Wine Grape Training Systems

Dr. Duke Elsner
Small Fruit Educator
Michigan State University Extension
Traverse City, Michigan
Training System

Definition

- An orderly, sustainable growth form for a vine.
- A specific training system has a conceptualized ideal form for a vine.
Selecting a Training System

- Scott-Henry
- Hudson River Umbrella
- Guyot
- GDC
- Lyre
Training System Choice Is Influenced By:

- Cultivar growth habit
- Cultivar cold hardiness
- Potential for winter injury
- Fruitfulness of base buds
- Grafted vs. own-rooted vines
- Desirability for mechanization
- Facilitation of equipment
- Labor and cost-effectiveness
An acceptable training system will:

- Promote maximum exposure of leaf area to sunlight.
  - Leaves must be well-exposed for photosynthesis to occur optimally.
An acceptable training system will:

- Warm clusters for adequate sugar accumulation, acid degradation, and biosynthesis of flavor compounds in cool grape regions.
An acceptable training system will:

- Create a desirable environment within the canopy (microclimate), particularly in the renewal region.
  - Proper training can provide for a renewal zone to be formed, which ensures that the vine form is perpetuated and yield is maintained.
An acceptable training system will:

- Arrange perennial wood and bearing units in such a way that shoot crowding and leaf and fruit shading are avoided, thus optimizing wine quality, disease control and yield.
An acceptable training system will:

- Promote uniform bud break, especially with those cultivars that exhibit pronounced apical dominance.
An acceptable training system will:

- Distribute vines and bearing units to avoid undue competition between vines.
An acceptable training system will:

- Minimize the volume of perennial wood, such as old trunks, in situations where the hazards of winter injury outweigh the merits of perennial wood retention.
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
Training Systems for Procumbent Vines

- High Cordon / Top Wire Cordon
  - Hudson River Umbrella
- Geneva Double Curtain
- Umbrella Kniffin
High Cordon / Top-Wire Cordon
High Cordon Growth, Training & Pruning

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

- 1st 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
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
High Cordon Training

Advantages

- Adaptable to mechanical pruning, unskilled manual pruning, and mechanical harvest
- Fruit high for good sun exposure
- Simple trellis construction
- Little or no annual tying
High Cordon Training

- Disadvantages

- Difficult to establish cordons where winter injury is frequent
- Old cordons hard to remove from the wire
- Old cordons may become a reservoir of diseases
Geneva Double Curtain
Geneva Double-Curtain Training

- **Advantages**
  - Handles large canopies of vigorous vines

- **Disadvantages**
  - Similar to Top-Wire Cordon, but more difficult to maintain
Training Systems for Upright Vines

- Guyot
- Mid-wire cordon
- Pendlebogen
- Fan
- Divided canopy systems
What about “VSP”?

*Vertical Shoot Positioning* is a canopy management action, not a training system per se.
Guyot training

- Requires a single “bearing” wire
- Requires 2-3 pairs of “catch” wires
- Typically 6 foot posts
Guyot Growth, Training & Pruning

- 1<sup>st</sup> bearing year, after pruning (3-4 years old)
Guyot Growth, Training & Pruning

- 1st bearing year – early shoot growth
Guyot Growth, Training & Pruning

- 1\textsuperscript{st} bearing year – after suckering & defruiting
Guyot Growth, Training & Pruning

- Vertical Shoot Positioning – tucking shoots
Well positioned shoots
Guyot Growth, Training & Pruning

- 1st bearing year, at harvest
Guyot Growth, Training & Pruning

- Leaves removed to show uniform fruiting zone
Guyot Growth, Training & Pruning

- mature canes after leaf drop
Guyot Growth, Training & Pruning

- 1st bearing year – mature canes after leaf drop
Guyot Growth, Training & Pruning

- 2nd bearing year, long cane pruning to renew
Guyot becomes... Mid-wire cordon

- 2nd bearing year – spur pruning on cordons
Guyot / Mid-Wire Cordon Training

**Advantages**

- Ease of establishment
- Adaptable to mechanical pruning
- Little tying required

**Disadvantages**

- Fruiting zone may become crowded and shaded on large vines
- Nodes on fruiting spurs may be of lower quality
Low Cordon Training

Fig. 13. A Low-Cordon training system.
Low Cordon Training

- **Advantages**
  - Fruiting zone close to the ground utilizes radiant heat to promote ripening
  - Adaptable to mechanical pruning
  - Low fruiting and renewal zones may benefit from snow cover or mulch to avoid winter injury

- **Disadvantages**
  - Difficult labor close to ground
  - Requires excellent weed management
  - Soil residues on fruit
  - Spring frost susceptible
  - Animal depredation problems
Pendlebogen Training

“arched cane”
Pendlebogen Training

- Advantages
  - All of the advantages of Guyot, plus….
  - Arching of canes gives better vertical distribution of the fruit
  - Combats apical dominance
  - Relatively fewer ties per vine
  - Can be spur pruned for next 1-2 years
Pendlebogen Training

- Disadvantages
  - More challenging if fruiting wires are low to the ground
  - A bit less adaptable to mechanical pruning
Fan Training

Fig. 6. The Fan training system which provides maximum flexibility in response to frequent winter injury.
Fan Training

Fig. 6. The Fan training system which provides maximum flexibility in response to frequent winter injury.
Fan Training

**Advantages**
- Maximum flexibility to adjust for frequent winter injury to vines
- Easily learned by hand labor pruners

**Disadvantages**
- Lots of tying
- Not adaptable to mechanical pruning
- Not adaptable to systematic shoot positioning or leaf removal
- Fruit is hard to find at harvest
Systems for upright growth habit cultivars \((Vitis \ vinifera)\) – dealing with vigor & large vines

- Divided canopy systems
  - Scott Henry
  - Smart Dyson
  - Lyre
Scott Henry Training

Cordon with spurs on top fruiting wire

Long cane on bottom fruiting wire
Scott Henry Training

- Head

Cordon with spurs on top fruiting wire

Long cane on bottom fruiting wire
Advantages

- Promotes a systemic display of a large canopy and good exposure of fruit to sunlight
- If cordons are used in upper zone partial mechanized pruning is possible
- Well organized fruiting zones are easy to hand harvest
Scott Henry Training

- **Disadvantages**
  - Fruit maturation in lower fruiting zone is often behind the upper fruit
  - Canes and buds developing in the lower portion of the trellis are of inferior quality
  - Complicated shoot positioning is required
  - Tall trellis, lots of wire required
  - No advantage to weak vines
Fig. 11. The Smart-Dyson training system which has a vertically divided canopy and is shoot positioned.
Smart-Dyson Training

- **Advantages**
  - Adaptable to mechanical pruning
  - Good fruit exposure for ripening
  - Less likely to develop differences in fruit maturity and bud quality than with Scott Henry

- **Disadvantages**
  - Lack of experience with this system
  - Many uncertainties
Lyre Training

After shoot growth

Before shoot growth

No catch wires shown on this side of trellis
Lyre Training
Lyre Training

- **Advantages**
  - Excellent distribution of the vine canopy
  - Good exposure of fruit for ripening
  - Adaptable to mechanical pruning

- **Disadvantages**
  - Complex and expensive
  - Extensive shoot positioning required
  - Difficult to mechanically harvest
Alright, Which One?

- You and your winemaker must judge
- Don’t discount employee opinion
- Avoid decisions based on neatness
- Learn how to recognize deficiencies
Recognizing deficiencies in training systems

- Difficulty in maintaining vine form
- Unfavorable trend in vine size
- Poor fruit quality from shading
- Pest & disease problems
- Poor fruiting capacity over time
Recognizing deficiencies in training systems

- Dense canopies with deteriorating interior leaves
- Confusion at pruning & training time
- Inability to efficiently employ canopy management practices
- Must & wine quality problems