Matching Grape Varieties to Sites
Are hybrid varieties right for Oklahoma?

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Wine Grape Team

2014 Oklahoma Grape Growers Workshop
2006 survey of grape varieties in Oklahoma:

- Vinifera: 80%
- Hybrids: 15%
- American: 7%
- Muscadines: 1%
Profiles and Challenges…continued…

- V. vinifera cultivars are the most widely grown in Oklahoma…; however, observation and research has shown most European cultivars to be highly susceptible to cold damage.

- More research needs to be conducted to elicit where European cultivars will do best in Oklahoma.

- French-American hybrids are good alternatives due to their better cold tolerance, but have not been embraced by Oklahoma grape growers... Reasons for this bias likely include hybrid cultivars being perceived as lower quality than European cultivars, lack of knowledge of available hybrid cultivars, personal preference, and misinformation.
Profiles and Challenges…continued…

• The unpredictable continental climate of Oklahoma is one of the foremost obstacles for potential grape growers.
• It is essential that appropriate site selection be done prior to planting.
• Many locations in Oklahoma are unsuitable for most grapes, including hybrids and American grapes.
• Growing grapes in Oklahoma is a risky endeavor and minimization of potential loss by consideration of cultivar and environmental interactions is paramount to ensure long-term success.
• There are areas where some European cultivars may succeed.
• Many hybrid and American grapes are better suited for most areas of Oklahoma than European grapes.
Outline

• History of interspecific hybrids
• Modern US hybrids
• Matching varieties to site climate
• My suggestions for Oklahoma
• Performance of hybrids in the Midwest
History of Grape Rootstock and Interspecific Hybrid Development

Phylloxera crisis in Europe (phyllo= leaf, xero=drying)
   Root louse (*Dactylosphaira vitifoliae*) native to North America
   1862 Introduction into southern France
   Spread northward ~15 miles per year
   By 1890, many grapes had been killed

American species were recognized as resistant to phylloxera
   Breeding to develop new hybrids initiated
   Grafting proposed as solution (Laliman, Bazille)
   Thousands of cuttings imported (Jaeger, Munson, others)
History of Grape Rootstock and Interspecific Hybrid Development

Phylloxera crisis in Europe (continued)

Downy mildew fungus introduced with cuttings (*Plasmopora viticola*)
  First fungicide (Bordeaux mixture) discovered (Alexis Millardet)

Nurseries began hybridizing to introduce new types (1880-1930)
  Baco, Vidal, Kuhlman, Seibel, Villard, Seyve
  Some types developed to be “hybrid direct producers”
  Other types developed to be “rootstocks”
Hybrid Direct Producers

Selections from:

- **Kuhlman**
  - Marechal Foch, Leon Millot
- **Vidal**
  - Vidal blanc
- **Seyve Villard**
  - Seyval blanc, Villard blanc, Villard noir
- **Ravat**
  - Vignoles
- **Joannes Seyve**
  - Chambourcin
- **Seibel**
  - De Chaunac, Aurore, Rougeon, Chancellor, Chelois,
Phylloxera Resistant Rootstocks

Selections of, or hybrids between:

- **V. riparia**  
  Riparia Gloire de Montpelier

- **V. rupestris**  
  Rupestris Saint George (du Lot)

- **V. riparia x V. rupestris**  
  3309 Couderc  
  101-14 Millardet et de Grasset

- **V. Berlandieri x V. riparia**  
  SO4  
  5BB Kober  
  5C Teleki

- **V. Berlanieri x V. rupestris**  
  110 Richter  
  140 Ruggeri

Others such as **V. candicans, V. cinerea, etc.**
Rootstocks and HDPs

Rootstocks: Used worldwide (almost everywhere) to protect *V. vinifera*
- Phylloxera resistance
- Lime tolerance
- Increased vigor
- Drought tolerance
- Nematode resistance
- Resistance to soilborne diseases

Hybrid Direct Producers
- Imported into the US in 1950-60s
- Have become the basis for wine production in the East
- Mostly banned on premier viticulture sites in France, Germany
Hybrids in the US

First introduced by Phillip Wagner (Boordy Vineyards) in Maryland
Used widely in New York and East in 1960s and 1970s
Hybrids in the US

Today hybrids are commonly used for wine production in the East and Midwest (where vinifera production is not practical)

Many of the original “French Hybrids” are still widely grown Chambourcin, Vidal, Seyval, Vignoles

New hybrids (developed in the US) are becoming increasingly important and are the basis for expansion into very cold areas of the upper Midwest
US breeding efforts

New York  (Dr. Bruce Reisch since 1980, others prior; George Remaly, John Einset. Program began in 1888)
   Aromella, Arandell, Corot noir, Noiret, Valvin Muscat, Traminette, Chardonel, Melody, Cayuga White

Minnesota  (Dr. Jim Luby and Mr. Peter Hemstad)
   Frontenac, Frontenac gris, La Crescent, Marquette

Elmer Swenson  (private breeding efforts, Osceola, WI)
   Edelweiss, La Crosse, St. Pepin, St. Croix
      (Brianna, Petite Amie, Prairie Star, Petite Pearl by Ed Swanson)

Arkansas  (Dr. John Clark since 1996, James N. Moore, began in 1964)
   Seedless table grapes: Hope, Faith, Joy, Gratitude, Neptune, Jupiter, Mars, Saturn, Venus, Reliance
Websites of Interest

Cold Climate Cultivars. Lisa Smiley, et al.
http://viticulture.hort.iastate.edu/cultivars/cultivars.html

Cornell University Grape Breeding and Genetics Program
http://www.nysaes.cornell.edu/hort/faculty/reisch/grapeinfo.html

University of Minnesota
http://www.grapes.umn.edu/

Elmer Swenson varieties
http://www.winemanager.com/slarsen/Grapebreeders_ES_parent.htm

Arkansas Table Grapes
http://www.uaex.edu/yard-garden/fruits-nuts/grapes.aspx
Advantages of Hybrids

Cold hardiness

- Tolerate minimum winter temperatures of -15°F or colder

Disease resistance (tolerance)

- Especially to fungal pathogens endemic in Eastern US
- Powdery mildew
- Downy mildew
- Anthracnose
- Phomopsis
- Black rot
- Bunch rots (Botrytis and others)

Wine Quality

- Many awards at national and international competitions
Hybrid wines?

• Very popular with consumers (can be sweet and fruity, or dry and complex)
  – Concord wine is one of the top sellers in the Midwest
  – Vignoles wins national awards regularly

• Relatively easy to grow, so less expensive than vinifera, can be produced locally, sustainably.

“The question is one of marketing, and nothing else. Most wineries make their money from the walk in trade. And each and every walker in is amenable to hand selling...it doesn’t matter what name is on the label, so long as there is quality in the bottle.”
From ‘The Grape Grower” by Lon Rombough
Local Foods Link

- Rubaiyat, Sunset and Cimmaron from OSU grape breeding program
Matching Varieties to Site
the key to sustainable production

Key characteristics
- Wine quality and style
  - Winery demand, consumer preference
- Cold hardiness
- Frost risk (date of bud burst)
- Season: Date of ripening
- Disease resistance/susceptibility
- Vigor/yield potential
- Ease of production
Zone 4: -20 to -30°F
Zone 5: -10 to -20°F
Zone 6: 0 to -10°F
Zone 7: 10 to 0°F
Fluctuating temperatures

- Cold hardiness is compromised when temperatures fluctuate in late winter and early spring.
  - Deacclimation and subsequent damage
- Need varieties that do not respond to early warm temperatures
Cold damage
‘Chardonnay’ vs ‘Chardonel’
Chardonel, 2014
Chardonel, 2014
### 2009 Bud Survival at Lafayette after -18°F

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<th>Variety</th>
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Match Cold Hardiness to Climate

- **Very hardy (-20 to -30°F)**
  - Frontenac, La Crescent, Marquette, La Crosse, Edelweiss, St. Croix, Esprit, Brianna, Petit Amie, etc.

- **Hardy (-15 to -20°F)**
  - Concord, Steuben, Foch, Noiret, Corot noir, Vignoles, Chancellor, Norton, Traminette

- **Moderately hardy (-10 to -15°F)**
  - Seyval, Chardonel, Cayuga white

- **Slightly hardy (-5 to -10°F)**
  - Chambourcin, Vidal

- **Tender (0°F to -5°F)**
  - Vinifera
Frost Risks
### Relative Date of Budbreak

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<th>Early</th>
<th>Foch, Marquette, La Crescent, Chancellor, Edelweiss, Brianna</th>
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<th>Mid</th>
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<td>(Mid April)</td>
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This is a map of the average date of the last freeze observed in spring.
Analysis of the April 2007 Freeze Event in Oklahoma

Eric T. Stafne
Oklahoma State University

Table 1. Last recorded frost (< 32 °F) and freeze (< 28 °F) date for 11 locations within Oklahoma 1994-2007.

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All numbers in above table are day of year, where Jan. 1 = 1 and Dec. 31 = 365.

Jan+Feb+Mar = 90 days
### Table 6. Budbreak date from 2003-2007 for grape cultivars grown at the OSU Cimarron Valley Experiment Station, Perkins, OK with average budbreak date, percentage of years coinciding with frost, and percentage of years coinciding with freeze.

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<th>2004</th>
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<th>Avg.</th>
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<td>Rubaiyat</td>
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<td>Cimarron</td>
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<td>40</td>
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<tr>
<td>Villard Blanc</td>
<td>94</td>
<td>96</td>
<td>98</td>
<td>93</td>
<td>87</td>
<td>94</td>
<td>60</td>
<td>40</td>
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</tbody>
</table>

All numbers in above table are day of year, where Jan. 1 = 1 and Dec. 31 = 365.
### Table 6. Effect of Variety on Average Budbreak Date - Replicated Wine Grape Variety Trial – Perkins, OK, 2003-2006

<table>
<thead>
<tr>
<th></th>
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<tr>
<td>Chardonnay¹</td>
<td>27-Mar</td>
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<td>27-Mar</td>
<td>1-Apr</td>
<td>17-Mar</td>
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<td>Sangiovese²</td>
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<td>7-Apr</td>
<td>30-Mar</td>
<td>3-Apr</td>
<td>31-Mar</td>
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<tr>
<td>Viognier¹</td>
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<td>7-Apr</td>
<td>30-Mar</td>
<td>5-Apr</td>
<td>7-Apr</td>
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<td>Cabernet Franc²</td>
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<td>7-Apr</td>
<td>2-Apr</td>
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<td>3-Apr</td>
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<td>Merlot²</td>
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<td>Malbec²</td>
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<td>6-Apr</td>
<td>7-Apr</td>
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<td>Pinot Gris²</td>
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<td>3-Apr</td>
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<td>Petit Verdot²</td>
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<td>7-Apr</td>
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<td>8-Apr</td>
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<td>Ruby Cabernet²</td>
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<td>3-Apr</td>
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<td>12-Apr</td>
<td>12-Apr</td>
<td>11-Apr</td>
<td>7-Apr</td>
</tr>
</tbody>
</table>
Table 2. Spring freeze injury ratings on primary shoots for observational cultivars at the OSU Cimarron Valley Experiment Station, Perkins, OK, done in April, 2007.

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Average Damage Rating</th>
</tr>
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<tbody>
<tr>
<td>Noiret</td>
<td>10.00</td>
</tr>
<tr>
<td>Valvin Muscat</td>
<td>10.00</td>
</tr>
<tr>
<td>Chardonnay</td>
<td>9.83</td>
</tr>
<tr>
<td>Traminette</td>
<td>9.67</td>
</tr>
<tr>
<td>Chardonel</td>
<td>9.67</td>
</tr>
<tr>
<td>Sauvignon Blanc</td>
<td>9.63</td>
</tr>
<tr>
<td>Cabernet Franc</td>
<td>9.39</td>
</tr>
<tr>
<td>Riesling</td>
<td>9.25</td>
</tr>
<tr>
<td>Gamay</td>
<td>9.25</td>
</tr>
<tr>
<td>Corot Noir</td>
<td>9.25</td>
</tr>
<tr>
<td>Zinfandel</td>
<td>9.20</td>
</tr>
<tr>
<td>Chambourcin</td>
<td>8.93</td>
</tr>
<tr>
<td>Montepulciano</td>
<td>8.67</td>
</tr>
<tr>
<td>Rubaiyat</td>
<td>7.75</td>
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<tr>
<td>Villard Blanc</td>
<td>7.75</td>
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<tr>
<td>Sunbelt</td>
<td>6.00</td>
</tr>
<tr>
<td>Vignoles</td>
<td>5.39</td>
</tr>
<tr>
<td>Frontenac</td>
<td>4.50</td>
</tr>
<tr>
<td>Cynthiana</td>
<td>4.40</td>
</tr>
<tr>
<td>Cimarron</td>
<td>1.00</td>
</tr>
</tbody>
</table>

1 = 10% damaged shoots

... 10 = 100% damaged shoots
Marquette, Lafayette
March 27, 2012
Marquette, Lafayette
April 12, 2012
Coping with the Frost

Delayed or double pruning was the key to having reasonable yields. These Concord vines produced 20 lb each in 2012.
Double Pruning

1. Select canes to be spurs, remove others

1. Cut those canes back to 10-15 nodes (instead of normal length of 3-4 nodes)

1. After risk of frost, shorten canes to 3-4 node spurs

If frost damage occurs, delay pruning until fruitfulness of surviving shoots can be determined and appropriate shoots retained.

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Apical dominance and additional buds

- Apical dominance *may* help avoid frost damage, but if not…
- After a frost event, having additional buds provides numerous shoots to produce a “balanced” crop.
Apical Dominance

Buds at distal ends of canes tend to develop before those at base, delaying development (of the basal nodes) by up to two weeks in some years.

The more developed the bud is, more cold sensitive it is.
Produced 22 lb/vine in 2012
Produced 20 lb/vine in 2012
Produced 21 lb/vine in 2012
Foch, May 3, 2012

Produced 5 lb/vine in 2012
La Crescent, May 3, 2012

Produced ~3 lb/vine in 2012
Marquette, May 3, 2012

Produced 0.0 lb/vine in 2012
Double Pruning

• Helps delay budbreak of basal nodes
  – Avoid frost damage
• Retains sufficient nodes to assure good yield potential from secondary and basal shoots
• Good Risk Management Practice
Match Ripening Date to Climate

- **Frost Free Days**
  - Indiana season length varies from 140 to 210+ days (28°F)
  - Oklahoma season length varies from 165 to 230 days (32°F)
  - Mid to late ripening varieties need 160-180 days
  - Early varieties need less

- **Heat units** (growing degree days base 50°F)
  - Indiana varies between 3,800 and 2,500
  - Oklahoma varies between 5,300 and 4,200
  - Cultivars vary season of ripening, need for heat

- **Precipitation**
  - Oklahoma averages over 50 inches southeast, 20 northwest
Theories on Heat Affects

- Amerine & Winkler, 1944. California Zones I-V based on Growing Degree Days 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 (daily mean 64-73)
- 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°F) veraison to harvest (daily mean below 72F)
- Happ, 2004. Daily heat load (>22°C) during last 28 days (warm days)
## Growing Degree Days (base 50) April-Oct

<table>
<thead>
<tr>
<th>City</th>
<th>30 yr Ave</th>
<th>City</th>
<th>30 yr Ave</th>
<th>City</th>
<th>30 yr Ave</th>
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</thead>
<tbody>
<tr>
<td>West</td>
<td></td>
<td>Central</td>
<td></td>
<td>East</td>
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<tr>
<td>Gage</td>
<td>4186</td>
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<td>Woodward</td>
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<td>4480</td>
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<td>Weatherford</td>
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<td>Oklahoma City</td>
<td>4933</td>
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<td>Ardmore</td>
<td>5326</td>
<td>McAlester</td>
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<td>Lawton</td>
<td>5188</td>
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<td>Poteau</td>
<td>4705</td>
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<tr>
<td>Altus</td>
<td>5324</td>
<td></td>
<td></td>
<td>Idabel</td>
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</table>
Temperature During Ripening-July

Average Air Temperature

July 1999-2013

Created 10:41:45 AM September 8, 2014 CDT. © Copyright 2014
Temperature During Ripening-August
Bottom Line

Fruit quality is best when ripened under **warm days** and **cool nights**

- Early ripening grapes grown in a long season, hot area (excess heat)
  - Low sugars, low acid, high pH, poor color, poor flavor & aroma
- Late ripening grapes grown in a short season, cool area (insufficient heat)
  - Low sugar, high acid, low pH, unripe herbaceous flavors
Relative Date of Ripening

<table>
<thead>
<tr>
<th>Relative Date of Ripening</th>
<th>Early</th>
<th>Mid</th>
<th>Late</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Harvest in mid Aug in South)</td>
<td>Foch, Marquette, St. Croix, Edelweiss, Brianna</td>
<td>Chardonel, Cayuga White, Frontenac, La Crescent, Seyval, La Crosse, Vignoles, De Chaunac, Traminette, Noiret, Corot noir, etc.</td>
<td>Chambourcin, Norton, Vidal, Villard blanc, Cabernet Sauvignon, Cabernet Franc, Petit Verdot, Malbec, Tannat, Riesling</td>
</tr>
</tbody>
</table>
Rainfall During Ripening

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

- Occurrence of bunch/fruit rots
  Vignoles, Seyval, Riesling, etc are very prone to bunch rots
  Some are more tolerant, e.g. Vidal, Noiret, Norton
- Dilution of sugar, acid, flavors

Harvest decisions are too often influenced by rainfall and resulting poor fruit condition, not optimum fruit quality
Average Precipitation During Ripening

Total Rainfall with Estimates

July 1999-2013

Created 10:47:02 AM September 8, 2014 CDT. © Copyright 2014
Average Precipitation During Ripening
Average Precipitation During Ripening

Total Rainfall with Estimates
Disease resistance/susceptibility

- Fungal pathogens can be a problem
  - Black rot, Phomopsis cane & leaf spot, downy mildew, powdery mildew, anthracnose, Botrytis
- Varieties vary widely in susceptibility
  - Table 1 in the Midwest Small Fruit and Grape Spray Guide
- Fungicide applications are necessary
  - Varietal susceptibility to specific diseases
  - Choice of fungicide
  - Timing of application
  - Thorough coverage
Black Rot
Sour rot (complex mix of organisms)
Phomopsis cane and Leaf spot
Vine decline
2,4-D sensitivity
## Variety Sensitivity to 2,4-D

<table>
<thead>
<tr>
<th>Rating</th>
<th>Variety</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slight</td>
<td>Cayuga white, DeChaunac, Frontenac, Steuben, Ventura, Vignoles, Vidal</td>
</tr>
<tr>
<td>Moderate</td>
<td>Chambourcin, Chancellor, Chardonel, Traminette, Melody</td>
</tr>
<tr>
<td>Severe</td>
<td>Aromella, Concord, Foch, La Crescent, La Crosse, Marquette, Norton, Valvin muscat</td>
</tr>
</tbody>
</table>

Ratings based on multiple years observation of naturally occurring “volatile drift” in research trials in Lafayette, IN
Dicamba Sensitivity
## Variety Sensitivity to Dicamba

<table>
<thead>
<tr>
<th>Rating</th>
<th>Variety</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slight</td>
<td>Brianna, Cayuga White, Corot noir, DeChaunac, Frontenac gris, Noiret, NY 76.0848.03, St. Croix, Vignoles, Vidal</td>
</tr>
<tr>
<td>Moderate</td>
<td>Chardonel, LaCrosse, LaCrescent, Frontenac, St. Vincent, Traminette, Vincent</td>
</tr>
<tr>
<td>Severe</td>
<td>Foch, GR-7, Marquette, Melody, NY 76.844.24, Seyval, Steuben, Ventura</td>
</tr>
</tbody>
</table>

Ratings based on response to early application (2-4 inch shoots) of 1/100\(^{th}\) standard field rate.
Damage in this trial was far less than experienced in 2004 or 2007 from naturally occurring “volatile drift”
Response not necessarily correlated with sensitivity to 2,4-D.
Desired characteristics for Oklahoma varieties

- Late budding to avoid frost
- Slow to deacclimate (little response to fluctuating temperatures)
- Late ripening to match best ripening temperatures
- Heat tolerant (high acid, low pH)
### Table 2D. Average Effect of Cultivar on Fruit Yield and Quality From Own Rooted Grape Vines, Perkins, OK 2004-2006

<table>
<thead>
<tr>
<th>Variety</th>
<th>Harvest Date</th>
<th>Wt/acre (lbs) 453 plt/a</th>
<th>Avg Wt. of 10 Berries (g)</th>
<th>Avg Cluster wt (g)</th>
<th>Avg. pH</th>
<th>Titratable Acidity (% Tartaric Acid)</th>
<th>°Brix Avg S.S.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chambourcin</td>
<td>21-Aug</td>
<td>14,490</td>
<td>20.3</td>
<td>175.5</td>
<td>3.85</td>
<td>0.47</td>
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<td>Merlot</td>
<td>24-Aug</td>
<td>13,379</td>
<td>13.5</td>
<td>133.3</td>
<td>4.19</td>
<td>0.29</td>
<td>23.0</td>
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<tr>
<td>Cabernet Sauvignon</td>
<td>1-Sep</td>
<td>8,996</td>
<td>13.0</td>
<td>95.3</td>
<td>3.99</td>
<td>0.34</td>
<td>21.9</td>
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<tr>
<td>Viognier</td>
<td>9-Aug</td>
<td>8,599</td>
<td>13.3</td>
<td>129.6</td>
<td>3.72</td>
<td>0.51</td>
<td>18.4</td>
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<td>Sangiovese</td>
<td>25-Aug</td>
<td>7,890</td>
<td>20.3</td>
<td>176.5</td>
<td>3.72</td>
<td>0.42</td>
<td>19.9</td>
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<td>Shiraz</td>
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<td>3.85</td>
<td>0.39</td>
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<td>31-Aug</td>
<td>7,366</td>
<td>13.4</td>
<td>83.2</td>
<td>4.11</td>
<td>0.31</td>
<td>22.3</td>
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<td>Pinot Gris</td>
<td>6-Aug</td>
<td>6,599</td>
<td>11.9</td>
<td>79.1</td>
<td>3.86</td>
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<td>Cabernet Franc</td>
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<td>6,068</td>
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<td>5,587</td>
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<td>0.74</td>
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<td>Chardonnay</td>
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<td>5,331</td>
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<td>Petit Verdot</td>
<td>28-Aug</td>
<td>2,775</td>
<td>9.5</td>
<td>66.3</td>
<td>4.18</td>
<td>0.35</td>
<td>22.5</td>
</tr>
</tbody>
</table>

Variety Type: 1-Vinifera, white; 2-Vinifera, red; 3-American, red; 5-Hybrid, red; Own rooted planted 2002; High cordon trellis; vine spacing 8x12
Table 5E. Average Yield and Quality of Selected Varieties/lines, Observational Grape Variety Trial, Perkins, OK 2003-2006

<table>
<thead>
<tr>
<th>Variety</th>
<th>Harvest Date</th>
<th>Wt/acre (lbs) 453 plt/a</th>
<th>Avg Wt of 10 Berries (g)</th>
<th>Avg Cluster wt (g)</th>
<th>Avg. pH</th>
<th>Titratable Acidity (% Tartaric Acid)</th>
<th>°Brix Avg S.S.</th>
</tr>
</thead>
<tbody>
<tr>
<td>H4 - #12-375&lt;sup&gt;4&lt;/sup&gt;</td>
<td>20-Aug</td>
<td>16,912</td>
<td>24.0</td>
<td>169.3</td>
<td>3.96</td>
<td>0.57</td>
<td>22.5</td>
</tr>
<tr>
<td>Zinfandel&lt;sup&gt;2&lt;/sup&gt;</td>
<td>17-Aug</td>
<td>11,399</td>
<td>24.4</td>
<td>229.0</td>
<td>3.57</td>
<td>0.55</td>
<td>16.5</td>
</tr>
<tr>
<td>*Frontenac&lt;sup&gt;5&lt;/sup&gt;</td>
<td>22-Jul</td>
<td>8,662</td>
<td>11.8</td>
<td>110.2</td>
<td>3.36</td>
<td>1.10</td>
<td>22.7</td>
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<tr>
<td>Sauvignon Blanc&lt;sup&gt;1&lt;/sup&gt;</td>
<td>4-Aug</td>
<td>7,954</td>
<td>15.0</td>
<td>126.5</td>
<td>3.79</td>
<td>0.56</td>
<td>19.3</td>
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<tr>
<td>Chardonnay&lt;sup&gt;6&lt;/sup&gt;</td>
<td>31-Jul</td>
<td>7,783</td>
<td>18.2</td>
<td>199.5</td>
<td>3.45</td>
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<td>7,531</td>
<td>19.2</td>
<td>169.3</td>
<td>3.83</td>
<td>0.56</td>
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<td>159.0</td>
<td>3.85</td>
<td>0.58</td>
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<tr>
<td>*White Reisling&lt;sup&gt;1&lt;/sup&gt;</td>
<td>25-Aug</td>
<td>6,200</td>
<td>13.5</td>
<td>92.4</td>
<td>3.65</td>
<td>0.52</td>
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<td>6,103</td>
<td>44.2</td>
<td>99.6</td>
<td>3.96</td>
<td>0.49</td>
<td>18.4</td>
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<tr>
<td>*Rubiyat&lt;sup&gt;3&lt;/sup&gt;</td>
<td>20-Aug</td>
<td>6,090</td>
<td>18.8</td>
<td>93.0</td>
<td>4.10</td>
<td>0.46</td>
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<td>Sunbelt&lt;sup&gt;3&lt;/sup&gt;</td>
<td>3-Sep</td>
<td>5,106</td>
<td>41.2</td>
<td>98.3</td>
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<td>5,094</td>
<td>38.9</td>
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<td>0.56</td>
<td>18.8</td>
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<td>4,884</td>
<td>20.1</td>
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<td>4.09</td>
<td>0.39</td>
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<td>12.6</td>
<td>95.5</td>
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<td>3,893</td>
<td>22.1</td>
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<td>4.03</td>
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<td>17.6</td>
<td>89.0</td>
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<td>16.9</td>
<td>59.8</td>
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<td>0.67</td>
<td>18.8</td>
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<tr>
<td>Traminette&lt;sup&gt;6&lt;/sup&gt;</td>
<td>1-Aug</td>
<td>2,671</td>
<td>15.3</td>
<td>98.4</td>
<td>3.63</td>
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<td>20.1</td>
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<td>16.0</td>
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<td>13.7</td>
<td>62.3</td>
<td>3.50</td>
<td>0.42</td>
<td>21.0</td>
</tr>
</tbody>
</table>

Variety Type - 1-Vinifera, white; 2-Vinifera, red; 3-American, red; 4-American, white; 5- Hybrid, red; 8-Hybrid, white
Planted in 2001, * planted in 2002; vine spacing 8x12; High cordon trellis; Own rooted plants,
Hybrids for Oklahoma

• Late budding to avoid frost
  – No Marquette, La Crescent, Foch, Chancellor, etc.
  – Chambourcin, Vignoles, Traminette

• Late ripening to match best ripening temperature
  – No Marquette, Foch, Brianna, etc.
  – Chambourcin, Norton, Noiret, Vidal, Ventura
  – Cabs, Petite Verdot, Malbec, Tannat
  – DVR varieties?
Interspecific wine grapes for Oklahoma?
My suggestions…

<table>
<thead>
<tr>
<th>Chambourcin</th>
<th>Traminette</th>
</tr>
</thead>
<tbody>
<tr>
<td>Norton</td>
<td>Chardonel</td>
</tr>
<tr>
<td>Frontenac</td>
<td>Cayuga White</td>
</tr>
<tr>
<td>Corot noir</td>
<td>Seyval</td>
</tr>
<tr>
<td>Noiret</td>
<td>Vidal</td>
</tr>
<tr>
<td>Others?…</td>
<td>Vignoles</td>
</tr>
<tr>
<td></td>
<td>Valvin Muscat</td>
</tr>
<tr>
<td></td>
<td>Others…</td>
</tr>
</tbody>
</table>
Varieties to avoid

- Minnesota varieties:
  - Marquette: early bud break and maturity
  - La Crescent: early bud break

- Foch and Leon Millot: early bud break and maturity
Red Wine Grapes for Oklahoma

• Chambourcin
• Norton
• Frontenac
• Corot noir
• Noiret
• Others?…

**Strengths**
- Excellent wine quality, especially if fully ripe
- Late bud break, ripening
- Large, loose clusters seldom rot

**Weaknesses**
- Only moderately cold hardy
- Needs long growing season
- Low vigor on heavy soils
- Poor nutrition, sensitive to air pollution
- May need crop control
- Black rot susceptible
Red Wine Grapes for Oklahoma

- Chambourcin
- Norton
- Frontenac
- Corot noir
- Noiret
- Others?

**Strengths**
- Good wine quality
- Cold hardy
- Late bud break, ripening
- Very disease resistant

**Weaknesses**
- Needs long growing season
- Low yields, high vigor
- High acid, high pH
- Drought susceptible
Red Wine Grapes for Oklahoma

- Chambourcin
- Norton
- Frontenac
- Corot noir
- Noiret
- Others?

**Strengths**
- Good wine quality
- Very cold hardy
- Mid-season ripening
- Moderately disease resistant
- High sugar

**Weaknesses**
- Very high acid, long hang time may not help
- Bird damage
- Very susceptible to leaf phylloxera
- Poor fruit set
Red Wine Grapes for Oklahoma

• Chambourcin
• Norton
• Frontenac
• Corot noir
• Noiret
• Others?...

Strengths
• Good wine quality
• Moderately cold hardy
• Mid-season ripening
• Loose clusters, tough skin, few rots (except Phomopsis)

Weaknesses
• Susceptible to downy mildew and Phomopsis
• Can be very vigorous, vegetative
• Tendency to produce many “summer” clusters… 2-4 sets
Red Wine Grapes for Oklahoma

- Chambourcin
- Norton
- Frontenac
- Corot noir
- Noiret
- Others?

**Strengths**
- Good wine quality
- Cold hardy
- Mid-late season ripening
- Loose clusters, tough skin, few rots

**Weaknesses**
- Can be very vigorous
- Moderate to low yields
Red Wine Grapes for Oklahoma

- Chambourcin
- Norton
- Frontenac
- Corot noir
- Noiriet
- Others?

DRV varieties:
- Arandell
- Chancellor
- Petite Pearl
- Crimson Cabernet, Cabernet Diane, Zinthiana
White Wine Grapes for Oklahoma

- Traminette
- Chardonel
- Cayuga White
- Seyval
- Vidal
- Vignoles
- Others…
White Wine Grapes for Oklahoma

- Traminette
- Chardonel
- Cayuga White
- Seyval
- Vidal
- Vignoles
- Others...

**Strengths**
- Excellent wine quality
- Moderately cold hardy
- Moderate disease resistance
- Not overly productive
- Late ripening

**Weaknesses**
- Excess vigor can lead to poor fruit quality.... shading
- Potential cold damage to trunks in young vines
- Susceptible to Phomopsis-fruit rot issues
- Poor fruitfulness
White Wine Grapes for Oklahoma

- Traminette
- Chardonel
- Cayuga White
- Seyval
- Vidal
- Vignoles
- Others...

**Strengths**
- Good wine quality
- Not overly productive (e.g. Seyval)
- Moderate disease resistance
- Mid to late season ripening

**Weaknesses**
- Only moderately cold hardy
- Moderate disease resistance... susceptible to Phomopsis
- Less prone to bunch rots than Seyval, but still a problem
White Wine Grapes for Oklahoma

• Traminette
• Chardonnel
• Cayuga White
• Seyval
• Vidal
• Vignoles
• Others...

Strengths
• Good wine quality
• Good disease resistance
• Large, loose clusters, large berries, not prone to bunch rots
• Mid-season ripening
• High yield potential

Weaknesses
• Only moderately cold hardy, especially canes and cordons
• Susceptible to Phomopsis on cluster stems
• Very vigorous, large upright shoots can suffer wind damage
White Wine Grapes for Oklahoma

- Traminette
- Chardonel
- Cayuga White
- Seyval
- Vidal
- Vignoles
- Others...

Strengths
- Good wine quality
- Moderately cold hardy
- Mid-season ripening

Weaknesses
- Excessively productive (non-count shoots, large clusters)
- Susceptible to bunch rots
- Low vigor, especially on heavy soils or replant sites
White Wine Grapes for Oklahoma

- Traminette
- Chardonel
- Cayuga White
- Seyval
- Vidal
- Vignoles
- Others...

**Strengths**
- Good wine quality
- Loose clusters, tough skin, resist fruit rots
- Late ripening

**Weaknesses**
- Only moderately cold hardy
- Large clusters may need thinning
- Susceptible to anthracnose
White Wine Grapes for Oklahoma

- Traminette
- Chardonel
- Cayuga White
- Seyval
- Vidal
- Vignoles
- Others...

**Strengths**
- Excellent wine quality, especially as late harvest
- Moderately cold hardy
- Mid-season ripening*
- Good acidity in cool areas for late harvest

**Weaknesses**
- Very tight clusters, fruit rots common, especially Botrytis
- Fruit quality concerns in southern areas (rots, early harvest*)
- Low yields
White Wine Grapes for Oklahoma

- Traminette
- Chardonel
- Cayuga White
- Seyval
- Vidal
- Vignoles
- Aromella (NY 76.0844.24)
- Others...

**Strengths**
- Good wine quality—mild muscat flavor (not as good as Valvin)
- Cold hardy
- Mid-season ripening

**Weaknesses**
- Very sensitive to 2,4-D and dicamba
- Low yielding (4 lb/vine) due to herbicide sensitivity
- Mediocre performance so far
Aromella (NY 76)
White Wine Grapes for Oklahoma

- Traminette
- Chardonel
- Cayuga White
- Seyval
- Vidal
- Vignoles
- Others…
- Melody
- Ventura
- Villard blanc
- Frontenac gris
- Brianna
- Edelweiss
- Diamond
- Golden muscat
- Valvin muscat
- Blanc du Bois
- DVR varieties?
  - Aphrodite, Cabernet Dore’
  - White Norton, White Cynfandel
Bottom Line

• Matching varieties to sites is one of the keys to successful, sustainable production of high quality grapes and wine.
  – Cold hardiness
  – Frost risk
  – Date of ripening
  – Disease susceptibility
  – Wine quality, consumer demand