Wine Grape Trellis and Training Systems

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Trellis systems

Definition
• A support structure for the grapevine.

Purpose
• Maintain vine form and provide maximum sunlight penetration for buds and clusters
Trellis systems vary in:

- **Height**
  - Higher the trellis = greater light interception
  - Extremely high and low trellis can reduce labor efficiency

- **Types, number and location of wires**
  - 9-guage vs. high tensile steel
  - Single, multiple fruiting wires / vine row
  - Catch wires and non-catch wire systems

- **Post types and size**
  - End posts: 9-10”, 4-6’ diam.
  - Line posts: 8-9”, 3’ diam.

- **End post anchor**
  - H-system
  - Dead-man
  - Screw

- **Cost of establishment**
Trellis end posts

H

Dead-man / inverted V

Screw / V
Trellis Line posts

• Influenced by
  • Availability
  • Installation equipment
  • Vine training system
  • Cost
Optimum trellis systems will:

• Be strong and long-lived;
  • Permanent with little annual maintenance

• Supports the above ground vine components
  • Trunk, cordons, arms, spurs, canes
  • Foliage and fruit

• Withstand elements
  • Wind, rain, cold, heat

• Adaptable to modern mech.
  • Pruning and harvesting

• Economical to construct
Training System

Definition
• A form in which a grapevine is cultivated.

Purpose
• To facilitate canopy management and promote vegetative (shoots and leaves) and reproductive (fruit) growth. “Vine Balance”

International standard = Bi-lateral cordon, vertical shoot positioning
Selecting Training and Trellis Systems

- Hudson River Umbrella
- Scott-Henry
- Guyot
- GDC
- Lyre
Training systems vary in:

- **Yield & quality**
  - A function of sunlight interception

- **Labor**
  - Canopy management
  - Mechanization
  - Facilitation of equipment

- **Suitability for varieties**
  - Upright or procumbent growth habits
  - Fruitfulness of base buds

- **Suitability for climates**
  - Wet, dry, cold, hot

- **Cost of establishment**

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**Table 11. Exposed Canopy Surface Area for Different Training Systems (Smart, 1996).**

<table>
<thead>
<tr>
<th>Trellis System</th>
<th>Surface Area for 12-ft. Row Spacing (m²/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VSP</td>
<td>8,500</td>
</tr>
<tr>
<td>HC</td>
<td>12,500</td>
</tr>
<tr>
<td>SH</td>
<td>13,100</td>
</tr>
<tr>
<td>SD</td>
<td>13,100</td>
</tr>
<tr>
<td>SD – Ballerina</td>
<td>13,700</td>
</tr>
<tr>
<td>GDC</td>
<td>20,000</td>
</tr>
</tbody>
</table>
Optimum training systems will:

- Promote uniform bud break
- Maximize sunlight exposure / minimize shading
- Promote vine balance (vegetative : fruit)
- Create desirable microclimate conditions
  - Optimize wine quality, disease control and yield
- Implement “Spare parts” philosophy
  - Extra trunks
  - Delayed pruning / minimal
  - Retaining spurs at the trunk base
  - Cane burial

Ripen the maximum amount of fruit without sacrificing quality (fruit and wood) at the lowest economic cost
American Cultivars

- Typical of *Vitis labrusca* (Concord)
- Procumbent (drooping) shoot growth habit
- High yield per vine
- Very cold-hardy
European Cultivars

- *Vitis vinifera* as dominant parentage
- Upright shoot growth habit
- Low yield per vine (about 15 lb)
- Cold-tender compared to American cultivars
Hybrid Cultivars

- American and European genetics
- Most have a procumbent shoot growth habit
- High yield per vine
- Relatively cold hardy, some very cold hardy
## Cold Hardiness of Grape Genotypes

<table>
<thead>
<tr>
<th>Cold hardiness class</th>
<th>Range of critical temp (LT50 °F)</th>
<th>Species</th>
<th>Examples of varieties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very tender</td>
<td>5 to -5</td>
<td>Most <em>V. vinifera</em></td>
<td>Merlot, Semilllon, Syrah, Sauv. Blanc</td>
</tr>
<tr>
<td>Tender</td>
<td>0 to -8</td>
<td><em>V. vinifera</em></td>
<td>Chardonnay, Cab Sauv, Gewurztraminer, Pinot gris, Pinot noir</td>
</tr>
<tr>
<td>Moderately tender</td>
<td>-5 to -10</td>
<td>Some <em>V. vinifera</em>, some hybrids</td>
<td>Riesling, Cab. Franc, Lemberger,Chambourcin</td>
</tr>
<tr>
<td>Moderately hardy</td>
<td>-10 to -15</td>
<td>Most hybrids</td>
<td>Chardonel, Traminette, Norton, Seyval</td>
</tr>
<tr>
<td>Hardy</td>
<td>-15 to -20</td>
<td>Most <em>V. labrusca</em></td>
<td>Catawba, Concord, Delaware</td>
</tr>
<tr>
<td>Very hardy</td>
<td>-20 to -30</td>
<td>Some hybrids</td>
<td>Frontenac, Foch, LaCrescent</td>
</tr>
</tbody>
</table>

(Zabadal et al. 2007)
Grapevine training and pruning

- High Cordon
- Umbrella kniffin
- Guyot / “VSP”
- Geneva double curtain

1st Sn’s growth  Spring 2nd Sn  2nd Sn’s growth  Spring 3rd Sn  3rd Sn’s growth  Spring 4th Sn  4th Sn’s growth  Spring 5th Sn

Dami et al. 2005
Midwest Grape Production Guide
Training Systems for Procumbent Vines

- High Cordon / Top Wire Cordon
- Geneva Double Curtain
- Umbrella Kniffin
High Cordon / Top-Wire Cordon

Active

Dormant
High Cordon Growth, Training & Pruning

- Requires a single “bearing” wire
- Typically 5-6 foot above ground
High Cordon Growth, Training & Pruning

- 1\textsuperscript{st} bearing year (3-4 year old vines)
- All 1 year old canes
High Cordon Growth, Training & Pruning

- Early season shoot growth
High Cordon Growth, Training & Pruning

- After removing suckers and unwanted fruit
High Cordon Growth, Training & Pruning

• Shoot growth by end of season - harvest
High Cordon Growth, Training & Pruning

- Mature canes after harvest & fall leaf drop
High Cordon Growth, Training & Pruning

• 2nd bearing season – long cane pruning
High Cordon Growth, Training & Pruning

• Renewing the system with long canes
High Cordon Growth, Training & Pruning

• Mature canes after fall leaf drop
High Cordon Growth, Training & Pruning

- 2\textsuperscript{nd} bearing year – spur pruning
- Adjust crop by number & length of spurs
High Cordon Growth, Training & Pruning

- 2nd bearing year – spur pruned
- Adjust crop by number & length of spurs
High Cordon Growth, Training & Pruning

- Replacing injured trunks as needed “spare parts”
# High Cordon Training

## Advantages

- Adaptable to mechanical pruning, harvesting, and unskilled manual pruning
- Excellent sun exposure
- Simple trellis construction
- Little or no annual tying
- Reduces vigor

## Disadvantages

- Difficult cordon establishment
  - Winter injury
- Difficult cordon removal
- Old cordons may become a reservoir of diseases
Geneva Double Curtain
Geneva Double-Curtain Training

<table>
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<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
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<tr>
<td>• Handles large canopies of vigorous vines</td>
<td>• Similar to Top-Wire Cordon, but more difficult to maintain</td>
</tr>
</tbody>
</table>
Training Systems for Upright Vines

• Guyot, AKA “VSP”

• Mid-wire cordon

• Pendlebogen

• Fan

• Divided canopy systems