Mechanical Blossom
Thinning of Peaches and Apples

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Presentation Outline

• Horticultural basis for thinning peaches & apples
• Economics of thinning
• Various strategies – past and present
Costs Associated with Thinning

- Cost: ~ $500/acre (based on $10/hr)
- Labour costs and availability
- Harvest efficiency is directly related to the amount of thinning

Minimum Wage in Ontario
Source: HRDC Canada

\[ y = 0.1827x - 358.26 \]
\[ R^2 = 0.9738 \]
Horticultural Basis for thinning Peaches and Apples

- Fruit trees usually produce an excessive number of flowers
- Set of 5-10% of the flowers are needed to produce a normal crop
- to maximize crop value
- to promote return bloom (apple)
- to maintain tree growth and structure
Approaches to Thinning

- Mechanical
- Chemical Thinning (Apple)
- Flower Inhibition (GA)
Mechanical Thinning

Dormant **pruning**, physical removal of flowers by **hand** or specialized brushes, rope drags

**Advantages**
- Some approaches are selective (pruning)
- Small or damaged fruit can be removed by hand
- Indication of the remaining number of viable flowers

**Disadvantages**
- Ropes tend to thin larger buds
- Not uniform - flower buds in narrow crotches angles are not adequately thinned
- Hand thinning is expensive
Blossom Chemical Thinning

Surfactants, fertilizers, desiccants, oils, long chain fatty acids

**Advantages**
- Early in the season
- Allocating photosynthates to fruit that will persist until harvest
- Low labour requirement
- Quick
- Relatively Inexpensive

**Disadvantages**:
- Potential for spring frosts
- Uncertainty of environmental conditions for pollination
- Unpredictable response
- Not many registered products
Rope Thinner

Photo courtesy of Dr. Bob Belding
Basis for Mechanical Thinning

- Method to thin earlier
- Non chemical approach for apple including organic
- For peaches and cherries, there are few effective methods (apart from pruning)
- Potential future loss of carbaryl (Sevin®)
2009 Research Objectives

To assess the effectiveness of mechanical blossom thinning on:

• Reduction in hand thinning and cost savings
• Improvement in fruit size
• Effect on yield
Mechanical String Thinner

- Designed by Fruit-Tec, Germany
- Cost: $C 15,000 for Model 300
- Has front mount 3PH, fixed, or fork-lift mounts
- Model evaluated Darwin 300
Source: Pen State University

Mechanical String Arrangements

9 Strings

18 Strings

2 On, 2 Off

2 On, 2 Off Opposing

Two On, Every Third Off

2 On, 4 Off

Four On, Four Off
Materials and Methods

Grower Experiments: Blossom Thinning Peaches

- 8-yr old “Catherina” peach 1.8 x 2.4 m (841 t/ha) – central leader
- 5-yr old “Allstar” peach 1.8 x 4.8 m (1121 t/ha) – tall spindle
- Goal was to evaluate: RPM, string configuration and to compare with hand thinning

Peach: Catherina and Redhaven
Apple: Ambrosia, Gala (2), Gingergold, Honeycrisp
Treatments

- Hand thinned control
- 180 RPM, 18 strings
- 180 RPM, 9 strings
- 240 RPM, 18 strings
- 240 RPM, 9 strings

In other experiments evaluated:
- RPMs
- String configurations
- Comparison with chemical thinners (Apple)

Ground speed: 2.1 miles per hr
Timing: Full Bloom
Peach Measurements

- Percent blossoms removed
- Fruit set (on selected branches)
- Number of fruit thinned per branch
- Time required to hand thin
- Harvest: Number of fruit per tree, yield, fruit size, split pits,
Allstar: 37-53  Catherina: 60-85%
• Mechanical thinning reduced fruit
• RPM greater effect than String configuration
Labour Savings

Hand thinning per Acre
- 77 hrs (Allstar)
- 20 hrs (Catherina)

Reduction
- 21-50% (Allstar)
- 10-50% (Catherina)

Savings (at $10 per hr)
- $160-290 (Allstar)
- $20-100 (Catherina)
Yield and Fruit Size

Total Weight per Tree
- No effect (Allstar)
- Mechanical thinning reduced yields 9 to 45% (Catherina)

Fruit size
- Mechanical thinning increased fruit size 8 – 15%
Materials and Methods – Apples

- 6-yr old “Gala”/M.9 2.0 x 4.5 m (888 t/ha) – vertical axe
- 6-yr old “Ambrosia”/M.26 2.0 x 4.5 m (888 t/ha) – vertical axe

Objectives:
- Compare mechanical thinning with hand thinning
- Compare mechanical thinning with chemical thinning
- Combine both mechanical and chemical thinning
## Results – Apples

### Significant Reduction in Crop Load (fruit /TCSA) / Fruit Weight

<table>
<thead>
<tr>
<th>Treatment Comparison with Control</th>
<th>Details</th>
<th>Ambrosia</th>
<th>Gala 1</th>
<th>Gala 2</th>
<th>Ginger-gold</th>
<th>Honeycrisp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical Thinning</td>
<td>220 RPM, 2 sets of 9 strings, 1.8 mph</td>
<td>-/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>Chemical Thinning</td>
<td>750 mg Carbary per litre, 75 ppm 6-BA</td>
<td>0/+</td>
<td>0/+</td>
<td>0/0</td>
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<td>0/0</td>
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</tbody>
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- Mechanical thinning was comparable to hand thinning in 4 of 5 expts
- Chemical thinning provided superior fruit size in 3 of 6 expts
Future Research and Challenges

• Need to demonstrate effectiveness on sweet cherries
• Tree architecture (tall spindles, hedge row systems) will need to be adjusted to make best use of this technology
• Negative effects of leaf injury not understood
• Incorporate methods to reduce risk of fireblight
• Likely a useful tool for peach and organic apple growers
• Useful for apple cultivars requiring early thinning
Acknowledgements

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