Understanding colour development in red-blushed pears
Content

- General introduction
- Effect of reflective mulch on red colour development
- Effect of artificial shading on red colour development
- Effect of training systems and rootstock on red colour development
General introduction

- Who am I?
- Master student in Plant Breeding from Netherlands, Wageningen.
General introduction

- What did I do?
- Understanding red colour development in red-blushed pears by different experiment
- How to measure colour?
Experiment 1 – effect of reflective mulch on red colour development in ANP-0131 (Deliza®) pears

• Cultivar:
  – On red-blushed pear cultivar ANP-0131 (branded Deliza®) grafted on BP1

• Treatments:
  – Mulch
  – No mulch
  – Under netting versus outside netting

• Measurement:
  – Light
  – Colour

• Duration:
  – 7 weeks

Reflective effect applied to orchard floor; inside netting
Experiment 1 – effect of reflective mulch on red colour development in ANP-0131 (Deliza®) pears

Significant effect in colour at different heights.
Experiment 1 – effect of reflective mulch on red colour development in ANP- 0131 (Deliza®) pears

No significant effect in colour for different treatment
Experiment 1 – effect of reflective mulch on red colour development in ANP- 0131 (Deliza®) pears

No significant effect in colour for different directions
## Experiment 1 – effect of reflective mulch on red colour development in ANP- 0131 (Deliza®) pears

<table>
<thead>
<tr>
<th>Height</th>
<th></th>
<th></th>
<th>Under netting</th>
<th>Outside netting</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>RM</td>
<td>Control</td>
</tr>
<tr>
<td>Incoming radiation</td>
<td>absolute</td>
<td>1580</td>
<td>1586</td>
<td>2077</td>
</tr>
<tr>
<td>Reflected radiation</td>
<td>absolute</td>
<td>326</td>
<td>56</td>
<td>581</td>
</tr>
<tr>
<td>%</td>
<td>20.63</td>
<td>3.53</td>
<td>27.97</td>
<td>4.76</td>
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<tr>
<td>Incoming radiation</td>
<td>absolute</td>
<td>1618</td>
<td>1600</td>
<td>2100</td>
</tr>
<tr>
<td>Reflected radiation</td>
<td>absolute</td>
<td>297</td>
<td>63</td>
<td>521</td>
</tr>
<tr>
<td>%</td>
<td>18.36</td>
<td>3.94</td>
<td>24.81</td>
<td>4.43</td>
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<tr>
<td>Incoming radiation</td>
<td>absolute</td>
<td>1677</td>
<td>1673</td>
<td>2128</td>
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<tr>
<td>Reflected radiation</td>
<td>absolute</td>
<td>237</td>
<td>66</td>
<td>419</td>
</tr>
<tr>
<td>%</td>
<td>14.13</td>
<td>3.95</td>
<td>19.69</td>
<td>4.92</td>
</tr>
</tbody>
</table>

Amount of light reflected using reflective mulch (RM) is higher compared to control.
Experiment 1 – effect of reflective mulch on red colour development in ANP-0131 (Deliza®) pears

- Conclusion:
  - Reflective mulch has no significant effect on red colour development of ANP-0131 pears when used between 35 and 83 days after full bloom

- Further research
  - Extend OR choose other period of covering orchard floor
  - More light measurement
Experiment 2 – effect of artificial shading on red colour of ANP-0534 fruits

- **Cultivar:**
  - On red-blushed pear cultivar ANP-0534 grafted on D6 rootstock

- **Treatments:**
  - No artificial shading (T1)
  - Artificial shading for certain period (T2 – T6)

- **Measurement:**
  - Colour of fruits at one height
  - Quality (not finished)

- **Duration:**
  - 15 weeks

Visual colour difference in pears after period of artificial shading
Experiment 2 – effect of artificial shading on red colour of ANP-0534 fruits

![Graph showing colour development ANP-0534 fruits under artificial shading]

- Colour expressed in a*
- Days after full bloom

Legend:
- T1
- T2
- T3
- T4
- T5
- T6
### Experiment 2 – effect of artificial shading on red colour of ANP-0534 fruits

#### Significant difference between colour of fruits during experiment

<table>
<thead>
<tr>
<th>Treatment</th>
<th>T=0</th>
<th>T=1</th>
<th>T=2</th>
<th>T=3</th>
<th>T=4</th>
<th>T=5</th>
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<tbody>
<tr>
<td>T1</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>T2</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>T3</td>
<td>×</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>T4</td>
<td>×</td>
<td>×</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>T5</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>T6</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

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<th>T=2</th>
<th>T=3</th>
<th>T=4</th>
<th>T=5</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>-10.22 b</td>
<td>5.71 b</td>
<td>9.33 c</td>
<td>13.05 c</td>
<td>18.83 d</td>
<td>30.49 c</td>
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<tr>
<td>T2</td>
<td>-15.30 a</td>
<td>-13.08 a</td>
<td>10.00 c</td>
<td>14.06 c</td>
<td>19.26 d</td>
<td>29.98 c</td>
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<tr>
<td>T3</td>
<td>5.43 b</td>
<td>-8.37 b</td>
<td>11.84 c</td>
<td>19.03 d</td>
<td>28.29 c</td>
<td></td>
</tr>
<tr>
<td>T4</td>
<td>9.05 c</td>
<td>4.95 b</td>
<td>-4.95 b</td>
<td>12.74 c</td>
<td>25.98 bc</td>
<td></td>
</tr>
<tr>
<td>T5</td>
<td>12.98 c</td>
<td>-1.29 b</td>
<td>21.87 ab</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>T6</td>
<td>-13.50 a</td>
<td>-15.85 a</td>
<td>-15.52 a</td>
<td>-16.10 a</td>
<td>-15.35 a</td>
<td>18.98 a</td>
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<tr>
<td>LSD</td>
<td>2.387</td>
<td>3.633</td>
<td>2.609</td>
<td>2.773</td>
<td>4.668</td>
<td>5.353</td>
</tr>
</tbody>
</table>
Experiment 2 – effect of artificial shading on red colour of ANP-0534 fruits

Means and e.s.e.'s for Treatment at T=5

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Colour expressed in a*</th>
</tr>
</thead>
<tbody>
<tr>
<td>T5</td>
<td>30.49 c</td>
</tr>
<tr>
<td>T1</td>
<td>29.98 c</td>
</tr>
<tr>
<td>T2</td>
<td>28.29 c</td>
</tr>
<tr>
<td>T3</td>
<td>25.98 bc</td>
</tr>
<tr>
<td>T4</td>
<td>21.87 ab</td>
</tr>
<tr>
<td>T5</td>
<td>18.98 a</td>
</tr>
<tr>
<td>LSD</td>
<td>5.353</td>
</tr>
</tbody>
</table>
Experiment 2 – effect of artificial shading on red colour of ANP-0534 fruits

• Conclusion:
  – No significant difference between control and some artificial shading treatments
  – Relation between $a^*$, $b^*$, $L^*$ unclear
  – Colour peak at end of experiment (~ harvest) which is favourable

• Further research
  – Repeated experiment confirm results
Experiment 3 – effect of training system and rootstock on red colour of ANP-0131 (Deliza®) pears

- **Cultivar:**
  - On red-blushed pear cultivar ANP-0131 grafted on D6, QA or BP1 rootstock

- **Treatments:**
  - Trainings system
  - Rootstock

- **Measurement:**
  - Light
  - Colour of fruits

- **Duration:**
  - 6 weeks
Experiment 3 – effect of training system and rootstock on red colour of ANP-0131 (Deliza®) pears

Colour expressed in $a^*$

-0.8 m regarding two training systems

QA - Open Tatura
D6 - Open Tatura
BP1 - Open Tatura
QA - Vertical
D6 - Vertical
BP1 - Vertical

Time point
Experiment 3 – effect of training system and rootstock on red colour of ANP-0131 (Deliza®) pears

Colour - 1.6 m regarding two training systems

- Colour expressed in a*

- Time point

- QA - Open Tatura
- D6 - Open Tatura
- BP1 - Open Tatura
- QA - Vertical
- D6 - Vertical
- BP1 - Vertical
Experiment 3 – effect of training system and rootstock on red colour of ANP-0131 (Deliza®) pears

Colour - 2.4 m regarding two training systems

- QA - Open Tatura
- D6 - Open Tatura
- BP1 - Open Tatura
- QA - Vertical
- D6 - Vertical
- BP1 - Vertical
Experiment 3 – effect of training system and rootstock on red colour of ANP-0131 (Deliza®) pears

Colour - 3.2 m regarding one training systems

- QA - Vertical
- D6 - Vertical
- BP1 - Vertical

Colour expressed in a*
Experiment 3 – effect of training system and rootstock on red colour of ANP-0131 (Deliza®) pears

• Conclusion:
  – Colour increase across height
  – 2.4 m colour generally higher – Open Tatura
  – Rootstocks mixed up
    • D6 lowest over all heights and times
  – No statistical analysis

ONLY SUGGESTIONS....
What did I learn?

- How colour develops in different cultivars
- Improved English writing and speaking skills
- Afterwards: how to set-up GOOD experimental design

- A lot about Australia, things I will never forget!
Understanding colour development in red-blushed pears

Questions?