

Postharvest Care to Enhance Blueberry Crop Value

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Overview

- Market Considerations
- Harvest
- Respiration
- Postharvest
  - Cooling
    - Cold chain, containers
    - Static
    - Forced-air
  - Modified Atmosphere Packaging
  - Resources
  - Questions/Discussion



Market Considerations



- Pick-Your-Own/Farmstand Only
  - Cold chain/shelf life extension not a factor
- Local Farmers and Retail Markets
  - Early picking/delivery/purchase- cold chain/shelf life extension not a major factor
- Wholesale or multiple Retail Markets beyond a 50 or 100-mile radius
  - Cold chain a major consideration
  - Most efficient Cooling methods to extend shelf life should be a major consideration





Harvest Maturity

- Blueberries are climacteric (respond to ethylene), but there flavor DOES NOT improve after harvest
- Some varieties may be picked soon after turning dark blue while others take longer to get fully ripe.
  - The latter should be picked after developing good flavor but when they are still firm enough for successful marketing.
- Only pick “loose” fruit

Harvest

- Train pickers
  - Personal hygiene
  - Methods of picking minimizing bruising
  - Avoiding diseased/damaged berries
  - Balance between speed/efficiency and quality



Harvest

- Minimize handling the berries should be minimized to reduce potential fruit damage
- SWD-infested fruit may be softer





Respiration

- Respiration involves the fruit converting sugars and oxygen to produce carbon dioxide, water and heat
  - Heat
  - CO2
- Produce respiration rates vary greatly



Respiration Rates- Select Produce

Crop	Respiration Rate BTU/ton/24 hrs
Nuts, Dates, Dried Fruits and Vegetables	Very Low < 5
Apple, Grape, Garlic, Onion, Potato (mature), Sweet Potato	Low 5–10
Apricot, Cherry, Peach, Pear, Nectarine, Plum, Cabbage, Carrot, Lettuce, Pepper, Tomato, Potato (immature)	Moderate 10–20
Blueberry Strawberry, Blackberry, Lima Bean, Raspberry, Cauliflower	High 20–40
Artichoke, Snap Bean, Green Onion, Brussels Sprouts	Very high 40–60
Asparagus, Broccoli, Sweet Corn, Mushroom, Spinach, Pea	Extremely high >60

Respiration Rates of Selected Fruits ($mgCO^2kg^{-1}h^{-1}$)



Cold Chain

- Blueberries will store longer if they are harvested at the coolest part of the day
  - Mornings, before field heat buildup, but preferably after any dew has dried off
- Choose harvest containers that allow adequate air flow for cooling
- Place berries in shade or cooler ASAP
  - On Average, for every hour delay in cooling results in a loss of 1 day of shelf life for small fruit

Blueberry Storage Conditions

- Blueberries can be stored at 32°F with 90-95% RH for 10-18 days.
- They have only low ethylene production and sensitivity.
- Blueberries are sensitive to freezing injury
- In retail operations, covering the small blueberry containers with plastic will keep the berries from shriveling.

Containers – Select Carefully

- Considerations
  - Are they designed for the commodity ?
  - Do they have adequate airholes/ventilation?
  - Are they stackable?
  - Are the re-usable?
  - Can they be easily cleaned/sanitized (GAPs)?



Examples



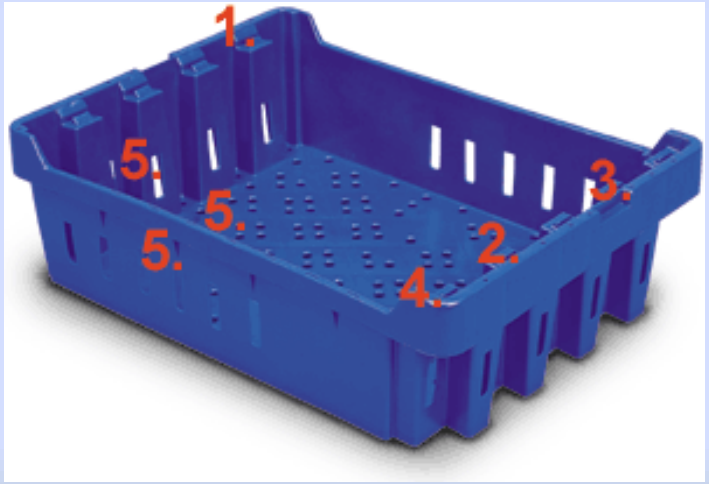








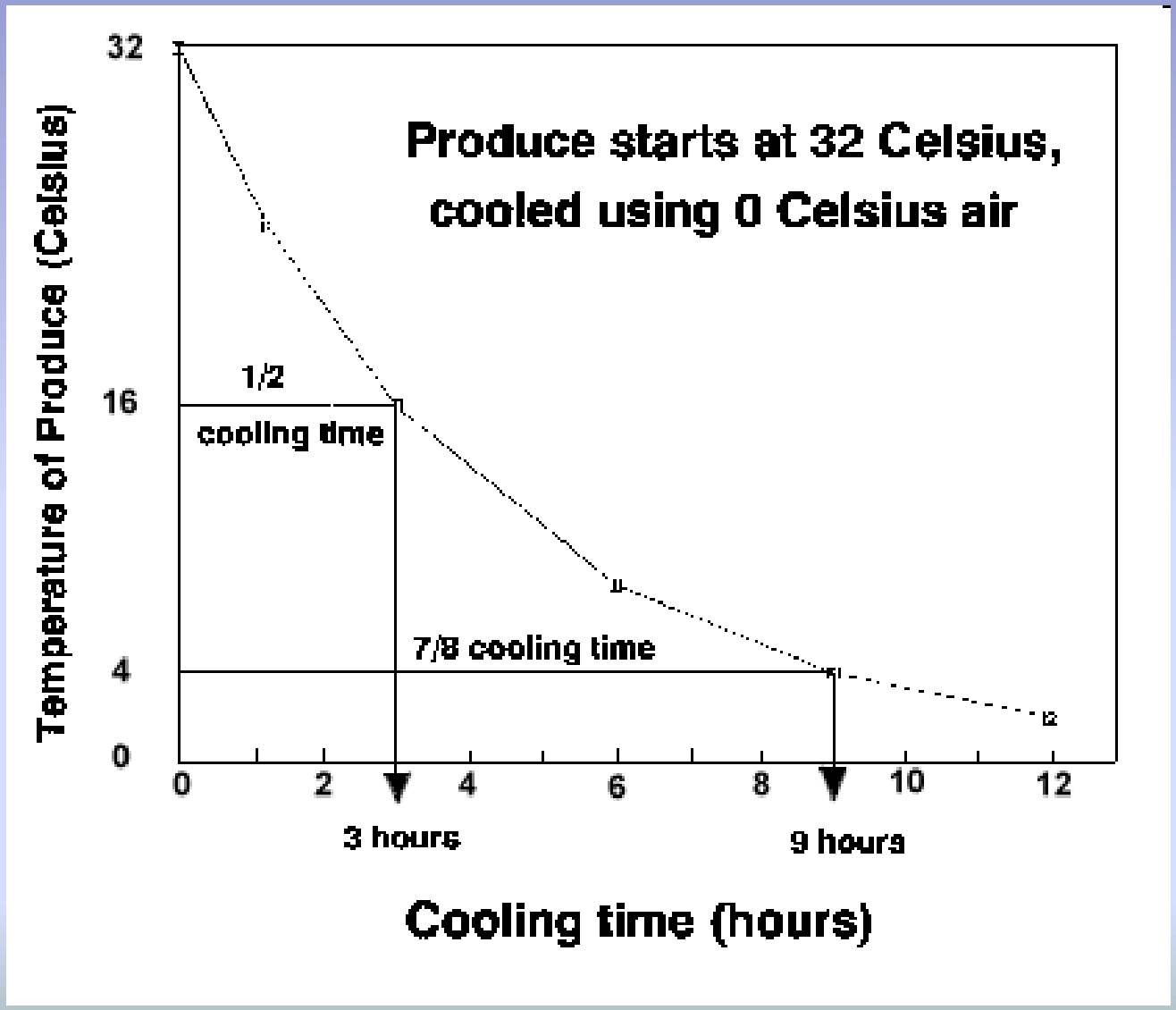




Static (Room) Cooling

- Placing fruit into cooler and allowing field heat to be removed very slowly
  - Density of produce -More and deeper the layers, slower the cooling
  - Container type, orientation, and venting characteristics (if air passes uniformly and evenly by the produce
  - travel distance of the cooling air (the shorter the distance, the faster is the cooling of the overall pile)
  - airflow capacity (the higher the airflow, the faster is cooling)

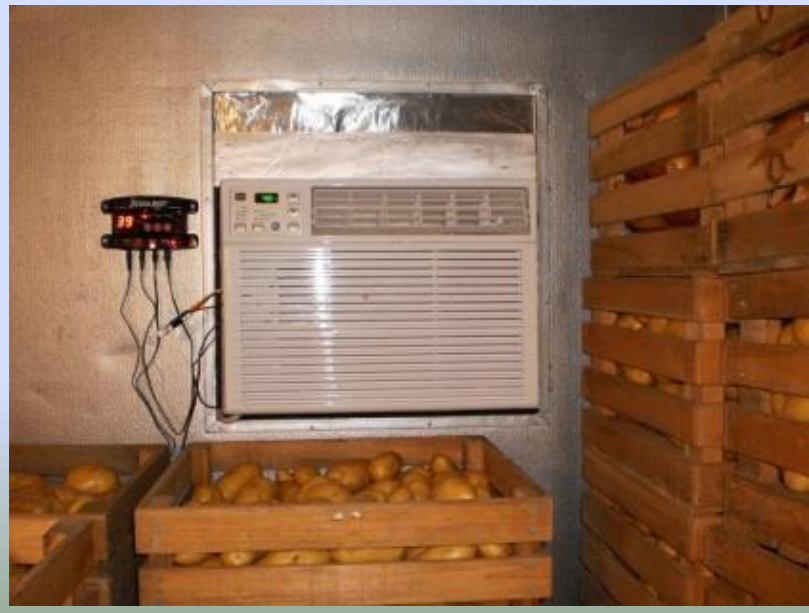
Typical Time-Temperature Relationships for Produce Being Cooled



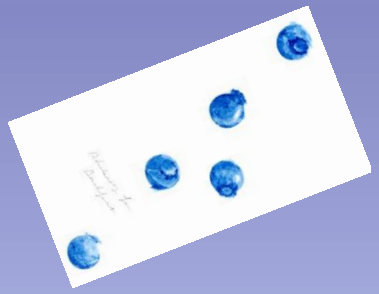
COOLBOT

- An attachment to a store-bought window air conditioner that allows it to cool much lower without freezing up
- Good for small (well-insulated!)rooms that are used on lower-respiring produce such as pome & stone fruit, garlic, tomatoes, onions, sweet potatoes, peppers
- Gets rooms down to upper 30's
- NOT recommended for berries or other high respiration produce such as greens, sweet corn, snap beans, asparagus, broccoli, peas

- www.storeitcold.com



Forced-Air Cooling

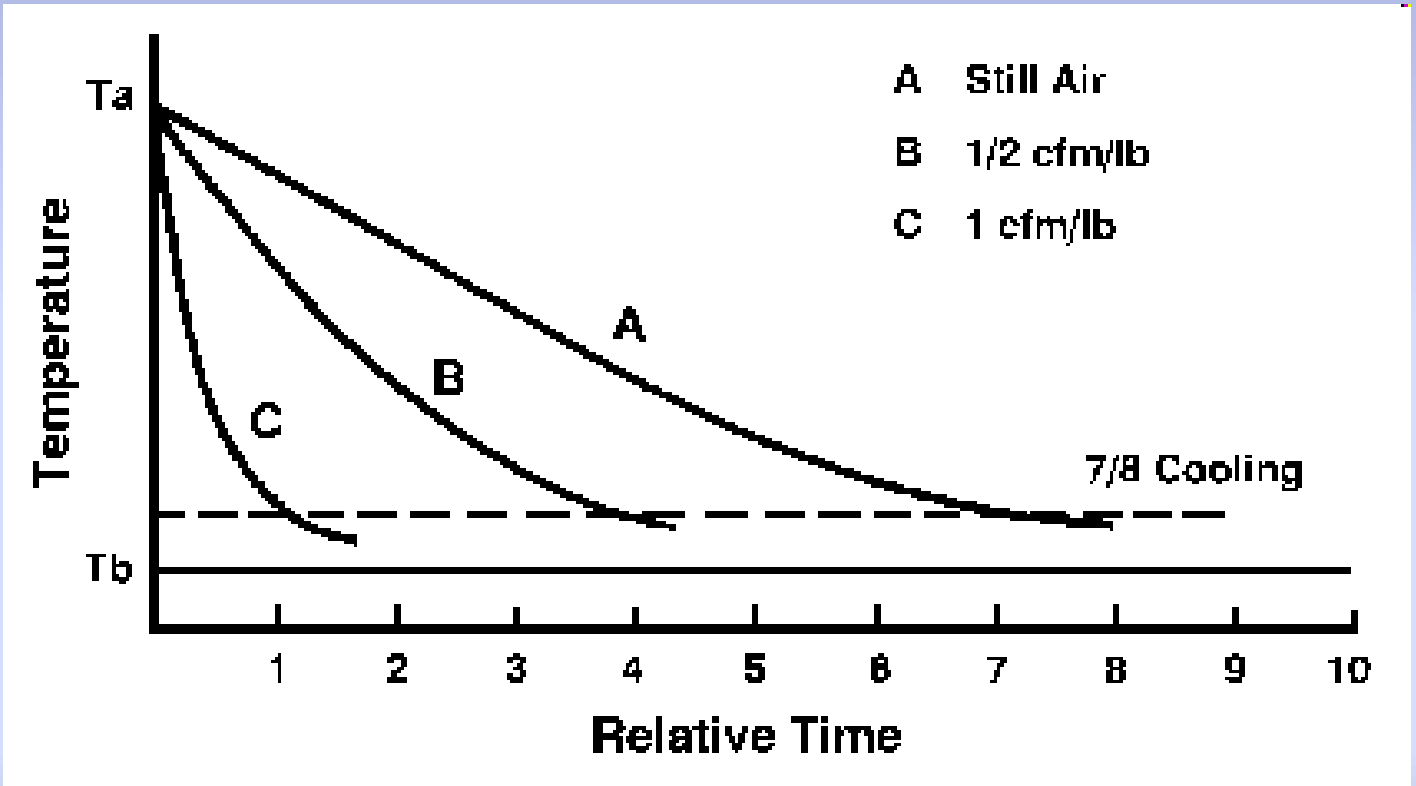


- Rapid cooling by pulling air through produce by the use of fans
- Field heat removal is several times faster than static cooling
  - ~ 4-10 times faster for small fruit with the correct setup
- It is recommended that you work with a refrigeration company that specializes in design and installation of refrigeration systems for agriculture/produce

Pulling air through produce by the use of fans

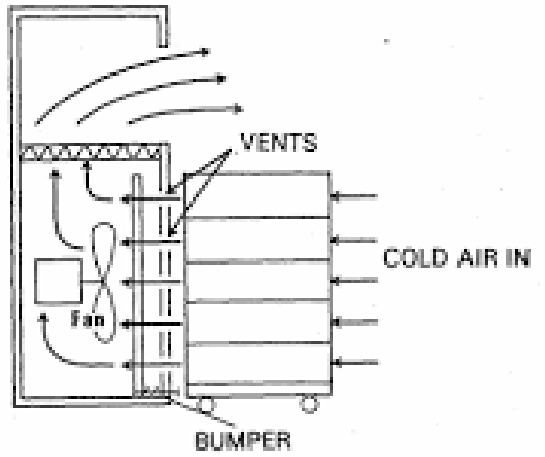
Typical airflow rates

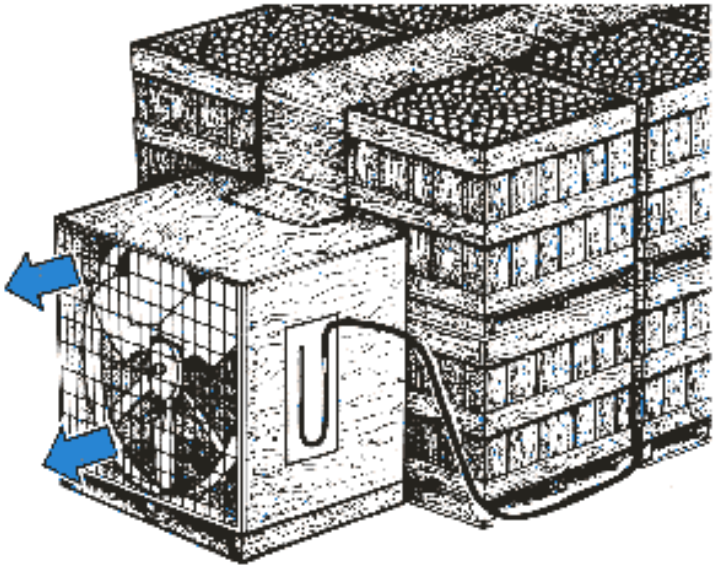
Typical Cooling Rates, Static vs. Forced-Air



Key: cfm/lb= cubic feet per minute per pound of produce

Damper is opened when pallet is pushed against bumper









Modified Atmosphere Packaging (MAP)

- Packaging that alters the composition of the gases around the produce
- Specially formulated for each individual commodity
- Gases can be passive or flushed (carbon dioxide)
  - In the case of blueberries & sweet cherries, no difference in shelf life

    passive vs flushed



Benefits of MAP

- MAP liners or shrouds allow respiration to be reduced
- Maintenance of high humidity
- CO^2 buildup and 0^2 reduction (ideal 8-10% CO2 ideal)
  - CO^2 acts as an antimicrobial, reducing the growth of fungus such as Blue and Grey mold
- You must pre-cool produce before using MAP



Large Volume Blueberry MAP

- Amcor Lifespan Pallet Shrouds
- 1,100-1,500 lbs berries
- Claim 6-8 weeks storage at 32F, although we haven't gone beyond 4 weeks in our trials
- CO_2 & O_2 buildup in 10-14 days



Small Volume Blueberry MAP?

- Stepac - Xtend®
  - New for blueberries, bulk packaging
  - Kahlke getting samples to try next season
- Small volume
  - 3-50 pounds?
- Claiming 45 days (32F) shelf Life



- http://www.stepac.com/blueberries

Resources

- Posted on the Lake Ontario Fruit Program website at : http://lof.cce.cornell.edu/

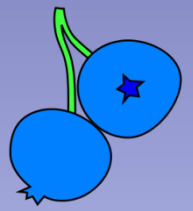
Click on “Harvest Storage”

Then click “Technology”

OR Google “Cornell Berries Resources”, click on “Postharvest”



Thank You!



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