PIPS 2
Extension update
Sept 2018

Facilitated by
Ross Wilson
AgFirst
PIPS 2 extension

The Productivity, Irrigation, Pests and Soils (PIPS) program coordinates different organisations to undertake orchard research for the apple and pear industry of Australia.

We are now taking PIPS research and communicating about it with growers on a regular basis.
Five projects

1. Integrated pest and disease management
2. Biennial bearing
3. Apple tree and fruit nutrition
4. Profitable pears
5. Tree structure (ASE) ~ now complete
1. Integrated Pest Management

**Team leader:** Dr David Williams  
**Organisation:** Department of Economic Development, Jobs, Transport and Resources (Victoria).

**Topic:**  
Integrated Pest Management
Mating disruption

- Delays mating by disrupting communication
  - Also affects pheromone trap results
- Efficacy depends on:
  - Release rate from dispensers
  - Population size
  - Number and distribution of dispensers
  - Timing
- Applicable to “conventional” and “organic” orchards
Mass trapping codling moth?

• Targeting male and female moths in orchards

• Potential to complement mating disruption, insecticides and bio-controls

• Applicable to “conventional” and organic orchards
The process of breeding and release of Matrus

https://www.youtube.com/watch?v=kXwV9TFkXq8
# Mastrus releases

<table>
<thead>
<tr>
<th>Location</th>
<th>State</th>
<th>Year</th>
<th>Mastrus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Merrigum</td>
<td>Vic</td>
<td>2014</td>
<td>50,000</td>
</tr>
<tr>
<td>St Germains</td>
<td>Vic</td>
<td>2016</td>
<td>10,000</td>
</tr>
<tr>
<td>Stanthorpe x2</td>
<td>Qld</td>
<td>2016</td>
<td>38,000</td>
</tr>
<tr>
<td>Orange x2</td>
<td>NSW</td>
<td>2017</td>
<td>50,000</td>
</tr>
<tr>
<td>Batlow x2</td>
<td>NSW</td>
<td>2017</td>
<td>50,000</td>
</tr>
<tr>
<td>Young</td>
<td>NSW</td>
<td>2017</td>
<td>9,000</td>
</tr>
<tr>
<td>Grove</td>
<td>Tas</td>
<td>2017</td>
<td>32,000</td>
</tr>
<tr>
<td>Ashton</td>
<td>SA</td>
<td>2018</td>
<td>16,000</td>
</tr>
<tr>
<td>Loebethal</td>
<td>SA</td>
<td>2018</td>
<td>16,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td>271,000</td>
</tr>
</tbody>
</table>
## Impact of pesticides on Mastrus

<table>
<thead>
<tr>
<th>Pesticides</th>
<th>Direct toxicity</th>
<th>Fertility of survivors</th>
<th>Fertility of offspring from survivors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fungicides</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chorus</td>
<td>Light green</td>
<td>Yellow</td>
<td>Green</td>
</tr>
<tr>
<td>Ziram</td>
<td>Blue green</td>
<td>Yellow</td>
<td>Green</td>
</tr>
<tr>
<td>Dithane</td>
<td>Blue green</td>
<td>Yellow</td>
<td>Green</td>
</tr>
<tr>
<td>Rubigan</td>
<td>Blue green</td>
<td>Yellow</td>
<td>Green</td>
</tr>
<tr>
<td><strong>Miticides</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sorcerer</td>
<td>Light green</td>
<td>Yellow</td>
<td>Green</td>
</tr>
<tr>
<td>Cormoran</td>
<td>Light green</td>
<td>Yellow</td>
<td>Green</td>
</tr>
<tr>
<td><strong>Insecticides</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Altacor</td>
<td>Red</td>
<td>No survivors</td>
<td>No survivors</td>
</tr>
<tr>
<td>Avatar</td>
<td>Red</td>
<td>No survivors</td>
<td>No survivors</td>
</tr>
<tr>
<td>Samurai</td>
<td>Red</td>
<td>No survivors</td>
<td>No survivors</td>
</tr>
</tbody>
</table>

| Risk category | Low            | Low-Moderate           | Very High                           |

**Notes:**
- Light green indicates low toxicity.
- Blue green indicates moderate toxicity.
- Red indicates high toxicity.
- Yellow indicates high risk for fertility issues.
- Green indicates low risk for fertility issues.
2 Biennial Bearing in Apple

Team leaders: Dr. Jens Wünske and Dr. Dario Steffanelli

Organisations: University of Hohenheim (Germany) and Vic DEPI (Australia) respectively

Topic:

Extending the understanding of the genetic, physiological and cultural aspects of biennial bearing.
5 year project: Mix between pure and applied science

Project led by University of Hohenheim, Germany

- Molecular and genetic studies (CGs)
- Metabolic and biochemical studies
- Histology of flower buds

AR&FS co-lead for field applications

- Crop load and fruit quality studies
- Adaptation of predictive thinning models (i.e. MaluSim)
- Digital imagery
Biennial bearing – facts

• occurs in temperate and (sub)tropical fruit crops at tree but also at branch level

• most/ all apple cultivars are susceptible to some level of biennial bearing, causing an annual financial loss to growers of about 30-50 Mill Euro in Germany (also a large opportunity cost in Australia?)

• frequently triggered by unsuitable weather conditions

• climate change will aggravate the problem

• good genetics, physiological understanding and management techniques can manage the issue
Annual cyclical changes in flowering and cropping

<table>
<thead>
<tr>
<th>1. Year</th>
<th>Flowers</th>
<th>Fruit load</th>
<th>Fruiting buds</th>
<th>2. Year</th>
<th>Flowers</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>many</td>
<td>heavy</td>
<td>few/ no</td>
<td>OFF</td>
<td>few/ no</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OFF</td>
<td>few/ no</td>
<td>little/ no</td>
<td>many</td>
<td></td>
<td>few/ no</td>
</tr>
</tbody>
</table>


Monday, 18 June; Speed Updating: Consistency instead of irregularity
Fruit growth and flower bud formation

peach  plum  cherry  apple and pear

fruit growth  bud development  fruit growth  bud development

What do we study?

2 cultivars x 2 treatments x 4 trees weekly x 15 weeks x 50 buds x 2 years

= 24,000 buds
Developmental stages of apple buds


Flower Bud Development, 2016, Germany

Number of initiated buds increases

Not initiated = 0

Initiated = 1

Flower Bud Development, 2016, Germany

10/1/18
Molecular and physiological control of Flower Initiation

integrator genes
FT, LFY, FUL

repressor genes
TFL1, SOC1

identity genes
AP1, AP2, LFY,
FLU, CAL, ...

Flowering

Flower induction in apple is triggered by...
(EU examples)

**Environmental cues**
- day length (> 14 hrs)
- temperature
- light intensity

**Phenology**
- ≥ 9 leaf primordia
- 39-53 dafb
- specific calendar date
- around 21st June (Europe)

**Cultural interventions**
- thinning
- PGR applications
- pruning/ shoot formation

*Transmissible plant signals*
- genes (proteins); carbohydrates; phytohormones

*But flower induction in apple is still a black box!*
Regulation of crop load for breaking the cycle


Monday, 18 June; Speed Updating: Consistency instead of irregularity

Yield (kg/tree) 1 year after thinning

<table>
<thead>
<tr>
<th>Date of thinning</th>
<th>Yield</th>
<th>% thinning</th>
</tr>
</thead>
<tbody>
<tr>
<td>4/5</td>
<td>60</td>
<td>47</td>
</tr>
<tr>
<td>10/5</td>
<td>50</td>
<td>69</td>
</tr>
<tr>
<td>26/5</td>
<td>40</td>
<td>75</td>
</tr>
<tr>
<td>15/7</td>
<td>30</td>
<td></td>
</tr>
</tbody>
</table>

distance (cm) of remaining clusters:
- 10
- 20
- 30
Activities Australia: Carbon balance modelling

• Translation of model MaluSim into R language

• Adaptation of MaluSim to Australian conditions
  • 140,000 simulations
  • Fruit numbers from 100 to 1200
  • Spurs (240 to 686) and shoots (193 to 387)
  • Up to 80 days from green tip
  • Comparison of weather data between USA and Australia
USA Recommendations based on C balance

<table>
<thead>
<tr>
<th>Weather</th>
<th>Carbon supply</th>
<th>Carbon demand</th>
<th>Carbon balance</th>
<th>Thinners efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dark, cloudy weather</td>
<td>Reduces solar radiation intercepted, reducing photosynthesis</td>
<td></td>
<td>Lowers</td>
<td>Thinner are more effective</td>
</tr>
<tr>
<td>High night-time temperatures (&gt;18.3°C)</td>
<td></td>
<td>Increases respiration</td>
<td>Lowers</td>
<td>Thinner are more effective</td>
</tr>
<tr>
<td>High daytime temperatures (&gt;29.4°C)</td>
<td>Encourages stomata closure, reducing photosynthesis</td>
<td></td>
<td>Lowers</td>
<td>Thinner are more effective</td>
</tr>
<tr>
<td>Clear sunny days</td>
<td>Increases solar radiation intercepted, increasing photosynthesis</td>
<td></td>
<td>Increases</td>
<td>Thinner are less effective</td>
</tr>
<tr>
<td>Cool daytime temperatures (&lt;18.3°C)</td>
<td></td>
<td>Slows fruit growth rates</td>
<td>Increases</td>
<td>Thinner are less effective</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4-day average carbon balance</th>
<th>Thinning Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 0g/day</td>
<td>Increase chemical thinner rate by 30%</td>
</tr>
<tr>
<td>0g/day to -20g/day</td>
<td>Apply standard chemical thinner rate</td>
</tr>
<tr>
<td>-20g/day to -40g/day</td>
<td>Decrease chemical thinner rate by 15%</td>
</tr>
<tr>
<td>-40g/day to -60 g/day</td>
<td>Decrease chemical thinner rate by 30%</td>
</tr>
<tr>
<td>-60g/day to -80 g/day</td>
<td>Decrease chemical thinner rate by 50%</td>
</tr>
<tr>
<td>&lt; than -80g/day</td>
<td>Do not thin (many fruits will fall off naturally)</td>
</tr>
</tbody>
</table>
Crop Load Results – Fruit size (grams)

- **Kanzi**
- **Rosy Glow**
Results – Fruit total soluble solids

Kanzi

Rosy Glow

R² = 0.7267

R² = 0.6484
Crop Load Application and return bloom

**Kanzi return bloom**
- 2016-17
- 2017-18

**Rosy Glow return bloom**
- 2016-17
- 2017-18

Flower clusters vs. Crop load (fruit/cm²)

Flower clusters vs. Crop load (fruit/cm² TCSA)
3. Tree and fruit nutrition for improved apple productivity

**Team leader:** Dr Nigel Swarts (Project lead)

**Organisation:** Tasmanian Institute of Agriculture and Plant and Food Research (NZ).

**Topic:**

Apple tree and fruit nutrition for improved productivity.
The SINATA model
Strategic Irrigation and Nitrogen Assessment Tool

**SOIL DATA**
- Water content [L/L]
- Pressure head [cm]

**CROP DATA**
- Variety
- Training system
- Root stock
- Phenology
- Planting density
- Yield target

**CLIMATE DATA**
- Historical (BOM)
- Daily values
- Solar radiation
- Temp & RH%
- Wind speed
- Rainfall

**MANAGEMENT**
- Irrigation
- N Fertilizer
- Crop Load
- Timing
- Rates
- Strategies

**SPASMO CORE**

**OUTCOMES**
- Irrigation need
- Fertilizer need
- Yield & Response
- Benchmarking
- Planning
- What-if answers
World’s best data!!
Sap flow data used for a Climate-based estimates of tree water use (FAO-56)

- Tree water use is estimated using  
  \[ ET_C = K_C ET_O \]

- The crop factor, \( K_C \), derived for 1-yr old Envy apple trees
Soil Report: Grey Kurosol, Hansens Orchard, Huon Valley, Tasmania

Site 1. Location: Huon Valley, Hansen orchards,
Grid reference: -43.014179, 147.065392
Elevation: 30 m
Australian Soil Classification: Grey Kurosol
Landscape description: Hillslope
Mapping Unit: Huon Loam
Geology: Permian Mudstone, Lower Permeener Supergroup.
Substrate material: Pebbly mudstone & sandstone.
Site description:
Slope: <5% 40 cm tree mound
Aspect: minimal
Runoff: Poor
Drainage: Poor
Surface coarse fragments: None

Table 1: Soil Profile Morphology

<table>
<thead>
<tr>
<th>Horizon</th>
<th>Depth (cm)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>0-25</td>
<td>Dark reddish brown (5YR 3/2m); clay loam; Moderate 2-10 mm, polyhedral structure; consistence very weak; common very fine to fine medium (&lt;2mm) macropores; fine cracks; non-repellent; few, fine to coarse (1-10 mm) roots;</td>
</tr>
<tr>
<td>B21</td>
<td>25-39</td>
<td>Light grey (10YR 7/2); light clay, moderate, blocky (?); structure; consistence firm; common fine distinct sharp brown organic mottles on macropores and ped faces, and common medium faint orange diffuse mottles; 10-20 mm thick sub-angular stone layer along the upper B21</td>
</tr>
<tr>
<td>B22</td>
<td>39-70+</td>
<td>Pinkish Grey (7.5YR 7/2); light clay +; Structure unknown, consistence weak; many moderate 50-100mm, prismatic structure; few fine distinct red mottles; many organic cutans; many medium distinct orange clear mottles; distinct few, clay skin cutans; few fine (&lt;5 mm) voids, fine cracks; few fine to very fine roots.</td>
</tr>
</tbody>
</table>
Integrating soils data into SINATA

A screenshot from the SINATA model (Version 2.0) showing the list of available soil series and a subset of the requisite hydraulic and physical properties of the selected soil series. Data for each soil series will be selected using a filter tab on the soils worksheet.
Interpretation of soils data

Soil Moisture mm by Horizon: Hansen

UnAvailable | Available-Tightly Held | Readily Available | Drainable Porosity

Soil Horizon:
- A1
- B21
- B22

Soil Moisture % by Horizon: Hansen

UnAvailable | Available-Tightly Held | Readily Available | Drainable Porosity

Soil Horizon:
- A1
- B21
- B22
Bi Zheng Tan (PhD study)
15N fertigation trial

<table>
<thead>
<tr>
<th>Treatment</th>
<th>N application timing</th>
<th>N rate (kg N ha(^{-1}))</th>
<th>Excavation timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>none</td>
<td>0</td>
<td>2018 winter &amp; 2019 summer</td>
</tr>
<tr>
<td>Pre-harvest</td>
<td>4 weekly fertigation from 3 weeks after full bloom</td>
<td>50</td>
<td>2018 winter &amp; 2019 summer</td>
</tr>
<tr>
<td>Post-harvest</td>
<td>4 weekly fertigation from 1 week after harvest</td>
<td>50</td>
<td>2018 winter &amp; 2019 summer</td>
</tr>
<tr>
<td>50-50 split</td>
<td>2 fortnightly fertigation during pre- and post harvest</td>
<td>50</td>
<td>2018 winter</td>
</tr>
</tbody>
</table>
- Harvest and 8-weeks post harvest stored at 2°C
- Fruit size, weight, colour, firmness, TSS, starch index
Commence of Leaf mineralisation trial – NPK interaction trial

Below ground excavation – Weekly leaf sampling
- Fruit quality assessment
- Tree excavation at commercial harvest (March)

Commence of
- Leaf mineralisation trial
- NPK interaction trial

June 2018 – 2018-19 season

Incomplete & in progress

June 2018

2018-19 season
4. Profitable Pears

**Team leader:** Dr Ian Goodwin (Project lead)

**Organisation:** Department of Economic Development, Jobs, Transport and Resources (Victoria).

**Topic:** Investigate sustainable management techniques to increase precocity, fruitfulness and fruit quality of new pear cultivars.
Objective

Investigate sustainable management techniques to increase precocity, fruitfulness and fruit quality of new pear cultivars.

Pear field laboratory, Tatura
Planting systems experiment

Materials and Methods

• Tree training: 2D Open Tatura, 2D Vertical, 3D Traditional
Planting systems experiment

• Tree training: 2D Open Tatura, 2D Vertical, 3D Traditional
• Tree density: tree spacing 0.5 to 3.0 m (2D single- and multi-leader; 3D central leader, spindle and vase)
• Rootstocks: D6, BP1, Quince A/Beurre Hardy

2D vertical single-leader
0.5 m tree spacing

2D vertical two-leader
1.0 m tree spacing

2D vertical four-leader
2.0 m tree spacing
Planting systems experiment

Results

Yield – 5th leaf after planting bench grafted trees

<table>
<thead>
<tr>
<th>Tree spacing (m)</th>
<th>2D Open Tatura</th>
<th>3D Traditional</th>
<th>2D Vertical</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>50</td>
<td>55</td>
<td>60</td>
</tr>
<tr>
<td>1.0</td>
<td>55</td>
<td>60</td>
<td>65</td>
</tr>
<tr>
<td>1.5</td>
<td>60</td>
<td>65</td>
<td>70</td>
</tr>
<tr>
<td>2.0</td>
<td>65</td>
<td>70</td>
<td>75</td>
</tr>
<tr>
<td>2.5</td>
<td>70</td>
<td>75</td>
<td>80</td>
</tr>
<tr>
<td>3.0</td>
<td>75</td>
<td>80</td>
<td>85</td>
</tr>
</tbody>
</table>

LSD₅%
Planting systems experiment

Results

Yield – 5th leaf after planting bench grafted trees

- Yield decreased with increase in tree spacing
Planting systems experiment

Results

Yield – 5th leaf after planting bench grafted trees

- Yield decreased with increase in tree spacing
- Yield lowest on BP1 rootstock
Yield decreased with increase in tree spacing

Yield lowest on BP1 rootstock

Yield high on QA rootstock at low tree densities
Planting systems experiment

Results

Fruit colour – 5th leaf after planting bench grafted trees

Red coverage (% fruit surface area)

Tree spacing (m)

2D
Open Tatura

3D
Traditional

2D
Vertical

BP1
D6
QA

LSD5%

PIPS
Apples & Pears

ANP-0131
Planting systems experiment

Results

Fruit colour – 5th leaf after planting bench grafted trees

- High density Open Tatura trellis had lowest red coverage
Rootstock x cultivar experiment

Materials and Methods

• D6, BP1, D6/BM2000, D6/Nijisseiki, D6+virus, Quince A/BH, Quince C/BH

• RCBD with nine tree plots
• Open Tatura trellis
• 1 x 4.5 m spacing
• 4 vertical leaders @ 50 cm
• Drip irrigated
Rootstock x cultivar experiment

Results

Yield – 5th leaf after planting nursery trees

Yield (t/ha equivalents)

LSD₅%

ANP-0131

ANP-0118

ANP-0534
Rootstock x cultivar experiment

Results

Yield – 5th leaf after planting nursery trees

- ANP-0131 highest yield
Rootstock x cultivar experiment

Results

Yield – 5th leaf after planting nursery trees

- ANP-0131 highest yield
- ANP-0118 performed better on Quince C rootstock
Rootstock x cultivar experiment

Results

• ANP-0131 highest yield
• ANP-0118 performed better on Quince C rootstock
• BP1 lowest yield
Rootstock x cultivar experiment

Results

Red colour coverage – 5th leaf after planting nursery trees

![Graph showing red coverage percentages for different rootstocks and cultivars, with LSD5% values indicated.](image-url)
Rootstock x cultivar experiment

Results

Red colour coverage – 5th leaf after planting nursery trees

- ANP-0131 highest red colour coverage
Fruiting behaviour

Materials and Methods

i. Return bloom and fruit set

ii. Pollen compatibility
## Fruiting behaviour

### Results

Return bloom and fruit set

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Return bloom (%)</th>
<th>Return set (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANP-0131</td>
<td>67</td>
<td>51</td>
</tr>
<tr>
<td>ANP-0118</td>
<td>83</td>
<td>67</td>
</tr>
<tr>
<td>ANP-0534</td>
<td>24</td>
<td>19</td>
</tr>
</tbody>
</table>
Fruiting behaviour

Results

Return bloom and fruit set

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Return bloom (%)</th>
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<tbody>
<tr>
<td>ANP-0131</td>
<td>67</td>
<td>51</td>
</tr>
<tr>
<td>ANP-0118</td>
<td>83</td>
<td>67</td>
</tr>
<tr>
<td>ANP-0534</td>
<td>24</td>
<td>19</td>
</tr>
</tbody>
</table>

- Return bloom and set on bourse shoot high for ANP-0131 and ANP-0118
Fruiting behaviour

Results

Pollen compatibility

<table>
<thead>
<tr>
<th>Polliniser</th>
<th>ANP-0131</th>
<th>ANP-0118</th>
<th>ANP-0534</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANP-0131</td>
<td>X</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>ANP-0118</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>ANP-0534</td>
<td>NA</td>
<td>NA</td>
<td>X</td>
</tr>
<tr>
<td>Corella</td>
<td>✔️</td>
<td>✔️</td>
<td>NA</td>
</tr>
<tr>
<td>Ya Li</td>
<td>✔️</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Tanzhiya</td>
<td>✔️</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Hosui</td>
<td>NA</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Howell</td>
<td>NA</td>
<td>✔️</td>
<td>✔️</td>
</tr>
</tbody>
</table>

- Blush pears are compatible with each other and other pollinisers
Fruiting behaviour

Results

Pollen compatibility

<table>
<thead>
<tr>
<th>Polliniser</th>
<th>ANP-0131</th>
<th>ANP-0118</th>
<th>ANP-0534</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANP-0131</td>
<td>X</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>ANP-0118</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>ANP-0534</td>
<td>NA</td>
<td>NA</td>
<td>X</td>
</tr>
<tr>
<td>Corella</td>
<td>✓</td>
<td>✓</td>
<td>NA</td>
</tr>
<tr>
<td>Ya Li</td>
<td>✓</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Tanzhiya</td>
<td>✓</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Hosui</td>
<td>NA</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Howell</td>
<td>NA</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

- Blush pears are compatible with each other and other pollinisers
- ANP-0118 is self fertile
### Fruiting behaviour

#### Results

##### Pollen compatibility

<table>
<thead>
<tr>
<th>Polliniser</th>
<th>ANP-0131</th>
<th>ANP-0118</th>
<th>ANP-0534</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANP-0131</td>
<td>X</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>ANP-0118</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>ANP-0534</td>
<td>NA</td>
<td>NA</td>
<td>X</td>
</tr>
<tr>
<td>Corella</td>
<td>✔</td>
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<td>Howell</td>
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<td>✔</td>
<td>✔</td>
</tr>
</tbody>
</table>

- Blush pears are compatible with each other and other pollinisers
- ANP-0118 is self fertile
- Timing of flowering and pollinator activity critical for set
Colour development

Materials and Methods

i. White reflective mulch

- ANP-0131 grafted on BP1
- +/- reflective mulch
- +/- netting
- 7 weeks from 27 Oct 2017 (35 DAFB)

<table>
<thead>
<tr>
<th>Height in canopy</th>
<th>Outside netting</th>
<th>Under netting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mulch Control</td>
<td>Mulch Control</td>
<td></td>
</tr>
<tr>
<td>1.5 m</td>
<td>28 5</td>
<td>21 4</td>
</tr>
<tr>
<td>2.8 m</td>
<td>20 5</td>
<td>14 4</td>
</tr>
</tbody>
</table>

ii. Seasonal artificial shading and exposure of fruit

- ANP-0534 grafted on D6
- 15 weeks from 16 Oct 2017 (21 DAFB)
- Shaded for 12 weeks and 3-week periods

Colour was measured with a spectrophotometer (Minolta CM-2600d)
Results

• No significant benefit of mulch in late spring and early summer
Colour development

Results

Seasonal artificial shading and exposure of fruit

- Shading caused loss in red colour
- Red colour developed rapidly when fruit exposed to sunlight
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Thank you