small bead size, high yielding
Emerald Star	63-85	Compact heads, high yielding
Premium Crop	65	Medium head, tight bead, for farmers market sales.
Greenbelt	67	Fall crop, large head, shorter stalk, slow maturing; small bead size, good for bunching.
Monaco	68-91	Uniformly green heads, small bead size
Arcadia	70	Spring or fall crop; large, blue-green tight-beaded heads; downy mildew tolerant.
Marathon	75	Large blue-green heads; excellent for bunching or crown cuts; downy mildew tolerant; very cold tolerant, good for early spring production.

ID-36: Vegetable Production for Commercial Growers, UK Cooperative Extension Service

Management

Consider:

- Cultural Practices
  - Field vs. Controlled Environment
  - Row covers and plastic
  - Irrigation type/frequency
- Disease ID
- Insect control
- Maturity Indices
- Weather Forecast



Courtesy of Marita Cantwell, UC Davis

Harvest

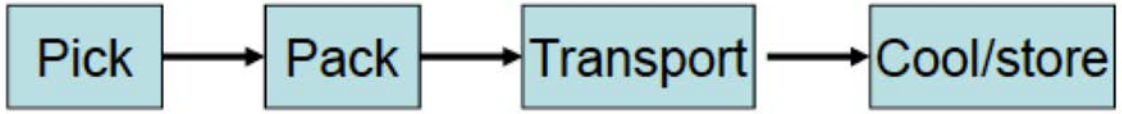
Consider:

- Time of Day
  - Shade availability (trips to packing house)
- Equipment/Technique
  - Develop SOPs to minimize damage
    - Train employees well
  - Sanitized knives/equipment
- Is field packing and option?

Pictures courtesy of UC Davis Postharvest Technology Center

Field vs. 'Shed' packing

Field Pack



Less damage to product
Less delay to cool, but requires coordination
More difficult to maintain consistent quality pack

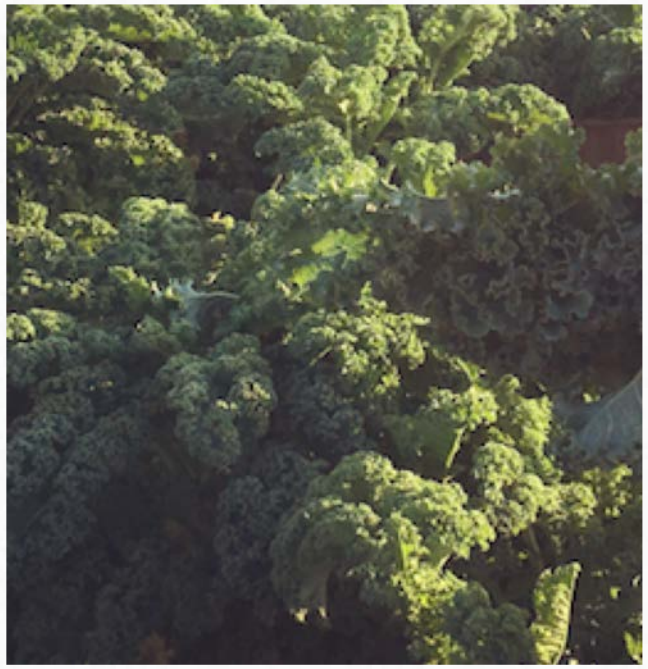
Shed Pack

Better color/size uniformity within a box
More consistent removal of defects
Better uniformity on a pallet
More damage? More delays?

Slide courtesy of UC Davis Postharvest Technology Center

Postharvest handling

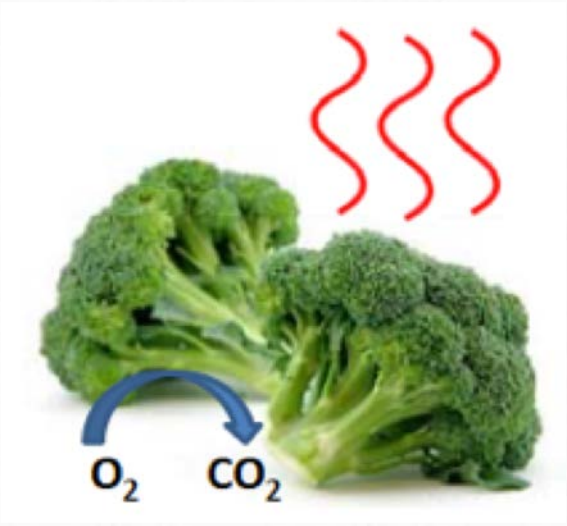
- From the moment in time your crop is harvested its quality will diminish. Our goal is to slow that process down.
  - Minimize touching
    - Each touch, no matter how gentle inflicts damage on the crop
  - Reduce:
    - Temperature
      - Key step in managing postharvest quality
      - 1 hour delay to cool can result in up to 1 day loss of shelf life
    - Transpiration – process of losing water to the environment
      - Humidity control
      - Higher surface area = more transpiration
    - Respiration



Courtesy of UK CSA

Respiration

- Even after harvest your produce is still alive!
  - Respiration is the process in which fruits and vegetables convert sugars and oxygen into CO_2, water, and heat.
    - Essentially the continuation of growth of the plant
  - We want to reduce respiration as much as possible
    - Cooling as soon as possible
    - Respiration varies by crop type



Courtesy of Marita Cantwell, UC Davis

Respiration Rates of Some Perishable Products

Category	Range at 5°C mg CO2/kg-h	Products
Very low	<5	Nuts, dates
Low	5-10	Apple, citrus, grape, kiwifruit, onion, potato (mature)
Moderate	10-20	Apricot, banana, cherry, peach, pear, plum; carrot, lettuce, pepper, tomato, cucumber, carrot (no tops); potato (immature)
High	20-40	Strawberry, other berries, cauliflower Leeks, carrots (with tops), avocado
Very high	40-60	Artichoke, snap beans, Brussels sprouts, cut flowers, okra, watercress
Extremely high	>60	Asparagus, broccoli, mushroom, peas, spinach, sweet corn

Respiration rate information for specific products:
Produce Facts: http://postharvest.ucdavis.edu/PF/
USDA Handbook 66: http://www.ba.ars.usda.gov/hb66/

Washing

Consider:

- Necessity
  - Is it required by buyer?
  - Are you washing to cool?
- Drying
- Food Safety
  - Is a sanitizer necessary?

Courtesy of UK CSA

Washing examples

Courtesy of UK CSA

Courtesy of UK CSA

Curing

- Root, tuber, and bulb crops
  - Each of these crops will have different needs for both curing and long-term storage

Commodity	Temperature		Relative Humidity	Days
	°C	°F	(%)	
Potato	15-20	59-68	90-95	5-10
Sweet potato	30-32	86-90	85-90	4-7

Pictures courtesy of UC Davis Postharvest Technology Center

Curing

- Keys to curing success
  - Varietal selection
  - Minimizing damage during harvest
  - Sorting
    - ”One bad apple”
  - Providing the right curing and storage environment

Cooling

Consider:

- Transpiration
  - Humidification
- Packing density
- Airflow

Inkbird.com

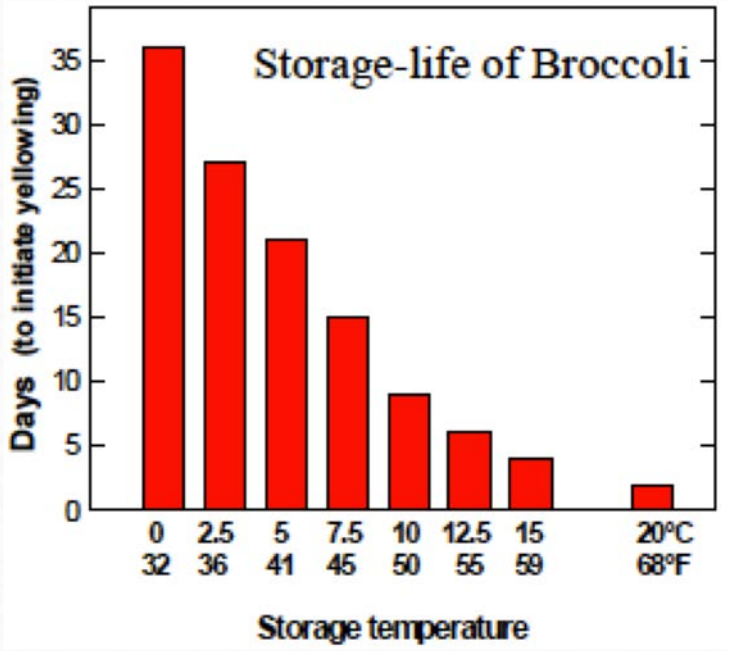
Packing/Storing

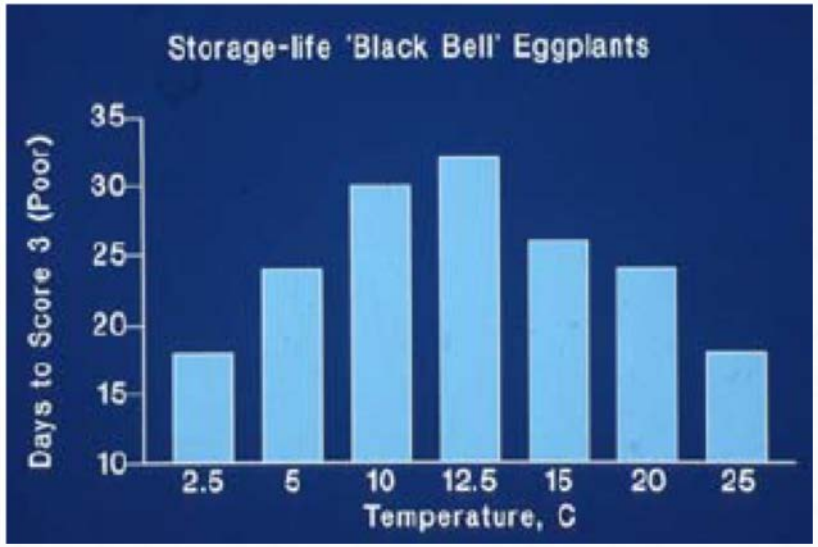
Consider:

- Temperature requirement by crop type
  - Two-zones
    - Non-chilling sensitive
    - Chilling sensitive
- Humidity
- Filling all available space
  - Pack gently but securely

Courtesy of UK CSA

Two storage zones





Pictures courtesy of UC Davis Postharvest Technology Center

Two storage zones

Non-chill sensitive 32-36 °F

Crop examples:

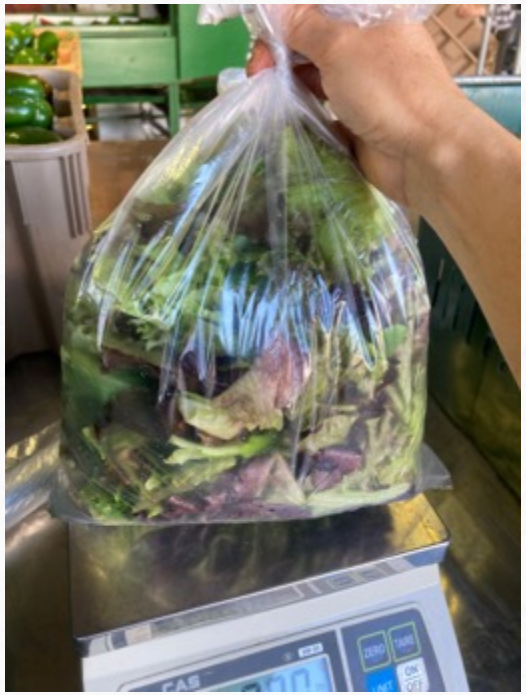
- Root veg
- Crucifers
- Lettuce
- Cool season herbs
- Leafy Greens
- Sweet Corn
- Small berries

Chill sensitive 50 °F

Crop examples:

- Green beans
- Cucumbers
- Eggplant
- Tomato
- Warm season herbs
- Bell peppers
- Potatoes
- Squash
- Watermelon

Packaging examples



Courtesy of UK CSA

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Putting it all together

- Standard Operating Procedures (SOPs) – A document that outline how to complete a task
  - Contains scope and purpose of the task, whose responsibility the task is, what materials are needed, and the procedure
- Simple way to make sure routine tasks are done the same way each time
- We've identified the areas that can affect product quality and shelf-life extension. The next step is to create crop specific SOPs for different steps in the process (harvest, washing, storage, etc.)

Thank You!

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