Basics of Blueberry Crop Physiology

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Blueberries are Native to the United States

1978 USDA Farmers' Bulletin No. 2254, Commercial Blueberry Growing
Blueberries Types

**Northern High-Bush**
- *Vaccinium corymbosum*
- Adapted to cooler day-time temperatures
- Hardy to -20°F
- Northern
- 3-4’ tall
- Varieties:
  - Bluecrop
  - Blueray

**Southern High-Bush**
- *Highbush x rabbiteye*
- Better adapted to cooler and wetter conditions
- Central region
- Injury at 0°F or just below
- Varieties:
  - Norman
  - Ozarkblue
  - Kabluey

**Rabbiteye**
- *Vaccinium virgatum*
- Adapted to hotter temps and dryer conditions
- Bud injury at 0°F
- Southern region
- Tall plants, >6’
- Varieties:
  - Tiftblue
  - Premier,
  - Brightwell
  - Powderblue
A little History, the First cultivated varieties

• **Highbush**
  – 1911, Elizabeth White (New Jersey) was determined to create an industry for cultivated blueberries. She worked with botanist Frederick Coville (USDA) to identify wild plants, make crosses and select new varieties.
  – 1916, the first commercial crop of blueberries in Whitesbog, N.J.

• **Rabbiteye**
  – 1925, Wild types taken from Florida and planted by the University of Georgia
    • Drs. Brightwell, Darrow, Scott, Galleta, Moore, and Draper worked together on blueberry breeding. Joint UGA, NCSU and USDA.
    • 1955, first cultivar of good commercial quality released: Tifblue
Blueberries in their native habitat

Highbush Blueberry
Vaccinium corymbosum L.

Native to “moist or wet peat of moderate to high acidity – in and around marshes, swamps, lakes and flood-prone areas”

– USDA Plant Factsheet
Blueberries in their native habitat

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– USDA Plant Factsheet
Plant Biology

Flower buds produced on last seasons growth.

- Endomycorrhizae
- Roots lack root hairs
  - Limits ability to absorb water
Dormant canes

Pruning

- Winter injury -20-0°F (depends on the type)
Chilling hour requirements

- Chilling Hours Accumulation
  - Temperatures below 45°F

- Blueberry requirements
  - Highbush: 650-1,000 hours
  - Southern highbush: 400-700 hours
  - Rabbiteye: 250-600 hours

- Map only indicates estimates, yearly variation is to be expected

https://extension.umd.edu/aronia/cultivation-range-0
Bud and Flower Development

Stage 1 – Dormant bud. No visible signs of swelling. Note bud scales are very tight.

Stage 2 – Visible bud swelling, scales starting to separate. Bud is leaving dormancy.

Stage 3 – Bud scales noticeably separated. Tips of flowers beginning to be visible.

Stage 4 – Bud scales have dropped. Individual flowers distinguishable. Bud has a “pineapple” look to it. Corollas beginning to elongate.

Temperature at which damage may occur:

- 10-15 °F
- 20 °F
- 20-23 °F

Flower buds break and open over a 3-4 week period

Photos: D. Scott NeSmith
Bud and Flower Development

**Stage 5** – Individual flowers separated, corollas elongated, but not yet open.

**Stage 6** – Corollas completely elongated, expanded, and open. This is the time when flower can be pollinated.

**Stage 7** – Corollas have dropped. Pollination is over. A rapid corolla drop often indicates good pollination has occurred. Especially if buds look to be more erect and less “droopy”.

Photos: D. Scott NeSmith
Assessing Cold Injury to Blueberry Flowers
-Leaf bud break

-Floral buds of many different stages
Number of Flowers per bud

- Dependent on variety, sun exposure, thickness of cane and location on the cane
  
  Example
  Primary buds: 7-10 blooms
  Tertiary bud: 5-8 blooms
Blueberry Pollination

Plant more than one variety?

*Typically, Yes*

- Highbush blueberry is generally self fertile, but cross-pollination increases fruit set and quality.
  - *Other species vary in self-compatibility.*
  - *Rabbiteye tend to be incompatible*

- Bumble bees are preferred over honeybees

- Flowers may be open and receptive over 5-8 days
  - *Type and variety dependent*
Fruit development

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<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>April</th>
<th>May</th>
<th>June</th>
<th>July</th>
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<table>
<thead>
<tr>
<th>Early green fruit</th>
<th>Late green fruit</th>
<th>Fruit coloring</th>
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<tbody>
<tr>
<td><img src="image1" alt="Early green fruit" /></td>
<td><img src="image2" alt="Late green fruit" /></td>
<td><img src="image3" alt="10% Blue" /></td>
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<tr>
<td><img src="image4" alt="25% Blue" /></td>
<td><img src="image5" alt="75% Blue" /></td>
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From petal fall to ripe fruit is: **approximately 50-100 days**
Harvest

- Generally come into production in year 3-4 and hit full production around year 5-8
  - A single variety will bear it’s crop spread over 3-4 weeks
  - Yield 3-10 lbs. /plant

- Nationwide average yields are 6,700 pounds per acre (USDA)
Post-harvest, Fruit Bud set

- Flower buds start to be initiated 60-90 days after harvest
  - 61-75°F is ideal for initiation
  - Initiation occurs from the tip, down the laterals
  - The end bud will have the highest number of flowers/cluster
  - Thin, “twiggy” growth will produce low numbers of flowers per cluster
Plants enter dormancy

- Foliage turns red, to dark green
- Flower bud initiation may continue
- Leaves may stay on the plant well into spring
Plant Lifespan

- 40 years or more?
- *Trend to re-plant earlier*
  - 10-20 years
Blueberry through the seasons
Thanks and stay in touch!

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Links and Sources

- https://web.extension.illinois.edu/mms/downloads/68755.pdf
- https://extension.oregonstate.edu/produce-forage/berries-grapes/blueberry-plant-physiology
- https://www.blueberrycouncil.org/about-blueberries/history-of-blueberries/
- https://www.canr.msu.edu/blueberries/growing_blueberries/growth-stages
- https://site.caes.uga.edu/blueberry/2014/02/blueberry-flower-bud-stages/
- https://extension.oregonstate.edu/produce-forage/berries-grapes/blueberry-plant-physiology