Cabernet franc: experiences from Bordeaux for the Fingerlake wine industry

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What does Cabernet franc look like?
Cabernet franc plantations in France
Cabernet franc around the world

- France: 40,000 hectares
- Italy: 3,000 hectares
- California: 1,000 hectares
- Chili: 500 hectares
- South Africa: 500 hectares
- Argentina: 500 hectares
- New Zealand: 50 hectares
Some great wines made with a high proportion of Cabernet franc
### Proportion of Cabernet franc in Bordeaux

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Merlot (ha)</td>
<td>44180</td>
<td>61438</td>
<td>69138</td>
<td>69416</td>
</tr>
<tr>
<td>Merlot (%)</td>
<td>52%</td>
<td>58%</td>
<td>62%</td>
<td>65%</td>
</tr>
<tr>
<td>Cabernet-Sauvignon (ha)</td>
<td>24677</td>
<td>29210</td>
<td>28347</td>
<td>24627</td>
</tr>
<tr>
<td>Cabernet-Sauvignon (%)</td>
<td>29%</td>
<td>27%</td>
<td>25%</td>
<td>23%</td>
</tr>
<tr>
<td>Cabernet franc (ha)</td>
<td>13356</td>
<td>14100</td>
<td>13218</td>
<td>11013</td>
</tr>
<tr>
<td>Cabernet franc (%)</td>
<td>16%</td>
<td>13%</td>
<td>12%</td>
<td>10%</td>
</tr>
<tr>
<td>Côt (Malbec) (ha)</td>
<td>2120</td>
<td>1060</td>
<td>974</td>
<td>1077</td>
</tr>
<tr>
<td>Côt (Malbec) (%)</td>
<td>3%</td>
<td>1%</td>
<td>1%</td>
<td>1,0%</td>
</tr>
<tr>
<td>Petit Verdot (ha)</td>
<td>389</td>
<td>479</td>
<td>677</td>
<td></td>
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<tr>
<td>Petit Verdot (%)</td>
<td>0,4%</td>
<td>0,4%</td>
<td>0,6%</td>
<td></td>
</tr>
<tr>
<td>Carmenère (ha)</td>
<td>38</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Carmenère (%)</td>
<td>0,04%</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>Total (ha)</strong></td>
<td><strong>84333</strong></td>
<td><strong>106107</strong></td>
<td><strong>112156</strong></td>
<td><strong>106933</strong></td>
</tr>
<tr>
<td><strong>% of total</strong></td>
<td><strong>77%</strong></td>
<td><strong>86%</strong></td>
<td><strong>89%</strong></td>
<td><strong>88%</strong></td>
</tr>
</tbody>
</table>
Characteristics of Cabernet franc at Cheval Blanc compared to Merlot and Cabernet Sauvignon

Data collected from 1996 - 2003
Bud Break around April 1st

Data 1996 - 2003

Flowering around June 1st

Data 1996 - 2003
Veraison during the first decade of August

Data 1996 - 2003

- Merlot
- Cabernet franc
- Cabernet-Sauvignon

Harvest late September or early October

- Around 50 days after veraison
- One week to ten days after Merlot
- One week to ten days before Cabernet-Sauvignon
Berry weight

Data 1996 - 2003

<table>
<thead>
<tr>
<th>Berry weight (g)</th>
<th>Merlot</th>
<th>Cabernet franc</th>
<th>Cabernet-Sauvignon</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b</td>
<td></td>
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<td></td>
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<tr>
<td>b</td>
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Potential alcohol between:
13 and 13.5 for Merlot
12.5 and 13 for Cabernet franc
11.5 and 12 for Cabernet-Sauvignon

Grape sugar

Data 1996 - 2003

<table>
<thead>
<tr>
<th>Sugar (g/L)</th>
<th>Merlot</th>
<th>Cabernet franc</th>
<th>Cabernet-Sauvignon</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
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</tr>
<tr>
<td>b</td>
<td></td>
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</tr>
<tr>
<td>c</td>
<td></td>
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</table>
Total acidity

Data 1996 - 2003

Total acidity (g tartrate/L)

Merlot

Cabernet-Sauvignon

Malic acid content

Data 1996 - 2003

Malic acid content (g/L)

Merlot

Cabernet franc

Cabernet-Sauvignon

pH

Data 1996 - 2003

pH

Merlot

Cabernet franc

Cabernet-Sauvignon
Anthocyanin content

Data 1996 - 2003

Anthocyanin (g/kg)

- Merlot
- Cabernet franc
- Cabernet-Sauvignon

- a
- b
- b
- 0.80
- 0.85
- 0.90
- 0.95
- 1.00
Clonal variability of Cabernet franc

Data: 2008, private clonal selection
Clonal variability in Cabernet franc

- Clonal variability is high in Cabernet franc
- Obviously, no high quality clones are available
- Some estates carry out their own clonal selection
- This is what Cabernet franc should look like:
  - Loose bunches
  - Small berries
Clonal variability in berry weight
Clonal Variability in yield
Clonal variability in sensitivity to Botrytis

![Bar chart showing clonal variability in sensitivity to Botrytis.](chart.png)
Clonal variability in berry sugar content (expressed in potential alcohol)
Clonal variability in total acidity
Clonal variability in Isobutyl Methoxy Pyrazines (IBMP)
Rating (loose bunches, small berries, no shatter, good taste...)
Selecting a clone: a combination of criteria

- Clone L is very low yielding, sensitive to Botrytis and produces grapes with high IBM content
- Clones K produces big berries with low sugar content
- Clone D obtains high ratings, and produces small berries, with average sugar content and low acidity and is not sensitive to Botrytis
Cabernet franc: a variety that reacts strongly to the soil type
Cheval Blanc has three different soil types:

- Gravel
- Sand
- Heavy clay
Rôle of environmental stress

- Some form of environmental stress is needed to produce great Cabernet franc
- This can be water deficit
- Or limited nitrogen availability
Vine water status is highly variable on these three soils

Stem water potential for Cabernet franc planted on three different soils at château Cheval Blanc in 2006

Level for moderate water deficit
Vine nitrogen status is also variable.

Yeast Available Nitrogen at ripeness for Cabernet franc on three soil types (château Cheval Blanc, 2006)

- Moderate nitrogen status
- Low nitrogen status

Yeast Available Nitrogen (mg/L)

Gravel
Sand
Clay
Berry weight at ripeness for Cabernet franc on three soil types (château Cheval Blanc, 2006)

Grape sugar at ripeness for Cabernet franc on three soil types (château Cheval Blanc, 2006)

Small berries on gravel, high sugar on clay
Total acidity at ripeness for Cabernet franc on three soil types (château Cheval Blanc, 2006)

Total acidity is high on sand and low on gravel.
Anthocyanins and tannins are high on clay and moderately low on sand.
Effect of water deficit stress

Data set:
- Cabernet franc grown at Cheval Blanc
  - on three soil types
- Data from 4 vintages (2004 - 2007)
Effect on shoot growth slackening

Correlation between minimal seasonal stem water potential and shoot growth cessation (Cabernet franc)

$R^2 = 0.60$
Effect on berry weight

Correlation between minimal seasonal stem water potential and **berry weight** (Cabernet franc)

![Graph showing the correlation between minimal seasonal stem water potential (Mpa) and berry weight (g). The graph displays a linear relationship with a correlation coefficient $R^2 = 0.68$.](image)
Effect on grape sugar

Correlation between minimal seasonal stem water potential and grape juice sugar content (Cabernet franc)
Effect on acidity

Correlation between minimal seasonal stem water potential and **total acidity** in grape juice (Cabernet franc)

- Total acidity (g tartarate/L)
- Minimal seasonal stem water potential (Mpa)

$R^2 = 0.62$

Correlation between minimal seasonal stem water potential and **grape malic acid** content (Cabernet franc)

- Malic acid (g/L)
- Minimal seasonal stem water potential (Mpa)

$R^2 = 0.54$

Correlation between minimal seasonal stem water potential and **grape juice pH** (Cabernet franc)

- pH
- Minimal seasonal stem water potential (Mpa)

$R^2 = 0.65$
Effect on anthocyanin

Correlation between minimal seasonal stem water potential and grape extractable *anthocyanin* content (Cabernet franc)

\[ R^2 = 0.41 \]
Quality factors for Cabernet franc

• Limit vine vigor (use devigoration rootstocks)
• Favor grape exposure (leaf removal is essential in cool climates)
• Exposed Leaf area / fruit weight $> 1.5 \text{ m}^2/\text{kg}$
• Good clonal material
• Environmental stress
  - Either water deficit stress
  - Or limited nitrogen
  - Or both