Overview of cherry industry
Research, Development & Extension at TIA

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This project has been funded by HAL using the cherry industry levy, voluntary contributions from the Washington Tree Fruit Commission and matched funds from the Australian Government.
Optimising cherry fruit set, crop load and fruit nutrition and size Phase 2: Dugald Close, Sally Bound, Matt Whiting*, Nigel Swarts, Jo Jones, Eric Mertes, Bob Dambergs, Steve Paterson, Justin Direen, Ross Corkrey

Fruit set (Sally Bound, Matt Whiting)
Can we manipulate fruit set with PGRs?

2011/12 season (Kordia at Cherries Tasmania, Old Beach)
2012/13 season (Regina at Cherries Tasmania, Old Beach)

3 application times
single application at 30% or 80% bloom, or double application at 30 & 80% bloom

2 rates
500 or 750 g Retain/ha (Kordia)
500 or 1,000 g Retain/ha (Regina)
Results: Fruit set

Kordia - 3 weeks before harvest

Regina - 10 weeks before harvest

No significant differences for
- Retain rate, or
- time of application (30% bloom, 80% bloom or 30 & 80% bloom)
Results: % cracked fruit

44% reduction in cracking with Retain

No significant differences for
- Retain rate (500 or 750 g/ha), or
- time of application (30% bloom, 80% bloom or 30 & 80% bloom)

Kordia

Regina

No treatment effect
- minimal cracking in 2012/13 due to dry season
No significant differences for
- Retain rate (500 or 750 g/ha)

Similar trends in Regina but
not significant
Flower / fruitlet abscission
(Jo Jones – first season results)

- Kordia had a higher rate of flower / fruitlet abscission when compared with Lapin.
- Trunk girdling 6 weeks after full bloom decreased the rate of abscission in Lapin.
- The effect of girdling on abscission in Lapin suggests a possible competition for carbohydrates between the roots and the developing fruitlets.
- Lack of effect in Kordia suggests that competition with roots for carbohydrate is not a factor in abscission.
Summary

- Positive effects of Retain were observed on fruit set
  - 57% fruit set increase in Kordia
  - 33% fruit set increase in Regina
- Reduction in fruit cracking
- Inconsistent and minimal effect on size & firmness – crop load effects?
- Reduction in stem retention
- No effect of retain on other quality parameters (sugar, acid, colour)
- Fruitlet abscission is not due to carbohydrate availability in Kordia
Crop load effects on quality (Bound, Close, Measham, Whiting)

Trees thinned by hand to 1, 2 or 4 buds/spur at pre-bloom, full bloom, 2, 4, 6 (& 8 in Sweetheart) weeks after full bloom (WAFB)

- In 2011/12 Firmtech and stem pull force also negatively correlated with crop load
Results – what about cracking?

- 2010/11 year with significant late season rainfall
- Clearly risk of cracking is high at low crop loads
- Where is the sweet spot?!
Post-harvest effects of crop load and thinning timing on quality?

- Similar responses of fruit from crop load and thinning treatments to storage for 28 days irrespective of initial quality at harvest – i.e. what goes in comes out!

- Good correlation between GÜSS Fruit Texture Analyser and FirmTech II
Crop load management:

- At high crop load (above 15-20 T/ha) fruit size, sugar, acid and firmness decreased in Van and Sweetheart

- (The earlier the thinning, the better the fruit quality response – hence work on ethrel applied at 2-3 weeks post bloom as a thinner)

- 15 T/ha (~2 buds/spur treatment) best compromise between optimal quality and cracking risk?

- Correlation between flesh texture and compression test supports utility of the latter for industry

- Same response post-harvest between fruit of treatments emphasises the importance on quality at harvest for the consumer experience of exported fruit
Role of Nitrogen Fertigation in Cherry Fruit Quality and Consumer Perception
(Nigel Swarts, Eric Mertes, Dugald Close)

What do we know about pre-harvest N use in tree crops?

• Strong competitive effect: vegetative growth vs fruit development

• Major influence on yield components of fruit number per tree and fruit mass at maturity

• Very little information on the effect of N on cherry fruit quality relative to other tree crops – e.g. apples, peaches

• Most studies use instrumental quality assessment – what do consumers perceive?
Study objectives

1. Can N concentration in fruit be manipulated through pre-harvest fertigation?

2. If so - how does this influence cherry fruit quality at- and post-harvest?

3. Can consumers perceive differences between –
   i) fruit grown with high N at-harvest and post-harvest
   ii) export quality fruit at-harvest and post-harvest
   iii) between the two fruit grades

4. How does consumer perception align with instrument measurements of fruit quality?
Fertigation trial established at Grove Research Station

- Lapins on F12-1 approx 10 years old – Spanish bush

- Four N treatments - 0N (water only), 25g, 50g and 75g N per tree as Calcium Nitrate - 5 replicates each

- Treatments split into 4 x weekly applications – November

- Fruit quality assessments: **firmness**, **skin and flesh firmness**, **stem pull force**, **TSS** and titratable acidity

- Analysis completed at harvest, 25 days and 50 days post-harvest
Results

Can we manipulate N in cherry fruit using pre harvest fertigation? - Yes

Did fruit N concentration have an influence on fruit quality? – Yes on firmness only

Total N in cherry fruit

Flesh firmness
Can consumers see, feel and taste the difference?

Consumer trial to test the difference between
- Cherries from high N treatment at two storage dates?
- High quality export cherries at two storage dates?
- High quality export cherries versus High N treatment cherries?

Consumers ranked variables 1-5, mean rank analysed with T-tests

57 people, 11 fruit quality assessment variables
Summary

1. Can we manipulate N in cherry fruit using pre-harvest fertigation?
   - During the fruit expansion stage there is clear evidence of immediate N uptake and movement into fruit – very easily manipulated

2. Did this significant result have an influence on fruit quality?
   - Only for firmness. Growers need to be wary of how much N is applied pre-harvest

3. Consumer perception:
   - High N fruit: deterioration in sweetness, acidity, flavour intensity, overall texture and juiciness after storage
   - Export grade fruit: no significant deterioration in quality attributes after storage was perceived

4. Consumer alignment with objective measures
   - Consumer perception of sweetness, acidity and firmness matched objective measures for export quality fruit and the comparison between fruit grades
   - Consumer perception of increased firmness with time in storage of high N fruit did not align with objective measures – due to flesh dehydration?
Effect of cherry variety and fruit density on fruit rot - Karen Barry and Penny Measham

- $2,000 to support a UTAS Honours project, by student Michael Tarbath

- Experiments conducted in one block of a Huonville orchard in the 2011-2012 season

- Significant effect of tree variety on total rot found at harvest; Sweetheart had about double the amount of rotten fruit compared to Regina and Simone.

- Crop load did not influence the amount of rotten fruit found at harvest for any variety, although crop load was low in this season at this site.

- Removing fungicide application during the last 53 days of fruit growth did not significantly alter disease incidence.

- Found all disease caused by Botrytis and not Brown Rot on this site.
Improving Marketable Yield of Premium Quality Fruit  (Penny Measham)

Reduced cracking and increased yield
1. Spray treatments reduced losses from 2.3 t/ha to 1.9 t/ha
2. Maintaining crop load reduced losses by up to 50%
3. Maintaining uniform irrigation reduced losses by up to 30%
4. Strategic pruning reduced losses by up to 30%

Increased yield, quality good
1. Marketable yield can be improved by reducing cracking
2. Some sprays significantly increased the average fruit size

More importantly, the increase in size is not just significant on paper, but actually increased the number of trees with fruit in the larger class sizes therefore having the potential to increase margins.

Allowed investigation of optimum yields for both quality and cracking ‘bush system’
Reducing the Impact of Late Season Rainfall

-Nutrition and irrigation (Penny Measham)

Aim; To build resilience into fruit before rainfall occurs by ensuring structural integrity

- Calcium levels in fruit at harvest were not influenced by application type, timing of application, or irrigation level
- Foliar applications increased calcium in the fruit skin
- Stem retention related to skin calcium and decreased in the absence of early foliar applications
- Fruit firmness increased with a full foliar program
Student involvement (in 2012/13 season)

Honours

Diurnal growth patterns of sweet cherry fruit
Matthew Calverley (P. Measham, A. Gracie)

Uniformity of bud burst in cherry
Nicholas MacNair (P. Measham, A. Quentin)

Masters

The influence of soil fungi on water uptake
Hend Mohammed (K. Barry, P. Measham)

PhD

Fruit Quality and Phenolic Chemistry During Post-Harvest Storage
Eric Mertes (D. Close, N. Swarts, J. Jones)

Understanding fruit set in sweet cherry
Hamid Jafari (P. Measham, S. Bound)
Communications and extension material – Michele Buntain (IDO) with input from TIA team and Penny Domeney as consultant

- Cherry Splitting
- Managing water and nutrients
- Fruit set, crop load, size
- Ionisation
- Chill
- Abscission
- Greenhouse gas emissions
- Cherry Flavours
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• A great team of researchers