Wine Grape Variety Trials for the Midwest
Matching Varieties to Sites

2011 Kentucky Grape and Wine Short Course
Bruce Bordelon
Why test varieties?

• Service to the industry
  – Identify varieties well adapted to our region that make good wine = Sustainable production
  – Determine strengths and weaknesses to advise growers

• Service to U.S. breeding programs
  – Determine if selections are worthy of release
  – Performance of selections in new climates

• New NE-1020 Multistate trials
  – Compare performance across wide range of climates
Strengths and Weaknesses

• Cold hardiness
• Disease susceptibility
• Fruit/wine quality
  – Date or ripening, fruit chemistry
• Vigor/yield relationship
• Etc.
Strengths

• Cold hardiness
  – Frontenac, Marquette, LaCrescent

• Disease susceptibility
  – Norton, Steuben, Cayuga white

• Fruit/wine quality
  – Traminette, Valvin muscat, Chambourcin

• Vigor/yield relationship
  – Noiret, Vidal, Cayuga white
Weaknesses

• Cold hardiness
  – vinifera, Chambourcin, Cayuga white

• Disease susceptibility
  – Traminette, Vignoles, vinifera

• Fruit/wine quality
  – Norton, vinifera, Frontenac

• Vigor/yield relationship
  – Norton, Traminette, Valvin muscat
Recent Releases

• New York
  – NY 70.809.10 = Corot noir
  – NY 73.136.17 = Noiret
  – NY 62.122.1 = Valvin muscat
  – NY 65.533.13 = Traminette

• Minnesota
  – MN-1047 = Frontenac
  – MN-1166 = LaCrescent
  – MN-1211 = Marquette
Selecting an appropriate grape variety is a major factor for successful grape production. Varieties differ significantly in their cold hardiness, ripening dates, disease resistance, and yield potential. The choice of a grape variety is highly dependent on the specific climate and growing conditions of the region.

Weather and Variety Selection

The major climatic factors affecting grape production are:

- **Winter cold and snowfall**
- **Length of the growing season and heat unit accumulation**
- **Rainfall during the ripening period**

Matching the variety characteristics to the site climate is critical for successful grape production. Varieties differ significantly in their cold hardiness, ripening dates, disease resistance, and yield potential. The choice of a grape variety is highly dependent on the specific climate and growing conditions of the region.

### Table 2. Grape Variety Performance in Southwest Indiana

<table>
<thead>
<tr>
<th>Variety</th>
<th>Average Annual Rainfall</th>
<th>Harvest Date</th>
<th>Viable Seeds (100)</th>
<th>Clusters (100)</th>
<th>Berry Weight (g)</th>
<th>Brix</th>
<th>pH</th>
<th>WW (g/100ml)</th>
<th>Picking Weight (lbs)</th>
<th>Grade (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chasselas</td>
<td>80</td>
<td>8/15</td>
<td>303</td>
<td>112</td>
<td>11.5</td>
<td>17.3</td>
<td>2.1</td>
<td>120</td>
<td>135</td>
<td>90</td>
</tr>
<tr>
<td>Muscat</td>
<td>75</td>
<td>8/25</td>
<td>300</td>
<td>109</td>
<td>11.2</td>
<td>17.0</td>
<td>2.0</td>
<td>120</td>
<td>135</td>
<td>90</td>
</tr>
<tr>
<td>Riesling</td>
<td>70</td>
<td>8/20</td>
<td>295</td>
<td>107</td>
<td>11.0</td>
<td>16.8</td>
<td>2.0</td>
<td>120</td>
<td>135</td>
<td>90</td>
</tr>
<tr>
<td>Pinot Noir</td>
<td>65</td>
<td>8/15</td>
<td>290</td>
<td>104</td>
<td>10.8</td>
<td>16.5</td>
<td>2.0</td>
<td>120</td>
<td>135</td>
<td>90</td>
</tr>
<tr>
<td>Gewürztraminer</td>
<td>75</td>
<td>8/25</td>
<td>300</td>
<td>109</td>
<td>11.2</td>
<td>17.0</td>
<td>2.0</td>
<td>120</td>
<td>135</td>
<td>90</td>
</tr>
</tbody>
</table>

### Publications

- **Grape Varieties for Indiana (HO-221)**
- **Midwest Grape Production Guide (OSU Bulletin 919)**
- **Growing Grapes in Kentucky (ID-126)**
Variety Adaptation to Climate

• **Temperature**
  - Minimum winter temperature
    - Cold hardiness
  - Heat accumulation and season length
    - Date of bud break and ripening

• **Rainfall**
  - Amount and distribution, especially from veraison to harvest
    - Ripening date and tendency toward rot problems
Midwest Climate
USDA Plant Hardiness Zone Map
Kentucky has zones:
5b (-10 to -15°F)
6a (-5 to -10°F)
6b (0 to -5°F)
General Guidelines to Match Variety Hardiness to Site

• **Excellent sites 6b (0 to -5°F)**
  – all commercial varieties including vinifera

• **Good sites 6a (-5 to -10°F)**
  – most commercial varieties (except vinifera)

• **Acceptable sites 5b (-10 to -15°F)**
  – moderately hardy varieties (hybrids, labrusca)
2 yrs out of 10 is break even
>2 yrs out of 10 is not profitable
Cold Damage to Buds

Live compound bud

Dead primary bud
Cold damage to vine trunks
Crown Gall
Crown Gall
Disease-free Nursery Stock?

Noiret planted 2003
Date of photo: 2009
>75% crown gall
Date of bud break - Frost damage

- Cultivar’s potential to be damaged by frost is directly related to it’s date of bud break.
  - Early (e.g. Foch, Marquette. GR-7) much more likely to be damaged than late (e.g. Chambourcin, Vidal)

- Choose cultivars accordingly

- Plant late budding cultivars on most frost prone sites (elevation, slope, aspect, etc)
Frost Damage
Relative Date of Bud Break

(About 2 week range)

• Early
  – Foch, St. Croix, Marquette, LaCrescent, GR-7, DeChaunac

• Mid
  – Seyval, Chardonel, Frontenac, LaCrosse, Corot noir, Noiret, Norton, etc.

• Late
  – Chambourcin, Steuben, Traminette, Vidal, Vignoles
Temperature During Ripening

Fruit quality is best if fruit ripens under **warm** days and **cool** nights

- Match ripening date to climate
  - Don’t grow early ripening grapes in a long season, hot area (excess heat) **
  - Don’t grow late ripening grapes in a short season, cool area (insufficient heat)
Theories on Heat Affects

- Amerine & Winkler, 1944. California Zones I-V based on GDDs base 50°F (I<2500…..V>4000)
- Coombe, 1987. Temps >86°F day & >64°F night are detrimental to fruit quality. Optimal temperature is 68-77°F day, 59-68°F night
- Gladstones, 1992. Mean temp of 64-70°F during final month of ripening. Biologically Effective days
- Butler, 2004. Quality ripening days (GDD base 50 <22) veraison to harvest (Ave daily temp <72)
- Happ, 2004. Daily heat load (>22°C) during last 28 days
Rainfall During Ripening

Rainfall between veraison and harvest almost always leads to a reduction in fruit quality

- Occurrence of bunch/fruit rots
  Vignoles, Seyval, etc are very prone to bunch rots

- Dilution of sugar, acid, flavors
Optimum conditions
Temperature 68-77 day
59-68 night
Mthly Ave 64-70
Daily Ave <72
Minimal rainfall.

Sept is the best month for varieties to ripen in the Louisville area.
Summary of Matching Varieties to Climate

• Choose varieties that:
  – have adequate cold hardiness
  – ripen during the appropriate time
  – can tolerate some rainfall during ripening
# Viticultural Regions of Kentucky

## Table 1. Macroclimatic regions for viticulture in Kentucky based on climate data, 1974-2005.

<table>
<thead>
<tr>
<th>Feature</th>
<th>Region I</th>
<th>Region II</th>
<th>Region III</th>
<th>Region IV</th>
<th>Region V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occurrence of -15°F: percent of time</td>
<td>Hardly at all</td>
<td>Rarely</td>
<td>Frequently</td>
<td>Very frequently</td>
<td>Extremely frequently</td>
</tr>
<tr>
<td>Winter severity index: January mean temperature</td>
<td>Mildly cold (23°F to 32°F)</td>
<td>Cold (14°F to 23°F)</td>
<td>Very cold (5°F to 14°F)</td>
<td>Extremely cold (&lt;5°F)</td>
<td>Extremely cold (&lt;5°F)</td>
</tr>
<tr>
<td>Spring frost index (SPI): difference between average mean and average minimum for April</td>
<td>Very low risk</td>
<td>Low risk</td>
<td>Moderate risk</td>
<td>Moderate risk</td>
<td>High risk</td>
</tr>
<tr>
<td>Growing degree days: 50°F base temperature from 1 April through 30 October</td>
<td>3000-4000</td>
<td>3000-4000</td>
<td>3500-4000</td>
<td>3500-4000</td>
<td>&gt;4000</td>
</tr>
<tr>
<td>Frost free days: between last spring frost occurrence at 32°F and first fall frost occurrence at 32°F</td>
<td>&gt;181</td>
<td>&gt;181</td>
<td>171-180</td>
<td>160-170</td>
<td>160-170</td>
</tr>
<tr>
<td>Growing season mean temperature: mean of daily maximum temperatures between 1 April and 30 October</td>
<td>Coolest</td>
<td>Cool</td>
<td>Intermediate</td>
<td>Warm</td>
<td>Hot</td>
</tr>
</tbody>
</table>

Source: UK HO-87
Viticultural Regions of Kentucky

Source: UK HO-87

Figure 1. Viticultural regions of Kentucky.
## Suggested Varieties for Kentucky

**Table 4. Summary of commercial grapes cultivars suitable for planting in Kentucky based on macroclimatic regions.**

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Region I</th>
<th>Region II</th>
<th>Region III</th>
<th>Region IV</th>
<th>Region V</th>
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</thead>
<tbody>
<tr>
<td><strong>Vinifera</strong></td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
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<tr>
<td>Hybrid reds</td>
<td>Chambourcin</td>
<td>Chancellor</td>
<td>Chancellor</td>
<td>DeChaunac</td>
<td>Frontenac</td>
</tr>
<tr>
<td></td>
<td>Chancellor</td>
<td>Corot Noir</td>
<td>DeChaunac</td>
<td>Frontenac</td>
<td>Leon Millot</td>
</tr>
<tr>
<td></td>
<td>Noiret</td>
<td>GR-7M</td>
<td>GR-7M</td>
<td>Leon Millot</td>
<td>Marechal Foch</td>
</tr>
<tr>
<td></td>
<td>St. Croix</td>
<td>St. Vincent</td>
<td>Marechal Foch</td>
<td>Marquette</td>
<td>St. Croix</td>
</tr>
<tr>
<td></td>
<td>St. Vincent</td>
<td></td>
<td>Marquette</td>
<td>St. Croix</td>
<td>St. Vincent</td>
</tr>
<tr>
<td>Hybrid whites</td>
<td>Cayuga white</td>
<td>Cayuga white</td>
<td>Frontenac gris</td>
<td>Frontenac gris</td>
<td>Edelweiss</td>
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<tr>
<td></td>
<td>Chardonnier</td>
<td>Frontenac gris</td>
<td>LaCrescent</td>
<td>LaCrescent</td>
<td>Frontenac gris</td>
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<tr>
<td></td>
<td>Seyval blanc</td>
<td>Seyval blanc</td>
<td>LaCrosse</td>
<td>LaCrosse</td>
<td>Seyval blanc</td>
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<tr>
<td></td>
<td>Traminiette</td>
<td>Valvin Muscat</td>
<td>Vignoles</td>
<td>Vignoles</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Valvin Muscat</td>
<td>Vidal blanc</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Vignoles</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>American reds</td>
<td>Alden</td>
<td>Alden</td>
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</tr>
<tr>
<td></td>
<td>Catawba</td>
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<tr>
<td></td>
<td>Delaware</td>
<td>Delaware</td>
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<td>Delaware</td>
<td>Delaware</td>
</tr>
<tr>
<td></td>
<td>Norton</td>
<td>Fredonia</td>
<td>Fredonia</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>American whites</td>
<td>Niagara</td>
<td>Niagara</td>
<td>Niagara</td>
<td>Niagara</td>
<td>Niagara</td>
</tr>
</tbody>
</table>

*Source: UK HO-88*
## Wine Grape Acreage in Kentucky, 2008

<table>
<thead>
<tr>
<th>Variety</th>
<th>Acreage</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vidal</td>
<td>53</td>
<td>1</td>
</tr>
<tr>
<td>Cabernet Sauvignon</td>
<td>47</td>
<td>2</td>
</tr>
<tr>
<td>Chambourcin</td>
<td>47</td>
<td>3</td>
</tr>
<tr>
<td>Norton</td>
<td>43</td>
<td>4</td>
</tr>
<tr>
<td>Cabernet Franc</td>
<td>36</td>
<td>5</td>
</tr>
<tr>
<td>Traminette</td>
<td>31</td>
<td>6</td>
</tr>
<tr>
<td>Chardonnay</td>
<td>21</td>
<td>7</td>
</tr>
<tr>
<td>Riesling</td>
<td>19</td>
<td>8</td>
</tr>
<tr>
<td>Chardonel</td>
<td>15</td>
<td>9</td>
</tr>
<tr>
<td>Seyval</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td>Syrah</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>Cayuga White</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>Foch</td>
<td>10</td>
<td>13</td>
</tr>
<tr>
<td>Vignoles</td>
<td>9</td>
<td>14</td>
</tr>
</tbody>
</table>
Kentucky Grape Trends

- Late ripening hybrids make most sense
  - Vidal, Chambourcin, Norton, Traminette
- About 50% vinifera is risky
- Little “new” varieties
  - Noiret, Valvin muscat, Marquette etc.
- Suggest grower coordinated trials
  - Share experiences with new varieties
Summary

• Match best varieties to best sites

• Strive for premium quality
  – From all varieties....