How climate influenced grape maturity in 11 Northern Grape variety trials from South Dakota to Massachusetts

Timothy E. Martinson
Sr Extension Associate
Cornell University

Murli Dharmadhikari
Iowa State University

AND – (See next slide)

The Northern Grapes Project is funded by the USDA’s Specialty Crops Research Initiative Program of the National Institute for Food and Agriculture, Project #2011-51181-30850
How climate influenced grape maturity in 11 Northern Grape variety trials from South Dakota to Massachusetts

Short Answer:
• Climate did not influence grape maturity in 2012.
• Everything got ripe. Early.
NE-1020 Coordinated Variety Trials

How does environment affect Flavors?

Climate and standard maturity indices

Vine performance and climate
- Eval: Yield and quality vs. climate indices
- Data from 3-9 sites/variety
### Table 1. List of cold-climate cultivars planted in NE-1020 project

The table below lists the cultivars planted in the NE-1020 project and two additional project blocks in Illinois and New York. The table includes the state, cultivar, and number of vines planted.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Connecticut</td>
<td>Connecticut</td>
<td>50</td>
<td>25</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>25</td>
<td>25</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Iowa</td>
<td>Iowa</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nebraska</td>
<td>Nebraska</td>
<td>36</td>
<td>36</td>
<td>36</td>
<td>36</td>
<td>36</td>
<td>36</td>
<td>36</td>
<td>36</td>
<td>36</td>
<td>36</td>
<td>36</td>
<td>36</td>
<td>36</td>
<td>36</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>Pennsylvania</td>
<td>36</td>
<td>36</td>
<td>36</td>
<td>36</td>
<td>36</td>
<td>36</td>
<td>36</td>
<td>36</td>
<td>36</td>
<td>36</td>
<td>36</td>
<td>36</td>
<td>36</td>
<td>36</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Massachusetts</td>
<td>Massachusetts</td>
<td>24</td>
<td>24</td>
<td>24</td>
<td>24</td>
<td>24</td>
<td>24</td>
<td>24</td>
<td>24</td>
<td>24</td>
<td>24</td>
<td>24</td>
<td>24</td>
<td>24</td>
<td>24</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Additional Cultivar Trials**

<table>
<thead>
<tr>
<th>State</th>
<th>State</th>
<th>Edelweiss Edelweiss</th>
<th>Frontenac Frontenac</th>
<th>Frontenac gris Frontenac gris</th>
<th>La Crescent La Crescent</th>
<th>Cultivars under Evaluation Cultivars under Evaluation</th>
<th>Marquette Marquette</th>
<th>MN 1258 MN 1258</th>
<th>MN 1189 MN 1189</th>
<th>MN 1200 MN 1200</th>
<th>MN 1220 MN 1220</th>
<th>MN 1235 MN 1235</th>
<th>Petit Amie Petit Amie</th>
<th>Prairie Star Prairie Star</th>
<th>St. Croix St. Croix</th>
</tr>
</thead>
<tbody>
<tr>
<td>NY-Champlain</td>
<td>NY-Champlain</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
</tbody>
</table>

**NE 1020 blocks were planted in 2008; NY Champlain in 2005; and Illinois in 2008**
What Can We Learn from Cultivar Evaluations?

Can variety X be grown profitably in environment Y?

• How often can we expect winter injury?
• Is there enough heat to ripen them consistently?
• What fruit composition is typical for region?

Benchmarks:

• ~ 4 T/acre of fruit, 5 yr average.
• Low frequency winter injury
• Budburst and spring frosts
• Acids, sugars and pH in acceptable ranges.
How Many Years of Data?

- One year is not enough.
- Three years ‘bare’ minimum
- Five years is better

- Today: Report on 2012 season only.
Weather and Growing Degree Days

30 year average 1980-2010
What We Measure

• **Phenology**
  – Budburst
  – Bloom
  – Veraison
  – Harvest

• **Yield/ components**
  – Cluster no & Wt

• **Fruit composition**
  – Brix, pH, TA
  – Tartaric/Malic acids

• **Pruning Weight**
Derived Values

- Vine spacing varies
  - 10x8 = 544 vines/acre
  - 8x6 = 807 vines/acre

- Yield/growth per unit of canopy.
  - No. Retained Nodes
  - Shoots per vine
  - Shoots per retained node
  - Shoots per foot (meter)
  - Crop weight per node.

  'Count' buds
  'Count' shoots, 'noncount' 2ndary
  Winter/Spring Frost Metric
  Canopy density
  "Bud fruitfulness"
  Cluster size/no
Weather and Growing Degree Days

30 year average 1980-2010

![Graph showing the monthly growing degree days (GDD) for different locations.](image)
Heat Unit Accumulations

30 Yr Average Growing Degree Days

- Ames, IA
- Geneva, NY
- Fargo, ND

- Bloom
- Veraison
Heat Unit Accumulations

30 Yr Average Growing Degree Days

![Graph showing heat unit accumulations for different locations and years, with labels for Bloom and Veraison.](image-url)
Budburst

DATE

Growing Degree Days

Range: 150
Bloom

DATE

Growing Degree Days

Range: 200

June 1
Veraison

DATE

Growing Degree Days

Range: 600

August 1
July 1
Harvest

DATE

Growing Degree Days

Range: 800

Sept 1

Aug 1

Oct 1
Frontenac Phenology Dates
2012

Growth Degree Days

AMES, IA
GENEVA, NY
Fargo, ND
AMES 2012
Geneva 2012
FARGO 2012

N Dak
IOWA
New York
Yield Components

Yield

Cluster Number

Cluster Weight
Fruit Composition at Harvest (Brix, pH, TA)
### Yield and Retained Nodes

<table>
<thead>
<tr>
<th>Yield per Vine (Lb)</th>
<th>Nodes per vine</th>
<th>Shoots/Vine</th>
<th>Shoots Per Node</th>
<th>Crop Per Node (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 lb/vine</td>
<td>30 nodes/vine</td>
<td>30 shoots/vine</td>
<td>1 shoot/node</td>
<td>150 g/node</td>
</tr>
</tbody>
</table>

Calculation:
- **10 lb/vine**
- **30 nodes/vine**
- **30 shoots/vine**
- **1 shoot/node**
- **150 g/node**

- = 4 T/acre
- 6ft x 9ft spacing
- = 5 per Ft at 6 Ft In-row spacing
- = 4.5 KG/vine
- = 9.9lb/vine
- 30 shoots/vine
Yield and Retained Nodes

Yield per Vine (Lb)

Brix

pH

Titratable Acidity (g)

Frontenac Gris ND
Frontenac ND
La Crescent ND
Marquette ND
St. Croix ND
La Crescent SD
Marquette SD
St. Croix SD
La Crescent IA
Marquette IA
St. Croix IA
La Crescent VT
Marquette VT
St. Croix VT
La Crescent CT
Marquette CT
St. Croix CT
Frontenac GRIS CT
Frontenac IA
St. Croix NY
St. Croix NY-2
La Crescent NY
Marquette NY-2
La Crescent NY-2
Frontenac Gris NY-2
Frontenac NY-2
Marquette NY-2
La Crescent NY-2
St. Croix NY-2
St. Croix NY-2
St. Croix CT
St. Croix CT
St. Croix IA
St. Croix IA
St. Croix VT
St. Croix VT
Frontenac VT
Frontenac VT

Frontenac Gris ND
Frontenac ND
La Crescent ND
Marquette ND
St. Croix ND
La Crescent SD
Marquette SD
St. Croix SD
La Crescent IA
Marquette IA
St. Croix IA
La Crescent VT
Marquette VT
St. Croix VT
La Crescent CT
Marquette CT
St. Croix CT
Frontenac GRIS CT
Frontenac IA
St. Croix NY
St. Croix NY-2
La Crescent NY
Marquette NY-2
La Crescent NY-2
Frontenac Gris NY-2
Frontenac NY-2
Marquette NY-2
La Crescent NY-2
St. Croix NY-2
St. Croix NY-2
St. Croix CT
St. Croix CT
St. Croix IA
St. Croix IA
St. Croix VT
St. Croix VT
Frontenac VT
Frontenac VT

10 lb/vine

= 4 T/acre
6ft x 9ft spacing
Acid Composition

Murli Dharmadhikari
Iowa State University

Acid Composition (Malic+Tartaric)

% Tartaric Acid
Summary

• Vine development advanced by 1 month in 2012
• Frosts after budburst reduced shoot counts.
• Shoots per ‘retained node’ at 0.5 at some sites.
• Yield per shoot was low (<<150 g/retained node) in some blocks, possibly due to smaller clusters arising from secondary buds.
• Only about 40% of blocks tested had > 10 lb/vine fruit.
• Brix, TA, pH (maturity indices) not limited by yields of up to 25 lb/vine.
In 2012...

- No ‘overcropping’ effects on fruit maturity
- Up to 25 lb/vine (= 7.5 T/acre @ 8x9 spacing)
- These cultivars will support higher yields, bud counts
- ? Need for shoot, cluster thin
- 2012 didn’t test ‘limits’.
- Cooler years: more quality-related fruit composition differences?
One season’s data is not enough

• Acknowledgements:
  – Harlene Hatterman-Valenti (ND)
  – Anne Fennell (SD)
  – Paul Domoto and Murli Dharmadhikari (IA)
  – Paolo Sabbatini (MI)
  – Justine Vanden Heuvel and Steve Lerch (Cornell)
  – Kevin Lungerman (Cornell Coop Extension)
  – Lorraine Berkett, Sarah Kingsley-Richards, Terry Bradshaw (VT)
  – Bill Nail (CT)
  – Sonia Schloemann (MA)
  – Dan Ward (Statistician, Rutgers Univ.)
  – NE1020 Multistate Coordinated Variety Evaluation Project.

The Northern Grapes Project is funded by the USDA’s Specialty Crops Research Initiative Program of the National Institute for Food and Agriculture, Project #2011-51181-30850