Vineyard Establishment
(vine training, trellis, planting, early vine training, nutrition, & canopy management)

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What is a Vine Training System?

- The **system** or **form** in which a vine is cultivated
- Large area of healthy leaves exposed to sunlight
Training Systems Vary in:

- **Applicability to a situation**
  - Site + variety + goal = situation
- **Quality**
  - Quantity
  - Wine quality potential
- **Labor**
  - Shoot positioning, leaf pulling, pruning, etc.
- **Suitability for varieties**
  - Upright or trailing shoot growth
- **Suitability for climates**
  - Wet, dry, cold, hot
- **Cost of establishment**
Varietal growth habit

Upright

Trailing

Varietal growth habit
A Review of Some Common Vine Training Systems
Canopy
 • Growing upward
Canopy

Growing downward
Canopy division
horizontal
Vertical Division
Non-Divided Canopy

• More “traditional” or “mainstream” training systems

VSP

High Bi-lateral
High Cordon
Divided Canopies

Geneva Double Curtain

Lyre

Smart-Dyson
Some Common Training Systems

Vertical Shoot Positioned

VSP
Bi-lateral cordon, vertical shoot positioned VSP

- A “standard” system
- Height of fruiting wire
  - Vertical division
  - Efficiency
  - Ease of work
- One fruiting zone
Vertical Shoot Positioned

Pros

✓ Simple concept, relatively cheap installation

✓ Can be modified into vertically divided canopy of cordon is high enough
Vertical Shoot Positioned

Cons

- Low to moderate yield potential
- May require frequent maintenance in high vigor site
Some Common Training Systems

Smart-Dyson

“Ballerina”
Smart-Dyson
Pros

✓ Increase leaf area –
  ✓ Yield increases of about 50-70% over non-divided VSP

✓ Suitable to most high-vigor situations

✓ Efficiently utilizes trellis space
Smart-Dyson
Cons

✓ Variety
✓ Timing weed control
✓ Additional labor
✓ Disease pressure?
Some Common Training Systems

Geneva Double Curtain

GDC
Geneva Double Curtain

- Cordons at top of trellis, separated by 4’
- Use only in high vigor situations (i.e., > 0.3 pounds of cane prunings/foot of canopy realized or expected
- Shoot positioning required, typically 2X/year
- Suitable for American, hybrids, and some vinifera cvs.
Geneva Double Curtain
Pros

- High yields; high phenols also possible
- Good fruitfulness reported
- Reduced vigor on downward growing shoots
Geneva Double Curtain

Cons

✓ **Over-exposure of fruit** a concern in hot climates

✓ Not suitable for some *vinifera* cvs.

✓ Slightly more **rot** reported, than vertical shoot systems
Trellis Construction

- 25 years of abuse
- Think though work before you begin
- Use Only Highest Quality Materials Available
- Wire Source – packed and wound under tension
- Posts – Line and End: deep enough, tall enough, pound in, do not auger in
- Right Equipment for Installation
- Install before or after plants? Irrigation? Drain tile?
- Wire Positions
- End Assemblies
Drive posts, do not plant them
Line posts: 2-3' deep, 6 - 7' above (non-divided, vertical division). 15-20 feet between posts. All must be same height – hedger, harvester.
End posts: steel w/ spade or min 5-8”, 4’ deep
Wire: use a spinning jenny to apply, splice correctly, leave enough length at ends to work with
Tie offs: double wrap with staple or wire vise on steel
Anchors – screw in straight down with bobcat auger or steel bar or bury, always to eye depth
Anchor wires: white pvc tubes for visibility
Strainers/tensioners – for individual catch wires
Trellis options
Trellis options
Trellis options
Not all posts are created equal
Wire catches & line post extensions
Figure 11-22  Screw Anchor Deadman Assembly
H-Brace End Post System

Required for rows over 600 ft

- 3-4” x 8’ line post
- Brace post
- Brace pin
- Brace wire
- 5-6” x 9-10’ end post
- 6’ tall
- 3-4’ deep
- 2’ deep

Requires 4 additional posts per row to construct the braces.
Irrigation lines
End post position & Anchors
Spinning Jenny

Spinning Jenny on Radio Flyer
Planting

- When to Plant
- Soil Condition
- Inspect Vines
- Preparing Vines
- Root Pruning
- How to Plant
- Water
Nurseries and Vines

• # of Vines to Order
• Nurseries
• When to Order
• What to Order
  • Rootstocks
  • Varieties
  • Clones
• Delivery
• Storing Plants
  • Damp
  • Cool
  • Dark
Care of Nursery Stock and Planting

- Choose Reputable Nursery
- Keep Vines Moist Until Planting
- Plant in Early Spring
- Water in by Bud Break
- Cut Back to Two Buds
Site layout for planting

Soil preparation
Planting and training

Staking vines
Vine protection?
Rocks?
Water before and after planting!
Layout and Marking the Field

• Hire a Professional Surveyor or Do It Yourself
• Transit, Distance Wheel and Marking Flags
• Marking Lines
• A Good Eye
The Way to Straight Rows
Laser Planting means straight and evenly spaced rows
Milk Cartons and Grow Tubes
Training young vines

Develop mature vines

primary goal for first three years

Goal: adequate vine size to fill the entire trellis by the end of the third growing season

The resource used to achieve this goal is healthy, exposed, leaf area
Example:

Year 1
establish a healthy root system

Year 2
Establish initial components of intended training system – one trunk

Year 3
Continue to develop and complete training system, harvest a crop and establish a second trunk
Beginning of year 1
Early vine training

Year 1: Mid-season

Year 2: End of season
Beginning of year 2
End of year 3
Early Vine Training

- Straight up!
- Keep graft union above ground
- Keep off ground
- Tie to stake
- 2 trunks
- Trim off suckers and clusters
- Eliminate weed competition
Early vine training

Two trunks, narrow angle for future cordons (left)
Canes tipped at point where adjacent canes meet (right)
If your grapes are grafted, make sure the graft union is placed above the soil line at planting.
Grow Tubes

Benefits
• Animal damage
• Moisture
• Herbicide
• Growth rate
• Replaces stake
• Physical protection

Limitations
• Cost
• Growth rate
  ○ Trunk “twist”
• Promotes single trunk
• Diseases, insects
• Removal
• Winter damage
alternatives
Remove young clusters – This will be done for the first 2-3 years.
Training for two or three trunks is insurance against winter damage that could completely kill the vine.

When the vine reaches the cordon wire, it will be trained/tied horizontally.
Grapevine Nutrition

- Pre-plant
  - Soil pH and OM
- First-year vine nutrition
  - Mineral nutrients + organic matter and CEC
- Avoidance and correction of common nutrient deficiencies in mid-Atlantic vineyards - a 3-part process
  - soil testing - important in both pre-plant and in vineyard maintenance
  - visual assessments – nutrient deficiency symptoms
  - plant tissue analysis – nutrient concentrations
... and we can save 700 lira by not taking soil tests
# Essential Grapevine Nutrients

needed for plant life – not replaceable – role in plant function

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<tr>
<th>Obtained from air and water</th>
<th>Macro-nutrients</th>
<th>Micro-nutrients</th>
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<tbody>
<tr>
<td>Carbon (C)</td>
<td>Nitrogen (N)</td>
<td>Iron (Fe)</td>
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<tr>
<td>Hydrogen (H)</td>
<td>Phosphorus (P)</td>
<td>Manganese (Mn)</td>
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<td>Potassium (K)</td>
<td>Copper (Cu)</td>
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<td></td>
<td>Calcium (Ca)</td>
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<td>Magnesium (Mg)</td>
<td>Boron (B)</td>
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<td></td>
<td>Sulfur (S)</td>
<td>Molybdenum (Mo)</td>
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How Soil pH Affects Availability of Plant Nutrients

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<th>Slightly Acid</th>
<th>Very Slightly Acid</th>
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<th>Slightly Alkaline</th>
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pH

4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5 10.0
Newly-planted vines

- **Most** new vineyards DO NOT require a fertilizer application.
  - Apply only as needed to maintain growth
  - Do not mistake need for water vs. need for nitrogen
  - On low OM soils, a small (10-20 pounds of actual N) nitrogen application may advance vine development in the first year.
  - Applying small amounts and splitting applications via drip irrigation is very desirable.
**Tissue:** leaf petioles from leaves opposite cluster

**Timing:** Bloom, 70-100 days post-bloom (if miss bloom)

**Number:** 75-100 (size of petiole)

**Labs:** Penn State [http://www.aasl.psu.edu/plant_tissue_prog.html](http://www.aasl.psu.edu/plant_tissue_prog.html), A and L Lab, Richmond [http://al-labs-eastern.com/index.html](http://al-labs-eastern.com/index.html)

**Interpretation:** Diagnostic samples related to nutrient sufficiency ranges that have been generated from similar tissues.
Nitrogen Issues

- Assessing need
  - Visual means (vine size, leaf color, trellis fill)
  - Tissue analysis (timing, tissue, relationship to standards (total N assessed at bloom-time - sufficiency at 1.2 to 2.1% N with this timing)
  - Cane pruning weights (e.g., < 0.2 lbs/ft canopy)
  - Crop history

- Other vigor-affecting factors
  - rootstock (very little difference in VA)
  - soils (depth and organic matter)
  - Weed and cover crop competition
  - Water / irrigation
Nitrogen: application during periods of active root uptake

- Post harvest
- Around bloom
- Miss-application represents lost money and environmental contamination
Boron Deficiency

- Critical nutrient for fruit set
  - Deficiency causes “shot berry”
    - Tissue test critical!
  - Corrected with foliar application
  - Grapevines very sensitive to over application (toxicity)
    - Toxicity symptoms
Boron Toxicity

- Grapevines very sensitive to over application (toxicity)
- Toxicity symptoms similar to deficiency

Don’t get confused by the different pictures. Bottom line, know your vineyard and look for things that are abnormal.
Key Viticulture Goals

- Balanced vine
  - Healthy, active, exposed canopy
- Uniform, fully mature, pest free grapes
- Ripen wood to maximum maturity for cold hardiness
Light Exposure
Air circulation
Pesticide deposition
FIGURE 10–7  Calendar showing when the stages in the growth and fruiting of a *vinifera* grapevine occur. (Adapted from Pratt 1971; used by permission)
Benefits of Proper Canopy Management

- Fruit Exposure
- Uniform Ripening
- Decreased Disease
- Increased Color
- Decreased Acidity
- Increased Volatiles

- Vine Balance
- Vigor management
- Bud Fruitfulness
- Uniform Bud Break
- Uniform Shoot Vigor
- Ease of harvest