Practical Farm Processes to Conquer Orchard Pests

Scott McKenzie
Our Background

• Century Orchards is a 600ha Almond Orchard located in Loxton, SA
  – Vertically integrated company, with interest and control from paddock to plate
  – High Inputs chasing Big Crops
  – Use state of the art technology to effectively produce almonds, resulting in maximum returns for our investors
Pest Issues and Management

- The Big 3; Hull Rot, Carob Moth and Carpophilus Beetle
  - What we have seen over the seasons
  - What we have and are trialling
  - What we have implemented
Observations

• 2011 Summer Rains Initiated the issues
• Hull Rot is the primary infection
  – minimise mummies minimise pest pressure
• Sanitation is key and most cost effective
  – There is no ‘Silver Bullet
• Insect Damage is a ‘Profit Killer’
  – Approximately every 1% increase in Insect Damage to Nonpareil Costs us $100,000

<table>
<thead>
<tr>
<th>Year</th>
<th>Insect</th>
<th>Mould</th>
<th>Staining</th>
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<tbody>
<tr>
<td>09/10</td>
<td>1.07%</td>
<td>1.14%</td>
<td>2.69%</td>
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<tr>
<td>10/11</td>
<td>1.66%</td>
<td>3.93%</td>
<td>12.27%</td>
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<tr>
<td>11/12</td>
<td>2.96%</td>
<td>2.56%</td>
<td>3.19%</td>
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<tr>
<td>12/13</td>
<td>2.34%</td>
<td>2.31%</td>
<td>3.15%</td>
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<tr>
<td>13/14</td>
<td>1.58%</td>
<td>1.05%</td>
<td>2.74%</td>
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<tr>
<td>14/15</td>
<td>0.78%</td>
<td>0.29%</td>
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<td>15/16</td>
<td>1.13%</td>
<td>0.86%</td>
<td>0.87%</td>
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<td>16/17</td>
<td>1.82%</td>
<td>0.55%</td>
<td>1.98%</td>
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<tr>
<td>4 yr average</td>
<td>1.33%</td>
<td>0.69%</td>
<td>1.79%</td>
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<tr>
<td>8 yr average</td>
<td>1.67%</td>
<td>1.59%</td>
<td>3.56%</td>
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Carob Moth Trials and Results
Predatory Wasps

• Trialled the Release of Trichogramma Predatory Wasps
  – x4 Releases with x3 different species released
  – Released using egg tabs stapled to trees

• Egg Laying Traps used for Monitoring

• Did see some Predatory activity but quite Labour Intensive
With the high cost of insecticide applications we have been looking at Mating Disruption.

Working with Organic Crop Protectants applying mating disruption pheromones by drone.

Drone applies pheromone material to tops of the canopy.
OCP- Results

- Initial Results on 40ha trial are looking promising with trap counts dropping to 0 after applications.

- Insect damage looks to have improved compared to the control.

- Similar results and costs to insecticide but allows for more markets as insecticide free.

<table>
<thead>
<tr>
<th>Date</th>
<th>DS, Row 2 5 trees sth M/R</th>
<th>F10, Row 24 9 Trees Nth M/R</th>
<th>J7, Row 3 M/R</th>
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<tr>
<td>13-Sep</td>
<td>Traps set</td>
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<td>20-Sep</td>
<td>10</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>27-Sep</td>
<td>13</td>
<td>11</td>
<td>4</td>
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<tr>
<td>4-Oct</td>
<td>27</td>
<td>32</td>
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<td>11-Oct</td>
<td>51</td>
<td>24</td>
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<tr>
<td>18-Oct</td>
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<td>55</td>
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<tr>
<td>25-Oct</td>
<td>97</td>
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<td>1-Nov</td>
<td>56</td>
<td>120</td>
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<td>6-Dec</td>
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<td>66</td>
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<tr>
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<td>17-Jan</td>
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<td>80</td>
<td>23</td>
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<tr>
<td>7-Feb</td>
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<td>54</td>
<td>23</td>
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<tr>
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<td>32</td>
<td>16</td>
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<tr>
<td>21-Feb</td>
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<td>0</td>
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<td>25</td>
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<tr>
<td>7-Mar</td>
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<td>80</td>
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<tr>
<td>Averages</td>
<td>13.7</td>
<td>52.5</td>
<td>41.0</td>
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</table>
This Season- OCP Trial

• We will be running the trial again this season to check positive data seen last season

• We are working very closely with both OCP and Agricultural Departments setting up the best methods of testing and monitoring

• We are using a ground applicator instead of the drone
  – This will reduce application cost
  – Increase % of pheromone in the canopy where it is most effective
What we have Implemented
Simple Rules

• Get as many Nuts off and out of the orchard as Possible
  – Correct harvest techniques
  – Re-shaking

• Proper levelling and ground preparation

• Keep Tree-Line/Wetting Zone Clean as possible

• Destroy mummies properly and at the right time

• Correct Timing of Sprays and Control Measures
Getting All the Nuts

- Shaking at the right time
  - Early shaking before Hull Rot sets in and insects can damage
- Setting up machines properly and at the right speed
  - Stop Sweepers and Harvesters leaving crop behind
  - Good operators with machinery set up correctly
  - Never assume Common Sense- Need Supervision
- Best results from Re-shaking
  - Straight after a rain or heavy fog/dew
  - Going the opposite direction of initial shake
  - Re-shake all Nonpareil as a minimum
Proper Ground Preparation

- X-blading straight behind last harvest pass
- Cover crop in straight behind X-blading
  - Improves IPM
  - During growing season slash every 2nd row
  - Allows mummies to be caught and concentrated for destruction
- Level ground improves harvest efficiencies
  - Less dirt swept
  - Run harvesters higher
  - Reduces nuts lost and buried
Keep Tree-Line/Wetting Zone Clean

- Mummies in the wetting zone are Breeding Sites
  - Watering every day creates perfect disease environment
  - Wet mouldy nuts attract moulds and pests
  - Less issues with Sprinkler Orchards- Feast to Famine

- It’s an ongoing battle keeping the wetting zone clean
  - Every wind/storm event brings mummies down
  - Birds, Spraying, Machine Traffic all bring nuts down

- Once a year clean up does not solve the issue
Options to Keep Tree Line Clean

• V-Sweeper/Sweeper
  – Best option as it concentrates the mummies
  – Quick but higher cost to purchase and run

• Tractor Mounted Blowers
  – Cheapest to buy and run
  – Made from Old sprayers
  – Slowest
Options to Keep Tree Line Clean

• Air-o-Fan
  – Lower deflector plates to blow each spray
  – Getting 5-8 passes a season
  – Must check coverage is still adequate
    • Water sensitive paper
  – Moving the spores into the canopy when the chemical is most effective
Destroying the Mummies

• Flory Flail Mowing
  – ‘Speed Kills’ need a patient operator
  – Rotate/Replace blades regularly
  – Make sure cover crop is not too wide
  – May not destroy nuts completely

• FAE Mulcher
  – Works best when swept prior
  – Destroys mummies really well when set up correctly
  – Can also be used to mulch sticks/pruning's
Timing is Key

Complete 1st Mummy destruction before 1st flight

Insecticide Application and 2nd Mummy destruction before Hull Split Flight
Insecticide Treatments

• We have seen improvements with Insecticide applications at Hull Split
  – We look at degree days to determine best timing
  – 1,000 degree days from 1st August which works well with Hull Rot applications
  – Only night/early morning spraying to improve droplet life

• Target high Pressure Areas
  – Areas that are harvested early and processed first are always best
  – Areas harvested last should be targeted for Insecticide Applications

• Fumigate any Nonpareil which will be stored for more than 21 days
Tying it all Together

- Clean Harvest
- Level Ground
- Keep Tree Line/Wetting Zone as clean as possible
- Destroy Mummies by early October
- Destroy Mummies again before Hull Split
- Spray at correct Times

- Sanitation Is Key and is an ongoing Process
- It’s a Team Effort, need everyone on the same page
Thank You