New Australian Almond Varieties
(PBR & Commercialisation)
AL12015 Australian Almond Breeding Program

• Secondary selections under evaluation
  – Secondary Block 1 LP planted 2006
  – Block 2 LP, planted 2010
  – Block 3 LP, planted 2013
  – Block 4 LP, planted 2016
  – Block 5 ACE Loxton, planted 2017, Block 6 in 2018
  – Block 7 Hillston, planted 2017

• Commercial trials
  – 5 selections from Block 1, 100 trees of each @ 3 sites, planted 2013
  – 1 selection from Block 2
  – First commercial yield 2016
Plant Breeders Rights (PBR)

- PBR acceptance
  - No.1 = ‘Carina’
  - No.2 = ‘Capella’
  - No.3 = ‘Maxima’
  - No.5 = ‘Mira’
  - No.7 = ‘Rhea’
  - No.10 = ‘Vela’

- US Plant Patents filed for first five.
  - First five in quarantine in Beltsville, Maryland, USA
  - Due for provisional release in Dec 2017
New Australian varieties

• Carina\textsuperscript{A} - is highly spur bearing with a compact to medium canopy that may suit higher orchard densities. The hull flares away from the shell in a ‘banana’ fashion and the semi-hard shell reduces kernel quality downgrades and late season bird damage. Self-fertile, early NP pollinator.

• Capella\textsuperscript{A} - is slightly open tree that is suited traditional orchard densities. The hull flares away from the shell in a ‘banana’ fashion and hard shell reduces kernel quality downgrades and late season bird damage. Self-fertile, late NP pollinator.

• Maxima\textsuperscript{A} - is a highly spur bearing tree that is suited to planting in traditional or higher density orchards. The hull flares away from the shell in a ‘banana’ fashion, semihard shell and has a very large kernel that may be suited to markets where large size attracts premium pricing. Late pollinator for NP.
New Australian varieties

• Mira – is an upright spur bearing tree that is suited to planting in traditional orchard densities. The hull flares away from the shell in a ‘banana’ fashion and the semi-hard shell reduces kernel quality downgrades and late season bird damage. Self-fertile, late NP pollinator.

• Rhea – is an upright bearing tree that is suited to planting in traditional orchard densities. It is a paper shell and the kernel itself has a hint of marzipan similar to Carmel and may be suitable for inclusion in the Carmel market. Early pollinator for Nonpareil.

• Vela – is an upright to spreading tree, spur bearing with high cropping capacity. It is self fertile, papershell and the kernel has a similar appearance and taste profile to Nonpareil. Early pollinator for Nonpareil.
## 2017 Harvest results – Block 1

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Yield Potential kg/ha</th>
<th>Kernel In-shell (g)</th>
<th>Kernel (g)</th>
<th>Crack out (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nonpareil</td>
<td>3088</td>
<td>1.28</td>
<td></td>
<td>28</td>
</tr>
<tr>
<td>No. 1 Carina</td>
<td>2197</td>
<td>3.70</td>
<td>1.46</td>
<td>22</td>
</tr>
<tr>
<td>No. 2 Capella</td>
<td>2989</td>
<td>4.96</td>
<td>1.43</td>
<td>21</td>
</tr>
<tr>
<td>No. 3 Maxima</td>
<td>1003</td>
<td>5.5</td>
<td>2.08</td>
<td>23</td>
</tr>
<tr>
<td>No. 5 Mira</td>
<td>3293</td>
<td>4.6</td>
<td>1.5</td>
<td>27</td>
</tr>
<tr>
<td>No. 7 Rhea</td>
<td>3680</td>
<td>1.89</td>
<td>1.09</td>
<td>27</td>
</tr>
</tbody>
</table>
Block 1 – Yearly yields

Yearly Yields

![Graph showing yearly yields for different varieties of almonds (Nonpareil, Carina, Capella, Maxima, Mira, Rhea) over the years 2009 to 2017. The graph displays the yield in kg/ha with a y-axis ranging from 0 to 7000, and the x-axis representing the years. Each variety is represented by a different color, allowing for easy comparison of yields.]
Block 1 – Cumulative yields 2009 - 2017

Cumulative Yield Block 1

Yield (kg/ha)

Nonpareil, Carina, Capella, Maxima, Mira, Rhea
## 2017 Harvest results – Block 2

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Dry fruit wt (g)</th>
<th>Kernel (g)</th>
<th>Crack out (%)</th>
<th>Full Bloom</th>
<th>Yield kg/ha kernel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nonpareil</td>
<td>4.17</td>
<td>1.25</td>
<td>30.0</td>
<td>17-8-17</td>
<td>4002</td>
</tr>
<tr>
<td>No. 8</td>
<td>6.78</td>
<td>1.73</td>
<td>25.5</td>
<td>18-8-17</td>
<td>2947</td>
</tr>
<tr>
<td>No. 9</td>
<td>6.89</td>
<td>1.62</td>
<td>23.5</td>
<td>19-8-17</td>
<td>1557</td>
</tr>
<tr>
<td>Vela*</td>
<td>5.45</td>
<td>1.68</td>
<td>30.9</td>
<td>12-8-17</td>
<td>3664</td>
</tr>
<tr>
<td>No. 11*</td>
<td>4.14</td>
<td>1.44</td>
<td>34.7</td>
<td>12-8-17</td>
<td>1373</td>
</tr>
<tr>
<td>No. 12*</td>
<td>6.13</td>
<td>1.93</td>
<td>31.4</td>
<td>11-8-17</td>
<td>2118</td>
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<tr>
<td>No. 13*</td>
<td>6.11</td>
<td>1.38</td>
<td>22.6</td>
<td>20-8-17</td>
<td>3278</td>
</tr>
</tbody>
</table>
Block 2 – Yearly yields

Yearly yields

Yield kg/ha

2013 2014 2015 2016 2017

Nonpareil No. 8 No. 9 Vela No. 11 No. 12 No. 13
Block 2 – Cumulative yields 2013 - 2017

Cumulative yield Block 2

Yield kg/ha

2013 2014 2015 2016 2017

Nonpareil  No. 8  No. 9  Vela  No. 11  No. 12  No. 13
Flowering times 2017

Flowering Synchronisation Chart - Using Observed Median Values

- Flowering Duration
- Full Bloom

Species: Peerless, Sonora, Rhea, Almond 12, Monterey, Avalon, Carina, Vela, Nonpareil, Wood Colony, Capella, Carmel, Maxima, Almond 13, Mira, Livingston, Padre, Butte

University of Adelaide

Chart produced by Josh Fielke
Block 3 – Yearly yields

Yearly yields

Yield (kg/ha)

Nonpareil
Almond 14
Almond 15
Almond 16
Almond 17
Almond 18
Almond 19
Almond 20
Almond 21
Almond 22
Almond 23
Almond 24
Almond 25
Almond 26
Almond 28
Almond 29
Almond 30
Almond 32
Almond 33
Almond 34
Almond 35
Almond 36

2016
2017
Block 3 – Cumulative yields 2016 - 2017
## 2017 Harvest results – Block 3 (best 6)

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Dry fruit wt (g)</th>
<th>Kernel (g)</th>
<th>Crack out (%)</th>
<th>Full Bloom</th>
<th>Cumulative Yield (kg/ha kernel)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nonpareil*</td>
<td>3.82</td>
<td>1.3</td>
<td>34</td>
<td>21/8/17</td>
<td>1788</td>
</tr>
<tr>
<td>No. 18</td>
<td>5.12</td>
<td>1.73</td>
<td>33.8</td>
<td>22/8/17</td>
<td>3123</td>
</tr>
<tr>
<td>No. 28</td>
<td>7.73</td>
<td>1.66</td>
<td>21.5</td>
<td>17/8/17</td>
<td>2430</td>
</tr>
<tr>
<td>No. 33</td>
<td>4.4</td>
<td>1.50</td>
<td>34.2</td>
<td>18/8/17</td>
<td>2339</td>
</tr>
<tr>
<td>No. 21#</td>
<td>5.85</td>
<td>1.52</td>
<td>26.0</td>
<td>30/8/17</td>
<td>2236</td>
</tr>
<tr>
<td>No. 32</td>
<td>3.85</td>
<td>1.21</td>
<td>31.4</td>
<td>20/8/17</td>
<td>2198</td>
</tr>
<tr>
<td>No. 25</td>
<td>3.15</td>
<td>1.41</td>
<td>44.8</td>
<td>19/8/17</td>
<td>2121</td>
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</table>

- *Nonpareil data from Block 2 equivalent age
- #Self-fertile

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Almond 25
## Tertiary trials 2017 harvest

<table>
<thead>
<tr>
<th>Century Orchards</th>
<th>2016 (3(^{rd}) leaf) kg/ha</th>
<th>2017 (4(^{th}) leaf) kg/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nonpareil</td>
<td>980</td>
<td>2230</td>
</tr>
<tr>
<td>Carina</td>
<td>1732.3</td>
<td>2193.9</td>
</tr>
<tr>
<td>Capella</td>
<td>1277.9</td>
<td>2159.6</td>
</tr>
<tr>
<td>Maxima</td>
<td>1938.9</td>
<td>2706.3</td>
</tr>
<tr>
<td>Mira</td>
<td>1680</td>
<td>2940.6</td>
</tr>
<tr>
<td>Rhea</td>
<td>838.7</td>
<td>3472.7</td>
</tr>
</tbody>
</table>
Commercialisation

• Sales of the PBR varieties have been ongoing since 2016
• 52,206 trees sold in 2016 season
• 105,000 buds delivered in 2017

• Overseas commercialisation
Beyond 2017

• Greater use of molecular markers
• New project application for molecular markers for oil content, Vitamin E, fatty acids, shell hardness
• Next generation of breeding for Sf
• Ongoing evaluation of secondary blocks
• Reliable data figures from tertiary blocks
• PBR extension to cover European countries
Thanks to...

Andrew Lacey
Tony Spiers
Brett Rosenzweig
Josh Fielke
Jana Kolesik