Blueberry Production

Rebecca Harbut
UW-Madison
harbut@wisc.edu/ 608-262-6452
Ericaceae

- Over 3000 species in 100 genera
  - About half in genus Rhodoendron (China)
  - Over 100 species in Erica (Southern Africa)

- Primarily shrubs and climbers

- Family Characteristics:
  - Woody stems
  - Simple evergreen leaves growing alternately
  - Clusters of flowers
  - Flowers with 4 or 5 petals forming a tube or trumpet
  - Stamens not attached to the flower tube
  - Grow in acid conditions
Genus *Vaccinium*

- Select fruiting species:
  - *corymbosum* (Northern Highbush, 4x)
  - *angustifolium* (Lowbush, 4x)
  - *ashei* (Rabbiteye, 6x)
  - *darrowii* (Southern Highbush, 2x)
  - *macrocarpon* (Cranberry)
  - *vitis-ideae* (Lingonberry)
V. corymbosum L.
Northern Highbush

- Main cultivated species of blueberry
- Sunny acidic sites
- NA: Nova Scotia- WI, South to N. Georgia
- Commercial cultivars are likely hybrids of several species
Highbush History

• Harvested from wild plants in North America

• Early 1900’s Elizabeth White of Whitesbog, NJ paid pickers for plants producing large fruit

• Provided a template indicating desired sizes
• Collaborated with USDA plant breeders

• 1911- USDA breeding program began
• 1920- first cultivars released
Highbush Plant

- Hardy in zones 5-7
- 5-8 feet tall
- About ½ hand harvested
- About ½ machine
**V. angustifolium**

Lowbush

- Native to NE US and Eastern Canada
- Maine largest producer
- Large production in Maritime provinces
  - NB, NS, QB, PEI, Newfoundland
- Hardy in zones 2-4
  - >1,000 chilling hrs
Lowbush Harvest

- Primarily hand harvested
- Some mechanical harvest with walk behind machines
- Primarily used in process market
Lowbush Management

• Primarily ‘managed’ wild stands
  • Commercially available cultivars do not establish very easily
• Burn or Mow alternate years
  • manage weeds and disease
• Add some fertilizer and pesticides
• Bring in bees for pollination
V. corymbosum x V. angustifolium

Half-high Blueberries

- Lowbush x highbush hybrids
- Developed at U Minn
- Hardy
- Short stature allows winter protection

Half-high best suited to high snowfall areas

**Cultivars**
- Northblue
- Northsky
- Northland
- Northcountry
- Chippewa
- Polaris
- St. Cloud
## Tame blueberries

<table>
<thead>
<tr>
<th>State</th>
<th>Acreage (2007)</th>
<th>Production (1,000 lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Michigan</td>
<td>18,500</td>
<td>93,000</td>
</tr>
<tr>
<td>New Jersey</td>
<td>7,600</td>
<td>54,000</td>
</tr>
<tr>
<td>Oregon</td>
<td>4,500</td>
<td>45,000</td>
</tr>
<tr>
<td>Georgia</td>
<td>4,500</td>
<td>31,500</td>
</tr>
<tr>
<td>North Carolina</td>
<td>4,200</td>
<td>14,500</td>
</tr>
<tr>
<td>Washington</td>
<td>3,700</td>
<td>29,600</td>
</tr>
<tr>
<td>California</td>
<td>2,700</td>
<td>16,500</td>
</tr>
<tr>
<td>Florida</td>
<td>2,600</td>
<td>7,800</td>
</tr>
<tr>
<td>Mississippi</td>
<td>2,300</td>
<td>9,500</td>
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# Wild blueberries

<table>
<thead>
<tr>
<th>State</th>
<th>Acreage (2002)</th>
<th>Production (1,000 lbs)</th>
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</thead>
<tbody>
<tr>
<td>Maine</td>
<td>23,000</td>
<td>76,850</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>411</td>
<td></td>
</tr>
<tr>
<td>New Hampshire</td>
<td>168</td>
<td></td>
</tr>
<tr>
<td>New York</td>
<td>76</td>
<td></td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>63</td>
<td></td>
</tr>
<tr>
<td>Connecticut</td>
<td>9</td>
<td></td>
</tr>
</tbody>
</table>
## NA Blueberry Acreage Trends

<table>
<thead>
<tr>
<th>Type</th>
<th>1982</th>
<th>1992</th>
<th>2003</th>
</tr>
</thead>
<tbody>
<tr>
<td>N Highbush</td>
<td>31,382</td>
<td>43,525</td>
<td>50,030</td>
</tr>
<tr>
<td>S Highbush</td>
<td>395</td>
<td>1,015</td>
<td>6,400</td>
</tr>
<tr>
<td>Rabbiteye</td>
<td>4,818</td>
<td>9,637</td>
<td>10,548</td>
</tr>
<tr>
<td>Lowbush</td>
<td>119,900</td>
<td>130,220</td>
<td>172,840</td>
</tr>
</tbody>
</table>
“Superfood?”

- High in anti-oxidants (proanthocyanidins)
- High in Vitamin C
- High in Manganese
- Anti-inflammatory
Blueberry Establishment Costs

- ~ $3,000/A establishment costs
- 5-7 years before a crop is harvested
- Long payback period, but potential for profit is high
Site Selection

• Blueberries require specific conditions in order to be productive

  • Soil amendments can be used to adjust soil conditions

  BUT...

Be realistic about how much you can change it!
Blueberry Soil Requirements

• Well drained soils

• pH 4.5-5.2

• high OM (20-50%)

• Must prepare soil before planting

• Half-high types are best suited to high snowfall areas
Soil Preparation

- Add copious amounts of organic matter
- If sulfur needed, add sulfur *at least* 1 year prior
- Cultivate to make soil loose, friable.
Soil acidification

- Ideal pH is 4.5 to 5.5
- Reduce pH with applications of sulfur
- Microbe mediated
- Thiobacillus
- $2S + 3O_2 + 2H_2O \rightarrow 4 H^+ + 2 SO_4^{-}$
Sulfur to change pH to 4.5

<table>
<thead>
<tr>
<th>Start pH</th>
<th>Sand/loamy sand</th>
<th>Sandy loam/loam</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lb/1000 ft²</td>
<td>Lb/a</td>
</tr>
<tr>
<td>7.0</td>
<td>19</td>
<td>800</td>
</tr>
<tr>
<td>6.5</td>
<td>15</td>
<td>650</td>
</tr>
<tr>
<td>6.0</td>
<td>12</td>
<td>525</td>
</tr>
<tr>
<td>5.5</td>
<td>8</td>
<td>350</td>
</tr>
<tr>
<td>5.0</td>
<td>4</td>
<td>170</td>
</tr>
</tbody>
</table>
Planting Layout

• Plant density:
  • 870 (5’ x 10’) – 1,089 (4’ x 10’) plants/Acre
  • < 5’ in-row spacing can lead to earlier production and higher density requiring greater management

• PYO
  • Rows should be no longer than 200’
    • People don’t want to walk too far!
Plant Layout

• North-south rows ideal

• Consider slope, air drainage and equipment needs

• Large blocks of same cultivar can be productive, BUT should have 2 or more varieties that have similar bloom time to meet pollination needs
  • Alternating pairs of rows
Planting

• Plants should be set early spring after danger of frost
• Blueberry roots are shallow and wide
  • Dig shallow and wide hole
  • Include soaked peat moss in the planting hole, especially in sand or high silt/clay soils
• Irrigate immediately
  • Drip irrigation should be installed
• Rub off flowers during first year
Irrigation

- Blueberries have a shallow roots system
- Significant benefit to installing drip irrigation
- Mulch can help conserve moisture

Considerations:
- Quality of water
- Capacity of water supply
- Fertilizer can be applied through irrigation system
Managing new planting

- Weed control is CRITICAL during establishment
  - Maintain 3’ weed-free strip around plants
  - Ensure cultivation is very shallow to not damage roots
Mulching

• Mulch is considered necessary
• Common mulch materials:
  • Wood chips, bark, straw, corn stalks
  • 3-5” thickness
  • Ensure mulch is flat-topped vs. cone shaped
  • 4’ wide strip
• Mulch should be replenished every 2-3 years
Fertilization

• New plants
  • 3-4 weeks after planting
  • If OM is low (<3%) addition application 8 weeks after planting
    • Ammonium sulfate (21-0-0)
    • 6 lbs actual N per plant
    • Additional application can be applied in July if growth is not satisfactory
Established Plant Fertilization

- Established blueberries have minimal nutrient requirements
- Sensitive to over fertilizing

<table>
<thead>
<tr>
<th>AGE (years)</th>
<th>UREA</th>
<th>AMMONIUM SULFATE</th>
<th>ACTUAL NITROGEN</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>145</td>
<td>310</td>
<td>65</td>
</tr>
<tr>
<td>7</td>
<td>120</td>
<td>260</td>
<td>55</td>
</tr>
<tr>
<td>6</td>
<td>100</td>
<td>215</td>
<td>45</td>
</tr>
<tr>
<td>5</td>
<td>80</td>
<td>170</td>
<td>35</td>
</tr>
<tr>
<td>4</td>
<td>60</td>
<td>130</td>
<td>27</td>
</tr>
<tr>
<td>3</td>
<td>45</td>
<td>95</td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>35</td>
<td>75</td>
<td>15</td>
</tr>
</tbody>
</table>

NRAES Blueberry Production Guide
## Tissue Testing

**Table 6.** Deficient, sufficient, and excessive nutrient concentrations in blueberry leaves.

<table>
<thead>
<tr>
<th>NUTRIENT</th>
<th>DEFICIENT BELOW</th>
<th>SUFFICIENT</th>
<th>EXCESSIVE ABOVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>N (%)</td>
<td>1.7</td>
<td>1.7–2.1</td>
<td>2.3</td>
</tr>
<tr>
<td>P (%)</td>
<td>0.08</td>
<td>0.1–0.4</td>
<td>0.6</td>
</tr>
<tr>
<td>K (%)</td>
<td>0.35</td>
<td>0.4–0.65</td>
<td>0.9</td>
</tr>
<tr>
<td>Ca (%)</td>
<td>0.13</td>
<td>0.3–0.8</td>
<td>1.0</td>
</tr>
<tr>
<td>Mg (%)</td>
<td>0.1</td>
<td>0.15–0.3</td>
<td>0.4</td>
</tr>
<tr>
<td>S (%)</td>
<td>—</td>
<td>0.12–0.2</td>
<td>—</td>
</tr>
<tr>
<td>B (ppm)</td>
<td>20</td>
<td>30–70</td>
<td>200</td>
</tr>
<tr>
<td>Cu (ppm)</td>
<td>5</td>
<td>5–20</td>
<td>—</td>
</tr>
<tr>
<td>Fe (ppm)</td>
<td>60</td>
<td>60–200</td>
<td>400</td>
</tr>
<tr>
<td>Mn (ppm)</td>
<td>25</td>
<td>50–350</td>
<td>450</td>
</tr>
<tr>
<td>Zn (ppm)</td>
<td>8</td>
<td>8–30</td>
<td>80</td>
</tr>
</tbody>
</table>

% by dry weight of blueberry leaf
ppm=parts per million

NRAES Blueberry Production Guide
Soil pH and nutrient requirement
Pruning

• Maintain range of cane age 1-8 years old
  • 2-3 canes of each age

• Productivity declines after 8 years of production on cane

• Mechanical harvest
  • maintain more narrow plant- reduces yield
Flowering

- 80% fruit set is considered full crop
- Flowering occurs for 7-14 days
- Blossoms on thin wood open before those on thick wood
- Wide range in flowering times based on cultivar
- Early cultivars flower for longer period than later flowering cultivars
Pollination

• Pollen is transported by insects
  • Sticky and heavy so wind can not transport
• Bumblebees, native wild solitary bees can ‘sonciate’ the flower to move pollen from anther
• Honeybees- do not sonicate and therefore collect less pollen
• Carpenter bees- ‘steal’ the nectar by piercing hole which honeybees than use
Encouraging Pollinators

• Maintain thick fence rows along the perimeter of a planting to provide nesting sites
• Provide ‘food source’ during the entire season
• Use only strong hives (min 45,000 bees)
• 1-3 hives/ A depending on variety
Flowers
Fruit

- Fruit ripens 2-3 months after flowering
- Thicker wood usually produces fruit that are larger and mature earlier
- Sugar content is ~15% and will increased for several days after full color is achieved
- Highest quality is achieved if fruit is picked fully mature
  - Shorter shelf life...consider post harvest needs
- Critical to cool fruit immediately after harvest
PEST MANAGEMENT
Pest Pressure on Blueberry

• Generally, pest pressure is low compared to other fruit crops

• Increased pest pressure:
  • Older plantings
  • High density of blueberry plantings in an area
  • Stressed plants (winter lows, water stress, etc)
3 Groups of Pests

1) Foliage, bud and flower feeders
2) sap feeders (plant juices)
3) fruit feeders
Foliage feeders

• Leafrollers
  • Tie blossoms together and feed on them
  • < 15/plant threshold
• Chafers and Weevils
  • Early season pest that feed on developing leaves and buds
  • < 15/plant threshold
Sap Feeders

- Leafhoppers
  - Feed on underside of leaves
  - Slit the stem to lay eggs
  - Can transmit diseases

- Aphids
  - Feed on young leaves and shoots
  - Most damaging on plants <3 years
  - Transmit viruses
  - Usually controlled by natural enemies
Fruit Feeders

• Blueberry Maggot
  • Primary pest of blueberries
  • Flies lay eggs in the fruit
  • Over winters in leaf litter, so sanitation is important
  • Chemical controls
Blueberry Disease

- Mummy berry
  - Most common fungal disease
  - Urea application and shallow cultivation at bud break can inhibit population
- Chemical controls
- Phomopsis Canker/Twig Blight
  - Avoid sites prone to spring frosts and late fertilization
Bird Protection

• Bird will eat berries as they ripen
• Netting
• Visual scare devices
• Audible scare devices
  • Canons
  • Distress calls
• Use your imagination!
• Rotate control measures during season
Winter Damage
Summary

• Blueberries are a desirable crop due to low pest and disease pressure

• Site selection and preparation are critical!

• Blueberry production has high long-term profit potential...if you have a market