Practical applications of research; Cherry cracking

Penny Measham
22/11/2012
Improving marketable yield

- Improving yield
  - Reducing damage from rain-induced fruit cracking

- Improving marketable yield
  - Reducing loss of yield from cracking AND maintaining or enhancing fruit quality

- Aim: Reduce cracking by 10%
The problem!
The life of a grower

“That’s just life”
“I lost half a million (dollars) in two days”
“Another season like this..... I just don’t know”
Project description

• Three years
High spring rainfall, water logged trees, abandoned trials and inconclusive results (Ca)

Twelve trials

Five orchards

Three states (South Australia, Victoria, Tasmania), Five varieties (Sweetheart, Simone, Stella, Sylvia, Regina, Van)
Project description

• Practical reassessment of;
  – Existing management techniques (sprays)
  – New techniques (irrigation, crop load, pruning)

• Based on knowledge gained from PhD

• Water movement

• Considers crack types
  – Cuticular (apical, stem)
  – Side
Management - Sprays

Tasmanian trials;
• Reduction in cracking of 43% and 50% (58.2, 49.6mm)

South Australia;
• Reduction of cracking of 51% and 27% (18.8 and 17 mm)

Victoria;
• Trial abandoned – spray applications not possible (100+mm)

<table>
<thead>
<tr>
<th></th>
<th>Size (mm)</th>
<th>Force (g/mm)</th>
<th>TSS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>25.5&lt;sup&gt;a&lt;/sup&gt;</td>
<td>412.7&lt;sup&gt;a&lt;/sup&gt;</td>
<td>16.5&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>1</td>
<td>27.1&lt;sup&gt;b&lt;/sup&gt;</td>
<td>436.4&lt;sup&gt;b&lt;/sup&gt;</td>
<td>18.9&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>2</td>
<td>27.1&lt;sup&gt;b&lt;/sup&gt;</td>
<td>464.7&lt;sup&gt;b&lt;/sup&gt;</td>
<td>16.4&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>3</td>
<td>27.6&lt;sup&gt;b&lt;/sup&gt;</td>
<td>403.0&lt;sup&gt;a&lt;/sup&gt;</td>
<td>19.5&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
</tbody>
</table>
Management - Sprays

The chart displays the percentage of cracked fruit for different spray types: Control, Pretect, Raingard, SureSeal, and Vaporgard. The chart categorizes cracked fruit into two types: 'side' and 'cuticular'. The data shows that the Pretect spray type has the highest percentage of cracked fruit, both 'side' and 'cuticular', followed by Control. The other sprays have lower percentages, with Raingard and Vaporgard having the lowest.
Management - Irrigation

• Three treatments
  – High, Medium and Low Volume
  – High 7, Medium 7, Low 16

• Fruit under Low Irrigation
  – Increased diurnal fluctuations in fruit shrinking and swelling

• Fruit Quality under High Irrigation;
  – Increase in size (27 to 29.5 mm)
  – small loss of sugars (19 to 18) and firmness (343 to 322 g/mm) NS
Management – Crop Load

• Effective for all crack types, in all regions and varieties
• Lower crop loads show higher % cracking
  – Higher and medium levels of crop loads show lower % cracking
• Reductions up to 50%
• Thinning to low levels at full bloom induced most cracking
Management - Crop Load

- Fruit properties
  - No fruit properties correlated with cracking levels
- Higher crop loads not always showing loss of size or sugar content (threshold >20 fruit/cross sectional trunk area)
- Development of yield range (t/ha)
  - Below - risk of cracking
  - Above – risk of decreased size*

<table>
<thead>
<tr>
<th>Increased Cracking</th>
<th>10 fruit/TCSA</th>
<th>15 fruit/TCSA</th>
<th>20 fruit/TCSA</th>
<th>Decreased Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>900 trees/ha</td>
<td>8.5</td>
<td>9.7</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>1000 trees/ha</td>
<td>9.6</td>
<td>14.5</td>
<td>19.5</td>
<td></td>
</tr>
<tr>
<td>1100 trees/ha</td>
<td>10.6</td>
<td>16.1</td>
<td>21.4</td>
<td></td>
</tr>
<tr>
<td>1200 trees/ha</td>
<td>11.6</td>
<td>17.5</td>
<td>23.4</td>
<td></td>
</tr>
</tbody>
</table>

The range of yields, t/ha, required to avoid cracking under low crop loads and loss of size under high crop load for tree with 35cm circumference (av. 12g fruit)
Management - Pruning

- Internal mechanism and side cracks
- Two internal pathways
- Xylem/Phloem
- After rainfall?
Management - Pruning

• Pruning during rainfall reduced total cracking in two trials
  – Up to 50%
  – Majority of reduction in side cracks
  – No loss of size
  – Increase in sugars

• Pruning before rainfall - NS
Management - Pruning

<table>
<thead>
<tr>
<th>Site</th>
<th>Weight (g)</th>
<th>Size (mm)</th>
<th>TSS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>10.31(^a)</td>
<td>30.28(^a)</td>
<td>16.04(^a)</td>
</tr>
<tr>
<td>Pruned</td>
<td>10.34(^a)</td>
<td>30.31(^a)</td>
<td>17.66(^b)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Site B</th>
<th>Weight (g)</th>
<th>Size (mm)</th>
<th>TSS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>10.23(^a)</td>
<td>30.20(^a)</td>
<td>17.05(^a)</td>
</tr>
<tr>
<td>Pruned</td>
<td>10.69(^a)</td>
<td>30.66(^a)</td>
<td>17.83(^b)</td>
</tr>
</tbody>
</table>
Conclusion

• Met aims of project
  – Reduction in cracking is **improving yield**
  – Management techniques are not adversely affecting quality, therefore **improving marketable yield**

• Growers welcoming news
  – Industry priority, #1 ranked issue/challenge

• The future?
  – Three years funding – Impact of Late Season Rainfall
    • Role of calcium
    • Early fruit growth rate, cuticular integrity
    • Xylem function over time
    • Root water uptake over time (mycorrhiza)
Acknowledgements

• HAL
• Fruit Growers Tasmania
• Project Team:
  – Sally Bound, Alistair Gracie, Stephen Wilson
• International collaborators:
  – Lynn Long, Clive Kaiser, Mekjell Meland
• National collaborators:
  – Darren Graetz (plant breeder), Paul James, Lenswood Research
• Orchardists/managers:
  – Aaron Bowden, Garth Friday, Andrew Hall, Howard Hansen, Nic Hansen, Nick Noske, Nick Owens, Tim Reid, Wayne Thomson
  – Fridays Orchards, Blue Cherry Company, Hansen Orchards, Cherries Tasmania, Reid Fruits
• Dugald Close, Justin Direen, Ann Gaffney, Keiren Rix, Alison Hall, Andrew Measham, Stephen Paterson

This project has been funded by HAL using the cherry industry levy and matched funds from the Australian Government.