GROWING HIGH QUALITY COLD CLIMATE GRAPE VARIETIES

Annie Klodd – Extension Educator, Fruit Production
University of Minnesota Extension
OUTLINE FOR TODAY:

- Breeding grapes for cold hardiness
- Cold climate grape varieties
- Management tactics for high quality fruit & why we do them
  - How vines ripen fruit
  - My favorite canopy management tips
  - My favorite pruning tips
  - Does nutrition matter?
SECTION 1:

Cold climates call for cold hardy grapes
COLD HARDINESS:

- Lowest temperature for survival
- Injury can still occur above min. temps.
  - Sudden hot-cold in fall
  - Season length
  - Duration of extreme temps
  - Early spring/late frost

Hardiness is relative: “Test winters” like 2014 and 2019 change our understanding of each variety’s hardiness
WHERE COLD CLIMATE VARIETIES ARE BRED
- Zones 4a, 4b, 5a, some 5b
Each variety differs in its cold hardiness, but all from UMN have been bred to grow reliably in USDA Zone 4 & up

Extreme weather can still lead to periodic failures
HOW MUCH COLD THEY CAN TAKE

Relative minimum ranges:

- Marquette: -20 to -30 degrees F
- La Crescent: -20 to -35 degrees F
- Louise Swenson: -20 to -40 degrees F
- Frontenac: down to -40 degrees F
- Summerset Seedless: -15 degrees F
THINGS WE DO DIFFERENTLY IN COLD CLIMATE VINEYARDS

- Replace damaged trunks & cordons
- Train up 2 trunks, not just one
- Leave extra buds during pruning
- Single high cordon (SHC) or VSP
  - SHC prevents radiation frost damage
  - Supports vigor of many cold climate hybrids
COLD HARDY GRAPE BREEDERS

- Elmer Swenson (1913-2004), 27 varieties
- University of Minnesota – MN Hardy
- Tom Plocher – Petite Pearl Plus
WHAT TO THINK ABOUT WHEN CHOOSING VARIETIES:

- Who will buy the grapes? What varieties do wineries want?
- What kind of wine does it make?
  - Flavor and aroma qualities
  - Foxiness, herbaceousness
- How hardy is it?
- How easy is it to grow?
- Will it be good for my site?
- What trellis system does it prefer?
SECTION 2:
10 Popular Cold Climate Grapes
MARQUETTE
LA CRESCENT
THE FRONTEINAC FAMILY
ELMER SWENSON VARIETIES

Brianna

Swenson Red

St. Pepin
TOM PLOCHER VARIETIES

Petite Pearl

Verona

Crimson Pearl
• 2017 – University of Minnesota
• Grape: Golden to rosy skin. Ripens mid-September.
• Wine: Lower acidity, high sugar levels.
TRELLISING ITASCA
2006 - University of Minnesota

Grape: Black skin, pink pulp, small/medium cluster size

Wine: Medium-bodied. Cherry, black currant, and can take on complex flavors.

Vine: Moderate vigor, somewhat upright. 2 clusters per shoot. Does well on SHC or VSP trellis. Less hardy than Frontenac.
MARQUETTE ISSUES

Does not like:

Wet soils during fall

Extreme cold temperatures during winter (below -30)

Can thrive in cold temperatures as long as site is not wet. Significant dieback limited to wet low-lying sites.
2002 – University of Minnesota


Wine: Apricot, citrus, tropical fruit. Very popular as dry, semi-dry, or sweet.

Vine: Moderate disease resistance. Berries sometimes fall off (shatter) 15-20% during harvest. Early bud break
- 1996 – University of Minnesota
- Grapes: Blue/black skin, dark pulp. Late harvest. High acidity, must fully ripen.
- Wine: Bold cherry. Can have notes of grass, evergreen, chocolate.
- Vine: Superior hardiness. Moderately high vigor. Shoot and leaf thinning may be needed. Good disease resistance
- Trellis: High cordon preferred

FRONTENAC
Frontenac Blanc

- 2012
- Amber skin
- Earlier harvest than Front. or Front. Gris
- Highly productive

Frontenac Gris

- 2003
- Gray-amber fruit, clear to rosy, amber juice
- Fruit-forward: Peach, pineapple, honey

FRONTENAC BLANC AND GRIS
2000 – Tom Plocher

Grapes: Small compact clusters, dark berries

Wine: Relatively higher tannin. Can take on nice black pepper notes. Blends well with Crimson Pearl or a small % Marquette.

Vine: Similar hardiness to Marquette (moderate). Lower vigor than other northern hybrids; plant @ 6 foot spacing
2002 – Elmer Swenson

Grapes: Greenish-gold, medium/large berries.

Wine: Makes a semi-sweet white wine w/ pineapple notes. For lighter table wine (tropical, floral) harvest b/t 3.2-3.4 pH.

Vine: Productive, high vigor, produces on secondary buds. Harvest mid-late August.

Trellis: High cordon or GDC preferred
▪ 1978 - Elmer Swenson
▪ Grapes: Large berries. Pink to reddish. Good wine or table grape.
▪ Wine: White or blush. Often used for sweeter wine. Strawberry and floral notes.
▪ Vine: Early-mid Sept. harvest. Less hardy (-15). Not suited for northern MN.

SWENSON RED

Photo: Double A Vineyards
### DISEASE RESISTANCE

#### Growing Grapes in Minnesota guide, page 47

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Disease Susceptibility*</th>
<th>Chemical Sensitivity*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Black rot</td>
<td>Downy mildew</td>
</tr>
<tr>
<td>Aromella</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Beta</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Bluebell</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Brianna</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Concord</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Frontenac</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Frontenac gris</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Geneva Red</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Kay Gray</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>La Crescent</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>La Crosse</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Louise Swenson</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Leon Millot</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Maréchal Foch</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Marquette</td>
<td>3</td>
<td>1</td>
</tr>
</tbody>
</table>
MORE VARIETY INFORMATION:

A Review of Cold Climate Grape Cultivars (Iowa State Univ.)

www.petitepearlplus.com

mnhardy.umn.edu
WHAT TO THINK ABOUT WHEN CHOOSING VARIETIES:

- Who will buy the grapes? What varieties do wineries want?
- Does it make good wine, and is it popular?
- How hardy is it?
- Will it be good for my site? Where on my site should I plant it?
- How susceptible is it to diseases?
- What flavor and aroma qualities does it have?
- How easy is it to grow?
MANAGING COLD CLIMATE GRAPES
STOPPING WINE FLAWS IN THE VINEYARD

- In-season canopy management
- Harvest season practices
- Pruning
- Vine nutrition and fertilization
LET’S START WITH HARVEST – THE GOAL
SUGAR SOURCES

Photosynthesis

Transportation via phloem

SUGAR SINKS

Sugars

Potassium (K+)

Carbohydrates

- Assimilation
- Storage
HOW MANY LEAVES PER CLUSTER FOR GOOD RIPENING?

High cordon, GDC, or Scott-Henry:
- 0.8 m² leaf area per 2.2 lbs (1 kg) of fruit

Vertical-shoot positioning:
- 0.8-1.2 m² leaf area per 2.2 lbs of fruit

2.2 lbs = ~7-9 clusters. Need about a square meter of leaves for every 7-9 clusters

Source: Kliewer and Dokoozlian 2005
CANOPY MANAGEMENT IN-SEASON

Manage your canopy for:

- Balanced sun exposure to fruit
- Balanced shoot – fruit ratio
- Balanced canopy, fruit and shoots
- Sugar & nutrient source for fruit
SHOOT THINNING
IMPORTANCE OF SHOOT THINNING

Question: why would you shoot thin?

- Too many buds left during winter pruning
- Air flow through canopy
- Sun exposure
- Balance energy between fruit and shoots
BEST PRACTICES FOR SHOOT THINNING

- Not every vine needs the same thinning
- When shoots are between 4-11 inches long
- Aim for 2 shoots per spur, spurs spaced 3-5 inches apart
- Keep these shoots:
  - Strongest
  - Best positions
LEAF PULLING
IMPORTANCE OF LEAF PULLING

▪ Less clear-cut than benefits of shoot thinning
▪ Increases sun exposure to fruit
▪ May create looser clusters to decrease disease
▪ May increase phenolics (tannins, flavor compounds)
LEAF PULLING

- Early: bloom
- Mid: Pea-sized fruit
- Late: Veraison
PRUNING
PRUNING – HOW MANY BUDS TO LEAVE?
PRUNING – ESTABLISHING NEW CORDONS
THERE’S NO SHAME IN A RE-TRAIN

1. Replacing unproductive cordons
2. Bringing up new trunks
DO NOT DO THIS!
DON’T DO THIS EITHER

Too long!
Too weak!
A YEAR LATER:

- Weak cordon
- Spindly shoots
- No good fruit
- Cordon may just die
Strong and thick!

15” or 4-5 buds
DO THIS INSTEAD
Bud facing outward
PRUNING – ESTABLISHING NEW VINES

Prune back to strong growth in winter
NEW VINES
Common grower question:

Should I fertilize my vines or not?
TRICK QUESTION! IT’S NOT THAT SIMPLE.

- All grapevines need nutrients for:
  - Yield
  - Berry size
  - Balanced acidity
  - Berry sugar accumulation
  - Vine vigor
  - Vine winter hardiness

Need to fertilize depends on:
- Soil fertility
- Soil type
- Soil pH
- Current vine health
BOTH VINEYARDS PLANTED 2010

Silty clay soil on south-facing
Fertilized every year according to foliar & soil tests
Big strong canes, consistent growth, minimal die-back

Silt loam soil on flat land
Never fertilized
Mix of weak and strong canes, inconsistent growth, frequent die-back
Pre-Planting nutrient sufficiency ranges

<table>
<thead>
<tr>
<th>Test</th>
<th>Ohio</th>
<th>Iowa</th>
<th>U of MN</th>
<th>Eastern NA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil pH</td>
<td>5.5 - 6.5</td>
<td>6.0 - 6.5</td>
<td>6.0 to 7.0</td>
<td>**</td>
</tr>
<tr>
<td>Phosphorus (P)</td>
<td>20 - 50 ppm</td>
<td>&gt; 30 ppm</td>
<td>&gt; 25 ppm</td>
<td>20 - 50 ppm</td>
</tr>
<tr>
<td>Potassium (K)</td>
<td>125 - 150 ppm</td>
<td>&gt; 150 ppm</td>
<td>&gt; 160 ppm</td>
<td>75 - 100 ppm</td>
</tr>
<tr>
<td>Magnesium (Mg)</td>
<td>100 - 125 ppm</td>
<td>100 - 125 ppm</td>
<td>&lt; 100 ppm</td>
<td>100 - 250 ppm</td>
</tr>
<tr>
<td>Zinc (Zn)</td>
<td>4 - 5 ppm</td>
<td>3 - 4 ppm</td>
<td>&gt; 1 ppm</td>
<td>2 ppm</td>
</tr>
<tr>
<td>Organic matter</td>
<td>2 - 3 %</td>
<td>2 - 3 (4) %</td>
<td>-</td>
<td>3 - 5 %</td>
</tr>
<tr>
<td>Calcium (Ca)</td>
<td>--</td>
<td>--</td>
<td>&gt; 600 ppm</td>
<td>500 - 2000 ppm</td>
</tr>
<tr>
<td>Boron (B)</td>
<td>0.75 - 1.0 ppm</td>
<td>--</td>
<td>&gt; 1 ppm</td>
<td>0.2 - 2.0 ppm</td>
</tr>
<tr>
<td>Manganese (Mn)</td>
<td>--</td>
<td>--</td>
<td>&gt; 6 ppm</td>
<td>20 ppm</td>
</tr>
<tr>
<td>Copper (Cu)</td>
<td>--</td>
<td>--</td>
<td>&gt; 0.2 ppm</td>
<td>0.5 ppm</td>
</tr>
<tr>
<td>Iron (Fe)</td>
<td>--</td>
<td>--</td>
<td>-</td>
<td>20 ppm</td>
</tr>
<tr>
<td>Sulfur (S)</td>
<td>--</td>
<td>&gt; 7 ppm</td>
<td>&gt; 7 ppm</td>
<td>--</td>
</tr>
</tbody>
</table>
# Sufficiency nutrient ranges in petiole samples

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Full bloom mid to late June</th>
<th>Veraison mid July to mid August</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen (%)</td>
<td>1.20 - 2.20</td>
<td>0.90 - 1.30</td>
</tr>
<tr>
<td>Phosphorus (%)</td>
<td>0.15 - 0.60</td>
<td>0.12 - 0.40</td>
</tr>
<tr>
<td>Potassium (%)</td>
<td>1.50 - 4.00</td>
<td>1.50 - 2.50</td>
</tr>
<tr>
<td>Calcium (%)</td>
<td>0.70 - 2.00</td>
<td>1.00 - 2.00</td>
</tr>
<tr>
<td>Magnesium (%)</td>
<td>0.20 - 0.50</td>
<td>0.25 - 0.45</td>
</tr>
<tr>
<td>Sulfur (%)</td>
<td>&gt; 0.12</td>
<td>&gt; 0.12</td>
</tr>
<tr>
<td>Manganese (ppm)</td>
<td>20 - 150</td>
<td>30 - 150</td>
</tr>
<tr>
<td>Boron (ppm)</td>
<td>25 - 50</td>
<td>25 - 50</td>
</tr>
<tr>
<td>Copper (ppm)</td>
<td>5 - 10</td>
<td>5 - 15</td>
</tr>
<tr>
<td>Zinc (ppm)</td>
<td>20 - 100</td>
<td>30 - 50</td>
</tr>
<tr>
<td>Iron (ppm)</td>
<td>40 - 180</td>
<td>30 - 100</td>
</tr>
</tbody>
</table>

Based on Domoto and Rosen
Common grower question:
How do I know how much fertilizer to apply?

Soil testing – every few years
Petiole testing (foliar) - annually
Vine vigor – cane girth, vine size, etc.
Visual symptoms – leaf discolor
SOIL AND FOLIAR TESTING

How do I know how much fertilizer to apply?

Instructions for calculating rates:
https://blog-fruit-vegetable-ipm.extension.umn.edu/2019/05/calculating-fertilizer-rates-for.html
Common grower question:

Do I fertilize the whole field, or just the vine rows?
Vast majority of roots are in the vine rows

2003 study — Morlat and Jacquet
86.4% of roots within 0.8 m of trunks
13.6% of roots in aisles (inter-row space)
For more information on cold climate grape varieties, refer to:

• *A Review of Cold Climate Grape Cultivars* (Iowa State Univ.)
• mnhardy.umn.edu
• www.petitepearlplus.com

My contact information:
Annie Klodd, klooddann@umn.edu