Tart Cherry Orchard of the Future: High Density Trial at the NWMHRC

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Need for Technology and Horticultural Modernization in Tart Cherry

- Michigan Cherry Industry faces challenges from globalization
  - Inexpensive labor
  - Favorable growing conditions
  - Accessibility to suitable farmland

- Montmorency: 250+ year-old cultivar
- Mahalab: standard rootstock
- 20ft+ x 20ft+ spacings
- 30 year-old harvest technology
High Density Montmorency Planting

• Concomitantly evaluate:
  – Rootstocks
  – Tree spacing
  – Irrigation
  – Fertilization strategies
  – Tree training and pruning
    • To optimize yields without sacrificing fruit quality

Planting established at NWMHRS in 2010
Rootstocks

• Commercially available dwarfing rootstocks:
  – Gisela 3®
  – Gisela 5®
  – Gisela 6®
  – Mahaleb
  – Montmorency on own root
    • From tissue culture

Montmorency on own root
Spacing

- Planted at 12ft between rows and 4.5ft between trees
- Left 21ft of empty space between five-tree replicates
  - For testing future harvesters
Plot Map –

6 reps of each treatment guard rows are sweet cherries
Pruning Systems

• *Bush*:
  – Numerous branches were left to help reduce tree vigor, imparting a small tree structure, and encouraging fast and easy tree maintenance
  – With small trees, light can penetrate readily through a properly pruned tree resulting in high fruit quality and high early yields
Pruning Systems, cont.

• **Central/Single Leader:**
  – Characterized by one main, upright trunk
  – Branching begins on the leader 12-24 inches above the soil surface
  – Selected 3 to 4 branches in first year, which were uniformly spaced around the trunk.
  – Above the first scaffold whorl, we left an area of approximately 18 to 24 inches without any branches to allow light into the center of the tree.
    • This area is followed with another whorl of scaffolds.
  – Alternating scaffold whorls are maintained up the leader to the desired maximum tree height
Irrigation

- Double line of RAM tubing
  - emitters are 24” apart
  - emit 0.42gal/hr.

- **2010**: 5/25-7/15---1.5 hrs. of water/day (Mon.-Fri); 7/16-9/3---2.5 hrs of water/day (daily)

- **2011-2013**: 1 May- 1 Sept.--2.5hrs of water/day (daily)
Fertigation

• Double line of RAM tubing
  – emitters are 24” apart
  – emit 0.42gal/hr.

• Soluble fertilizer (28-8-18) was injected through irrigation system
  – May - August
Data Collection

• Amount of bloom
• Leaf area
• Yield – first harvest 2013
  – Used limb shaker
  – No crop in 2012
• Pull force
• Trunk diameter (for trunk cross-sectional area)
• Limb growth
• Tree efficiency
Own Root – Bush

June 2010

August 2010

May 2011

May 2013
Own Root – Central Leader

June 2010

August 2010

May 2013
Gi3 - Bush

June 2010

August 2010

May 2013
Gi3 – Central Leader

June 2010

August 2010

May 2012
Gi5 - Bush

June 2010  
August 2010  
May 2011  
May 2013
Gi5 – Central Leader

June 2010

August 2010

May 2011

May 2013
Gi6 - Bush

June 2010
August 2010
May 2011
May 2013
Gi6 – Central Leader

June 2010  August 2010  May 2011  May 2013
Mahaleb – Central Leader

June 2010  August 2010  May 2011  May 2013
Bloom rating – May 16, 2013

- Mahaleb
- Own Root
- Gi3
- Gi5
- Gi6

Avg. % Bloom/tree

Central Leader
Bush
Leaf Area

measure length and width on largest leaf on 2 yr. old, non-fruiting spur, 5 leaves per tree

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![Leaf Area Graph]

- **Avg. Leaf Area (cm²)**

- **2011**
- **2012**
- **2013**

**Species and Growth Forms:**

- Gi6 Central Leader
- Gi6 Bush
- Gi5 Central Leader
- Gi5 Bush
- Gi3 Central Leader
- Gi3 Bush
- Mah Central Leader
- Mah Bush
- Own Central Leader
- Own Bush

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[Bar graph showing average leaf area for different species and growth forms across three years (2011, 2012, 2013).]
Tree Volume
height x depth x width

![Bar chart showing tree volume for different varieties and planting methods]

- Mahaleb
- Own Root
- Gi3
- Gi5
- Gi6

- Central Leader
- Bush
Current season limb growth
measured 4 limbs per tree in each cardinal direction, collected 8/19/13
collected 5 fruit per tree with stems attached and measured with a pull force meter
Trunk cross-sectional area (TCSA)

measure trunk diameters in fall on all trees 30cm above graft union
Average Yield/Tree

all fruit was harvested from individual trees with a limb shaker and weighed
Tree Efficiency
tree yield divided by TCSA

[Graph showing tree efficiency for Mahaleb, Own Root, Gi3, Gi5, Gi6 with Central Leader and Bush categories]
Preliminary Conclusions

• Gisela 3 and 5 had highest tree efficiencies
  – No differences between pruning systems
• Gisela 6 pruned to a central leader had a comparable tree efficiency to G3 and G5
  – G6 central leader had significantly higher tree efficiency than G6 bush
• Mahaleb has very low tree efficiency
  – In first 4 years, lots of wood and little fruit set
    • To properly recycle limbs (i.e. cut off the two biggest per year), we will be removing all wood with fruiting potential
• Montmorency on own root had no bloom in 2013
Future Management Considerations

• Issues with recycling limbs—will Montmorency push out a new limb when we leave a stub cut?
  – Evidence suggests Montmorency does not reliably push new limbs like sweet cherries
Considerations, cont.

- Will canopies be too dense to allow for adequate light penetration?
- Will we frost out more often with limbs too close to ground level?
- Is there a place for GA in this new system to manage crop loads?
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• NW Michigan Horticultural Research Foundation
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