Harvest and Storage of Blueberries

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When to harvest

• When berries turn blue?
• Berries can be blue well before they ripen fully
• Even when fully ripe, they can hang for 10 days
• Blueberries do not improve after picking
How to harvest

• Machine vs Hand Harvest
• Hand: less damage, longer time
• Machine: more damage, less time, less shelf life
Hand Harvest

• Run a hand around the cluster: only berries that come off easy are ripe
• Hand free devices
• Pick straight into container (no leaves/stems!)
• Plastic bag as container liner
• Modified 1 gal container
• In large containers, keep layers shallow
Hand harvesting

- Needs 550 worker hours per acre
- Or: 5-10 people per acre
- 2-3 pickings per cultivar, 7-10 days apart
- Start picking at 1/3 of berries blue
- Ripe berries can hang for 10 days
- Do not harvest when plants are wet
- Finding labor
- U-pick insurance
Machine harvest

• Catch frame + shaker or hand shaking
• Blueberry rake

• Battery powered limb shaker (also useful for fruit thinning)
Improvised Shaker

- Resistor limits rpm
- 800 rpm are optimal
Over the row harvesters

• Slapper style
  – Fruit loss, cane damage

• Sway style
  – Good for blackberries, raspberries
  – Tends to compress bush, then the sudden release dislodges a lot of fruit

• Rotary head style
  – Nylon wands that rotate

• Any type of machine needs to have a well trained operator!
Machine Harvest

- Over the row harvester
- Oxbo, Littau, Korvan
Side mount harvester
Rotary head harvester

- BEI International
Mechanical harvest

- Height of fall determines bruising
- Bruising affects storage life
- Use for berries to be processed
- Varietal differences – stem scars
- Needs clean up, debris removal
• Fits on a half ton truck
• Acadian Machine Works
Machine Harvest considerations

- New planting – consider layout – row space, turn-around space
- Less than 10% slope
- Varieties:
  - Concentrated ripening
  - Firmness
  - High quality
- Pruning style: hedgerow, narrow base
- More than 10 acres
- Harvester can also be used for raspberries, blackberries
Machine Harvest considerations

- Methyl-jasmonate and ethephon can be sprayed on to induce abscission
- 24 hours prior to harvest
- This increases amount of fruit detached with stem
Field handling

• If using labor: make a plan!
• Avoid additional handling steps, rough handling/transport, dropping boxes etc
• Keep fruit in the shade, cover with light fabric, wet this down to provide evaporative cooling
• Cool down as soon as possible
• Berries are not washed during sorting/packing for fresh market
Field handling

- Cooling to 32F within 2 hours can reduce decay by 37-46% after 10 days of storage
- Forced air cooling, about 1 hour
Field Handling and Storage

• Cooling without air movement won’t cool berries on the “inside”, leading to sweating on the colder “outside” berries

• However, too long forced air cooling can lead to desiccation

• With careful picking, prompt precooling and storage at 32F the minimum shelf life is 14 days
• Respiration: uses oxygen, produces CO2 plus heat
• @ 40F: 20; @ 60F: 50; ie about double
Storage

• Controlled atmosphere storage:
  – Removal of ethylene and CO2
  – May help reduce botrytis
  – Trial: 1.8% O2, 12 % CO2: after 46 days 97% of berries were rated very good

• Cold storage:
  – Optimum temperature: 32 +/- 1 F (1-2 weeks)
  – Opt. humidity: 90-95%
  – Reduces shriveling/softening due to water loss
Small scale CA storage

- CA tent in a refrigerated room
- HortTechnology, October–December 1999 9(4)
- Proposed already in 1957
Storage

• Edible coatings can be used on pre-washed, ready to eat fruit:
  – Semperfresh
  – Chitosan
  – Caseinate
  – Alginate

• Can reduce water loss, increase storage time

• Chitosan can be used together with antimicrobials
Packaging

• Clam shells, paper pulp containers
• For CA: semipermeable film wraps (MAP):
  – Reduce moisture loss
  – Maintains modified atmosphere
• Blueberries are generally sold as U.S. No 1 or unclassified
• USDA-AMS sizes: extra-large <90 berries/cup, Large 90-129, medium 130-189, small 190-250
Post harvest diseases

• Most start in the field and have to be controlled in the field
• Any damage provides entrance to spores
• Can spread by having healthy berries touching surfaces contaminated by infected berries (sorting equipment etc)
Blueberry (Vaccinium corymbosum) — Cultivar Susceptibility

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<tr>
<th>Cultivar</th>
<th>Mummy Berry* 1°</th>
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<th>Blueberry Scorch</th>
<th>Bacterial Canker</th>
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MR = Moderately resistant, R = Resistant, I = Intermediate, S = Susceptible, T = Tolerant, ? = Unknown, D = Described as resistant but unknown reaction in the Pacific Northwest relative to other cultivars.

*1° = Primary Infection, 2° = Secondary Infection
Botrytis

• aka Grey Mold
  – Grows even at 32F, but very slowly
  – Can infect only damaged, dead tissues
  – Increased by harvest on wet, cool days
  – Grey, fluffy mycelium
  – Treat at bloom to control botrytis blight
Alternaria

- Sunken lesion first, then gray-green mycelium
- Treat from bloom time on
Anthracnose

• Ripe Rot (Colletotrichum)
  – Starts during long wet periods around harvest
  – Bloom sprays
  – Early signs: softening, puckering of berries at blossom end
  – Rapid decay, oozing of orange fungal masses
Phomopsis

- Soft calyx end rot on fruit
- Twig blight on plants
Rhizopus

• Soft Rot
  – Ever present in the air
  – Will not grow below 41F, cannot infect without wetness and wounds
  – Immediate cooling helps

Rhizopus (left), Botrytis (right)
Exobasidium and mummy berry

• Do not spread during storage
Disease control

- Control in the field
- Post harvest treatments SO2
- Berries with stems keep better
- Prompt cooling
- Storage at the lowest safe temperature
- Preventing physical injury to the fruit
- Shipment under high carbon dioxide
- The higher the sugar to acid ratio, the better the fruit will keep
Processing

• Freezing
• Cooking (Jam, jelly)
• Drying
• Washed berries for freezing:
  • Straight pack: no sugar
  • Sugar pack: “4+1”: 24 lbs berries, 6 lbs berries for a 30 lb pail
• IQF: berries are frozen while traveling on a belt through a freezing tunnel, then packed
• Good Agricultural Practices for Food Safety in Blueberry Production

Good Agricultural Practices for Food Safety in Blueberry Production:
Basic Principles

Prepared by

Anamaria Gomez Rodas, Les Bourquin, Carlos Garcia Salazar,
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