Laying the foundation for your Chateau: growing basics for grapes in Ohio

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Master Gardener Horticulture Series 2021
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About me
Graduate from Penn State Horticulture
Began with OSU Horticulture and Crop Science in 2018
Based in Wooster at OARDC
Aid in providing solutions for issues in commercial wine grape production and adoption of new management strategies
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Our team and state partners
Ohio State University (OSU) grape team
Viticulture Extension: Maria Smith, Gary Gao, Imed Dami
Viticulture Research: Imed Dami
Kingsville, OH Station Manager: Andy Kim
Ecology: Todd Stauffer
Pathology: Melanie Lewis-Ivey
Weed Science: Doug Doohan
Technicians: Diane Kinney, Yvonne Wooden, Ryan Slaughter
Ohio Grape Industries Committee
Ohio Wine Producers Association

OSU Resources
Buckeye Appellation Online
The Grape Exchange (buy/sell)
OSU Grape and Wine Electronic Newsletter (OGEN blog)
Grape Maturity Updates (fll only)
Tutorial and workshop videos
Fact Sheets, Research publications, Grape Guide Access
Annual disease management guide

Visit our event page for upcoming grape team programing*

February 2022

March 2021
Spotted Lanternfly Management Workshops
March 3, 5-7pm Geneva, OH
April 11, 9-11am Findlay, OH
Wooster Grape Pruning Workshop
Piketon Small Fruit Pruning Workshop

*All upcoming events are planned as in-person meetings
Agenda
Reminder: be on the lookout for SLF egg masses over winter!
Viticulture basics
• Site selection
• Variety/Cultivar selection
• Site preparation
• Preparing for major grape issues

SLF quickly spreading westward
SLF confirmed in new counties during 2021

Be on the lookout for egg masses throughout the winter months
Grey, putty-like masses
Contain up to 50 eggs per mass
Eggs can be found on any hard surface (trees, rocks, outdoor furniture, etc.)

How to report sightings of SLF
Do not transport any live SLF
Contact ODA:
• 614-728-6400 or email plantpest@agri.ohio.gov
Submit to Great Lakes Early Detection Network App (can confirm Tree-of-Heaven here, too): https://apps.bugwood.org/apps/gledn/
*Using GLEDN: https://www.youtube.com/watch?v=PT9lik8X-Fs

Basics of Ohio Grape Cultivation

The 2 most important aspects to growing grapes:
Site (where you grow)
Cultivar (what you grow)
Site Selection

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Site selection and considerations: the most important aspect of grape growing that determines what you can grow

1. Climate
   • Macro and Mesoclimate
2. Soil physical and chemical properties
3. Proximity to nearby hazards: woodland and wildlife, herbicide drift

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Important macroclimate features

1. Winter minimum temperatures
2. Frost-free days (FFD)
3. Growing degree days (GDD)
4. Last date of spring frost/freeze and frequency of spring frost

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Winter minimum temperatures are the most limiting factor to grape success

- V. vinifera = 0 to -10 °F
- French-American/Vitus hybrids = -15 to -25 °F
- MN cold hardy hybrids = -30 to -40 °F

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Climate

- Oceanic/maritime climate: cool summers, cool but not cold winters
  • NE Ohio, Lake Erie
- Humid Subtropical: hot/humid summers, cold to mild winters
- Warm/Hot-summer humid continental climate: warm to hot/humid summers and cold winters

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Macroclimate

- Frost free days (season length)
  • Minimum FFD = 165
  • Ohio = 140-185
- Growing degree days (base 50°F; heat accumulation)
  • Minimum GDD = 2000
  • Ohio = 2000 – 3500

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Temperature has a major affect on mature fruit quality
Mesoclimate – climate of the vineyard site

- Total elevation
- Topo/Relative elevation
- Air drainage (% slope)
- Slope aspect (N, S, E, W)

Data from https://mrcc.Illinois.edu

Spring frost risk

- Frequency
- Intensity (minimum temperature)

Data from https://mrcc.Illinois.edu

Soil physical and chemical properties

Grapes require:
- Well-drained soils
- pH range between 5.5 – 6.5
- Moderate soil nutrition

Cultivar Selection

Cultivar selection

1. Limited by site conditions
2. Limited by local economic demands (does not apply to home growers/winemakers)

The goal is to match the variety with the site conditions and enological potential

The grapevine as a plant

- Botanical family: Vitaceae
- Genus: Vitis

Over 70 species of grapes worldwide!

Vitis riparia: Riverbank grape
Vitis labrusca: Fox grape
Vitis vinifera: European wine grape
Grapes are woody perennial vines

- Grapes are climbing vines
- Require a sturdy structure to grow
  - Trellises
  - Fences
  - Pergolas

Back to the grape bud

- Each bud is compound with a Primary, Secondary, and Tertiary bud
- Each bud on 1-year old wood contains a fruit-bearing shoot
- Latent buds on > 1-year wood still produce shoots (usually not fruitful)
- This is the reason why grapes are pruned so aggressively compared with tree fruit

Cultivating grapes: harnessing biology

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Wine grape cultivars and clones

- Cultivars are vines derived from genetically distinct seeds of the same species or hybridizations across species
- Clones come from mutations in genetically identical propagated vine material
- Grape inflorescences (flower clusters) contain 100s of flowers
- Flowers are self-fertile and wind pollinated
- Each berry contains genetically distinct seeds

An interesting example of clonal diversity (Pinot)

- Slight mutations arising from the same variety can be advantageous for dealing with specific factors (climate, disease) or for distinct qualities for wine (color, flavors)

Clonal diversity

- Slight mutations arising from the same variety can be advantageous for dealing with specific factors (climate, disease) or for distinct qualities for wine (color, flavors)
Over 10,000 known wine grape cultivars in the world!

Vitis x labruscana – cultivars resulting from hybridization between V. vinifera and V. labrusca

Vitis vinifera – cultivars resulting from vine hybridization within this species

Vitis hybrids – cultivars resulting from different species hybridization

1850s changed the history of grape production: Grape phylloxera

- Aphid-like insect that girdles roots
- Introduced from North American vines to Europe in 1850s
- Discovered in California-planted vines in 1860s
- Reduced European grape production between 75-90%

The phylloxera response: interspecific hybridization
1900s grape breeding effort began with hybridizing phylloxera-resistant native North American species with V. vinifera.
Some of these cultivars can be grown on their own roots!
Grafting *V. vinifera* and resistant rootstocks

Resistant rootstocks allow *V. vinifera* to be cultivated in the US and Europe. These are created using phylloxera-resistant North American grapes (e.g., *V. riparia*, *V. rupestris*, *V. aestivalis*, *V. berlandieri*). Examples of common rootstocks in Ohio and the Eastern US:

- 101–14
- 3309 C
- Riparia gloire
- SD4
- 988

Modern academic and private grape breeding efforts focus on improving disease resistance, cold hardiness while maintaining high wine quality potential.

**Site Preparation**

Once a site has been selected and designed, site preparation can begin to provide the best chance at vine success.

Failure to properly prepare a site for planting can set a vineyard back years in productivity.

**Goals of site preparation**

- Drainage installation
- Weed control
- Elimination of potential subsoil compaction
  - Removing trees/brush, rocks
  - Cultivation: sub-soiling, plowing, disking
- Soil pH and fertility adjustments

Hitting these goals leads to strong vine establishment and success.

The problem: soil water availability in Ohio

Most Ohio soil is deep with silt-loam topsoil (5-10”) and thick clay subsoil (8-35”) and prone to erosion. Weak vine growth, production loss, trunk injury, crown gall, weak vine growth, production loss.

Drainage + Weed control = Soil erosion, compaction

The 2010s have been the wettest decade on record for Ohio, with above average to record annual rainfall in 8 of the past 10 years.
Solution: tile drainage installation

Creating subsurface drainage with drain tile systems on fields improves discharge of water.

Subsurface drainage increases rooting depth. (photo: University of Minnesota Extension)

Tile drainage installation (photo: Andy Kirk, Yvonne Woodworth)

Sites vary, gather recommendations prior to installing drainage

Row orientation, topography and terrain aspects matter!

Consult your county soil and water conservation specialist and OSU Extension. It’s a free service for you!

Department of Horticulture and Crop Science

Goals of site preparation

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✓ Weed control
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Department of Horticulture and Crop Science

Why are weeds a leading cause of poor vine establishment?

Weeds compete for soil resources (water and nutrients) that are necessary for good root establishment in the first year of vine growth.

Example: Young vines planted in former pasture fields where weeds were not controlled before planting.

Solution for weeds: Plan at least 1 year before planting for weed eradication.

Chemical control: Use systemic herbicides** about one week BEFORE plowing and tilling in late summer during active weed growth.

Mechanical control: Plowing and tilling aid in removing root systems of perennial weeds.

Biological control: Sow groundcover (grasses) in late summer. Helps suppress new weed growth and prevents soil erosion.

**Avoid all use of 2,4-D and Dicamba systemic herbicide products near vines!
Table of herbicides for young vines

<table>
<thead>
<tr>
<th>To select herbicides, consider:</th>
<th>Pre-emergence</th>
<th>Post-emergence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vine age</td>
<td>Treflan (1st year)</td>
<td>Select - grass only</td>
</tr>
<tr>
<td>Weed type (perennial/annual/biennial)</td>
<td>Devrinol (1st year)</td>
<td>Poast - grass only</td>
</tr>
<tr>
<td>Herbicide mode of action</td>
<td>Surfian (1st year)</td>
<td>Fusilade - grass only</td>
</tr>
<tr>
<td>Stage of vine development</td>
<td>Prowl (1st year)</td>
<td>Venue (contact)</td>
</tr>
<tr>
<td></td>
<td>Snapshot (1st year)</td>
<td>Aim (contact)</td>
</tr>
<tr>
<td></td>
<td>Chateau (2nd year)</td>
<td>Gramoxone (contact)</td>
</tr>
<tr>
<td></td>
<td>Matrix (2nd year)</td>
<td>Rely (contact)</td>
</tr>
<tr>
<td></td>
<td>Casoron (2nd year)</td>
<td>Regione (contact)</td>
</tr>
<tr>
<td></td>
<td>Zea Prime XC (3rd year)</td>
<td>Roundup (systemic)</td>
</tr>
<tr>
<td></td>
<td>Princep (3rd year)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Karmex (3rd year)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Alion (4th year)</td>
<td></td>
</tr>
</tbody>
</table>

To select herbicides,
consider:

- Vine age
- Weed type (perennial/annual/biennial)
- Herbicide mode of action
- Stage of vine development

Table from: Dr. Doug Doohan, OSU Department of Horticulture and Crop Science

The goal of weed control at planting

To select herbicides, consider:

- Vine age
- Weed type (perennial/annual/biennial)
- Herbicide mode of action
- Stage of vine development

Table from: Dr. Doug Doohan, OSU Department of Horticulture and Crop Science

Goals of site preparation

- Drainage installation
- Weed control
- Elimination of subsoil compaction
- Soil pH and fertility adjustments

Managing vineyard nutrition

- 16 essential nutrients for vine growth and development:
  - Air, Water: H, O, C
  - Soil Macronutrients: N, P, K, Ca, Mg, S
  - Soil Micronutrients: Cl, B, Fe, Mn, Zn, Cu, Mo

Soil nutrients become available through mineral weathering, decomposing organic matter, or fertilizer application.

Soil organisms (bacteria, fungi, insects) have a critical role in facilitating nutrient availability.
Nutrient abundance is not the same as accessibility

Root access to essential nutrients is pH dependent.

For wine grapes, the optimal pH is slightly acidic between 6.0 to 6.5.

High pH often leads to iron, manganese, boron deficiency

Low pH often leads to phosphorus, potassium, and magnesium deficiencies

Soil nutrient requirements for grapes

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Soil</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen (N)</td>
<td>---</td>
</tr>
<tr>
<td>Phosphorous (P)</td>
<td>20-50 ppm</td>
</tr>
<tr>
<td>Carbon (C)</td>
<td>0.05-0.08 ppm</td>
</tr>
<tr>
<td>Magnesium (Mg)</td>
<td>150-200 ppm</td>
</tr>
<tr>
<td>Copper (Cu)</td>
<td>0.5 ppm</td>
</tr>
<tr>
<td>Zinc (Zn)</td>
<td>2 ppm</td>
</tr>
<tr>
<td>Aluminum (Al)</td>
<td>1-6 ppm</td>
</tr>
<tr>
<td>Organic matter</td>
<td>1-2%</td>
</tr>
<tr>
<td>pH</td>
<td>5.5</td>
</tr>
</tbody>
</table>

In bold: Nutrients fixable before planting

Soil amendment steps:

1. Assess soil nutrition as 1st step to know what to amend
   - 2 depths: 0-8" and 8-16"
2. Late summer before planting
   - Deeply (> 12") incorporate P, K, lime/sulfur, gypsum
   - May also add 50lbs/A of N to help soil establishment
3. Following vine planting in spring
   - Spread N around vine
   - Avoid excess N, since it can burn plant tissues

Once vines are in the ground, soil nutrients change as vines age!

Continue to **REGULARLY** monitor soil and vine nutrient status to ensure optimal nutrition each season.

What are the major risks for grapes?

- Diseases
- Insect pests
- Mammal and bird pests
- Nutrition management
Let’s talk about grape diseases

- The biology of each disease differs
- Cultivar susceptibility differs
- Environment and weather conditions are very important to disease development

Grape disease management is a season-long endeavor from pre-bud break through leaf fall

Diseases – early season (budbreak through fruit-set)
- Phomopsis blight
- Black rot
- Anthracnose

Diseases – early through late season (post-budbreak through leaf fall)
- Downy mildew
- Powdery mildew

Disease – late season fruit rots (veraison through harvest)
- Botrytis mold
- Sour rot complex

A no-input vineyard is unrealistic in Ohio but using IPM approach can significantly reduce it!

- Consider planting more disease-resistant cultivars
- Understand the biology to each important disease to the grape cultivar and plan a control strategy
- Use good canopy management to reduce humidity and shading of fruit
- Pay attention to the vine growth stages to anticipate when to best apply fungicides
- BE PREVENTATIVE! Once you see signs of disease on fruit, it is often too late to eradicate and control

Resources for home grower disease controls

***Always read labels and pay attention to grape sensitivities!***
A few major insect pests

Like diseases, the biology of these insects matter to best control practices!

Grape insect resources

Like diseases, understanding the biology of these insects matters to best control practices!

Birds and mammals

There are many control methods, but exclusion is the most tried and true

Vine nutrient imbalances and impacts on vine growth

Visual symptoms of nutrient deficiency

Ex. Chambourcin vines exhibiting growth restrictions due to nutrient deficiencies

Deficiencies impact fruit maturation and quality and vine health

Visual symptoms of nutrient deficiency

Nitrogen Potassium (early symptoms, red grape variety) Magnesium
Visual symptoms of nutrient deficiency

Many leaf symptoms look similar.

If you’re uncertain, the easiest diagnostic step is to test the vine nutrient status.

However, tissue analysis only tells vine status.

Couple soil analyses with tissue analysis for long-term management

- Check soil fertility once every 3-5 years once vines are in production
- Best practice is to check vine nutrient status annually
- Weather conditions impact annual nutrient status

Let’s sum up the past of hour

- Take your time in the decision-making process!
- Adequately prepare your site, no matter how small before planting
- Know the problems and prevent them from happening!

Thanks for your attention!