Overview of cherry industry Research, Development & Extension at TIA

TASMANIAN INSTITUTE OF AGRICULTURE

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HAL
Horticulture Australia

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

UTAS

TIA is a joint venture of the University of Tasmania and the Tasmanian Government

Tasmania
Explore the possibilities

Current/recently completed projects:

1. Optimising cherry fruit set, crop load and fruit nutrition and size (2010-2012)

➢Dugald Close, Sally Bound, Matt Whiting*, Erik Smith*, Nigel Swart, Eric Mertes, Bob Dambergs, Eva Aertse, Audrey Quentin, Penny Measham, Lieke Hennen

2. Improving marketable yield of premium quality cherries (2009-2012)

➢Penny Measham, Sally Bound

3. Effect of cherry variety and fruit density on fruit rot (2012)

➢Penny Measham, Karen Barry, Kathy Evans

4. Sustaining production in marginal climates (2012)

➢Penny Measham, Audrey Quentin

5. Extension contributions to the CGA newsletter, factsheets, cherry export manual, IPM poster (Ongoing)

➢Penny Domeney

New projects

1. Reducing the impact of late season rainfall (2012-2015)

➢ Penny Measham, Sally Bound, Karen Barry, Penny Domeney

2. Optimising cherry fruit set, crop load and fruit nutrition and size – Phase 2 (2012-2015)

➢ Dugald Close, Sally Bound, Matt Whiting*, Erik Smith*, Nigel Swart, Jo Jones, Eric Mertes, Bob Dambergs

3. Improving fruit quality and consistency in cherries through maximised nutrient availability (2012-2017)

➢ Sally Bound, Penny Domeney, Penny Measham

Optimising cherry fruit set, crop load and fruit nutrition and size

Fruit set

i. Variability in flowering time, fruit set and fruit quality?
ii. Can we manipulate fruit set with PGRs?
iii. Can we manipulate fruit set or quality using targeted trunk or branch girdling?

Crop load management

i. What is the optimum crop load and post-bloom thinning for yield/size?
ii. When is the best time to thin to the targets?
iii. Which buds have the greatest quality potential?

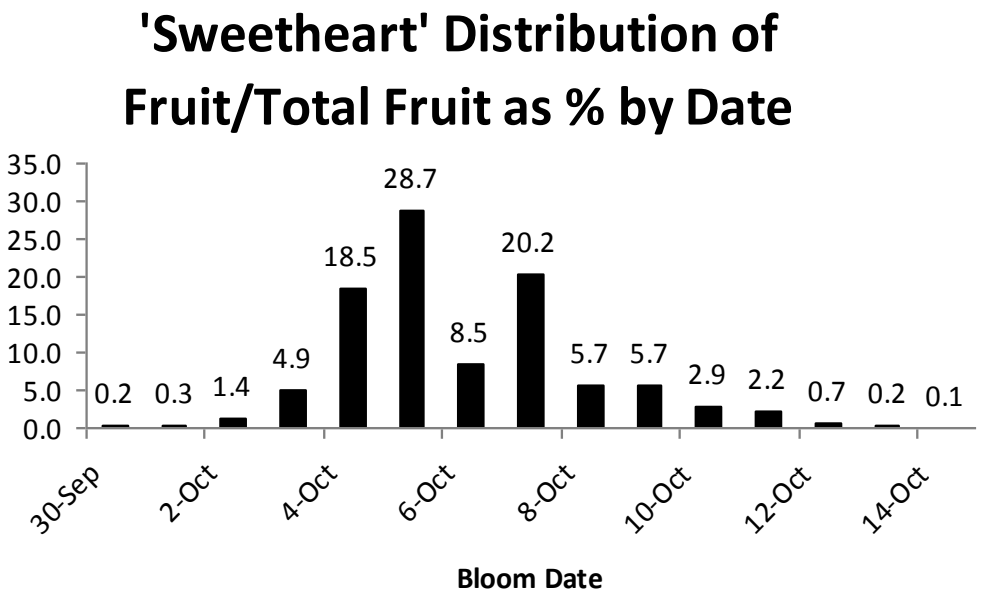
Fruit nutrient matrix

i. What are the nutritional characteristics of high-quality fruit?
ii. Can we develop a nutrient matrix for fruit quality?

Fruit set

i. *Variability in flowering time, fruit set and fruit quality? (concluded in 2010/11 season)*

• Fruit set was 35% Simone, 37% Van and 38% Sweetheart, around 75% of which was set over a 4-day window, not increased by hand pollination.
• Fruit from earlier bloom date was not of higher quality than later bloom date fruit, in contrast to some results from Washington State (where crop loads were much higher)



Fruit set

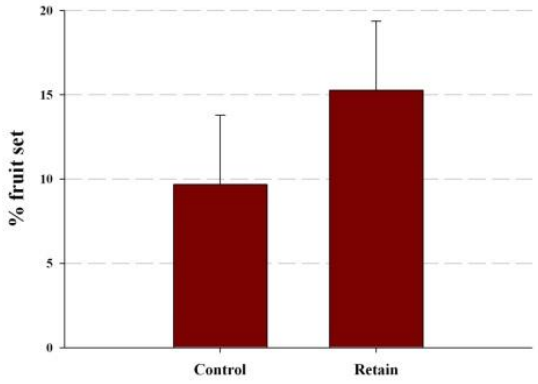
ii. Can we manipulate fruit set with PGRs?

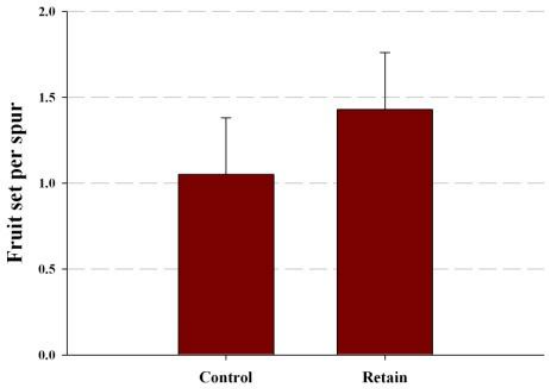
2010/11 season results promising but inconclusive (adverse rainfall)

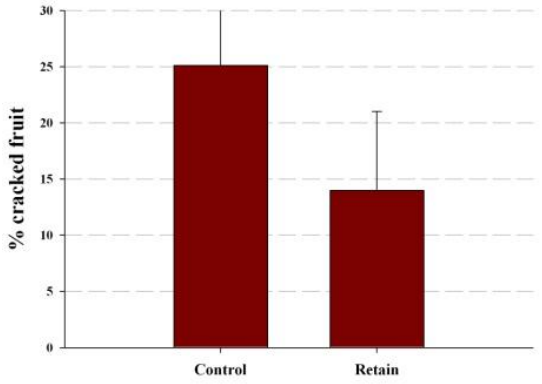
2011/12 season (Kordia [results shown below] and Regina at Cherries Tasmania, Old Beach):

Treatments:

1. untreated control
2. 4g Retain / 5L water @ 30% bloom
3. 4g Retain / 5L water @ 80% bloom
4. 4g Retain / 5L water @ 30% & 80% bloom
5. 6g Retain / 5L water @ 30% bloom
6. 6g Retain / 5L water @ 80% bloom
7. 6g Retain / 5L water @ 30% & 80% bloom





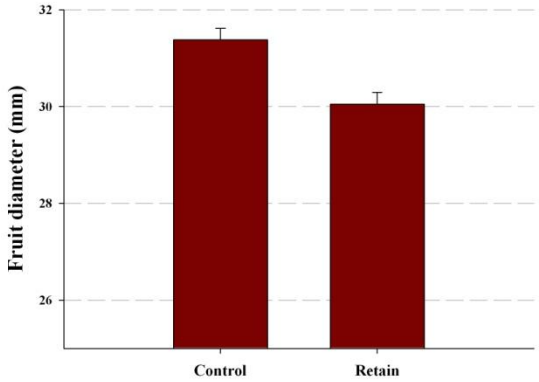


Higher fruit set, higher fruit set per spur (and less cracked fruit)!

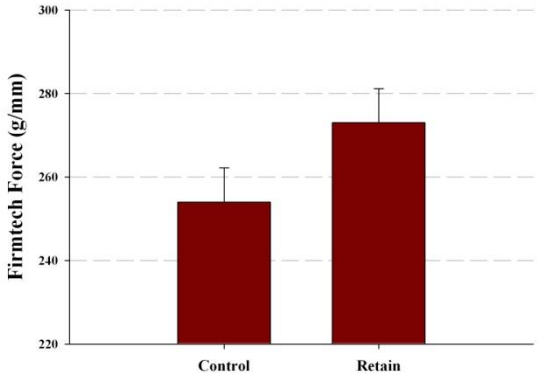
Fruit set

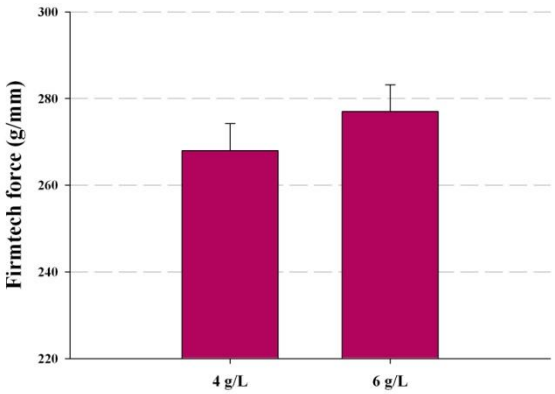
ii. Can we manipulate fruit set with PGRs?

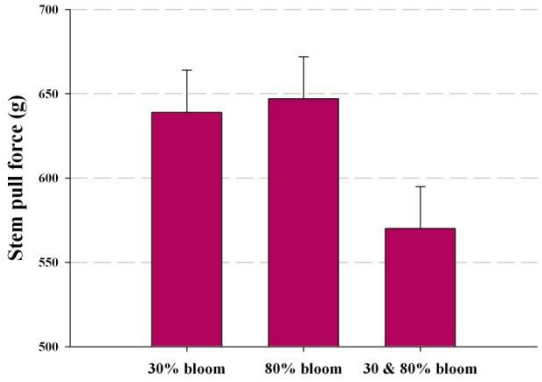
But there are impacts on fruit quality



- Higher set comes with smaller fruit







- Firmness greater with retain, with 6 g/L and stem pull force impacted by double application

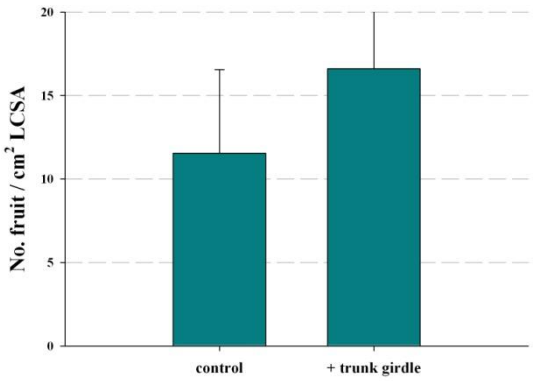
Fruit set

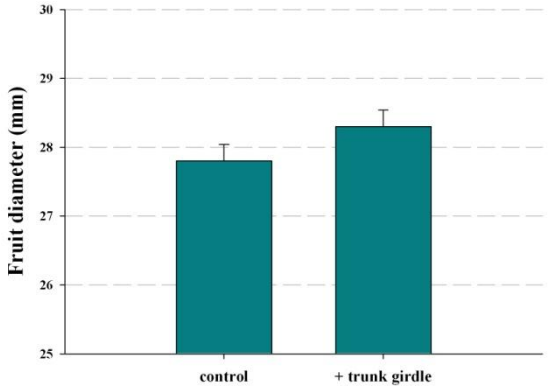
iii. *Can we manipulate fruit set using targeted trunk or branch girdling?*

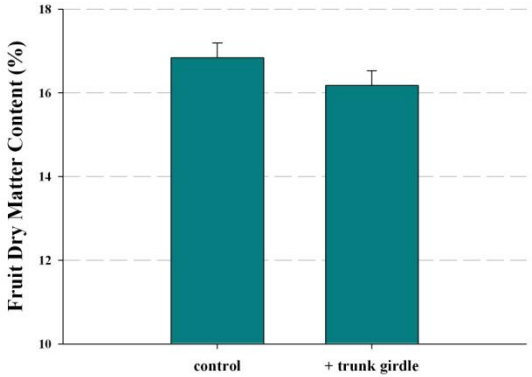
Treatments: Kordia and Regina (results shown below) at Cherries Tasmania, Old Beach, ± Trunk girdle (pre-bloom), Limb girdle: nil, pre-bloom

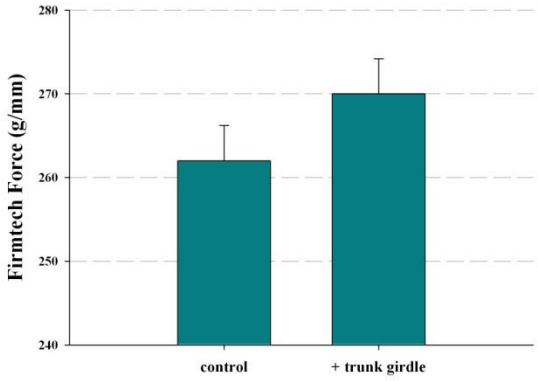
Results (limb girdling results inconclusive):

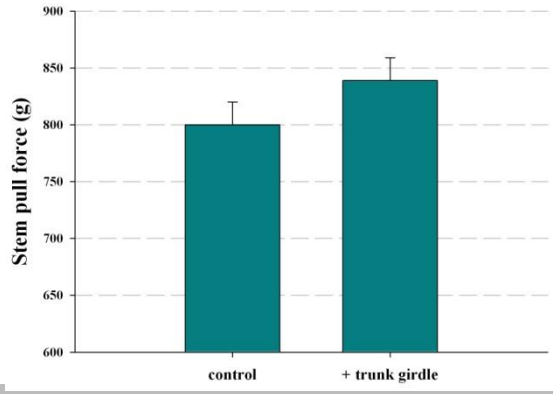
- No effects on fruit set
- But positive effects on yield and fruit size (no negative impact on sugar)
- Negative impact on fruit dry matter content











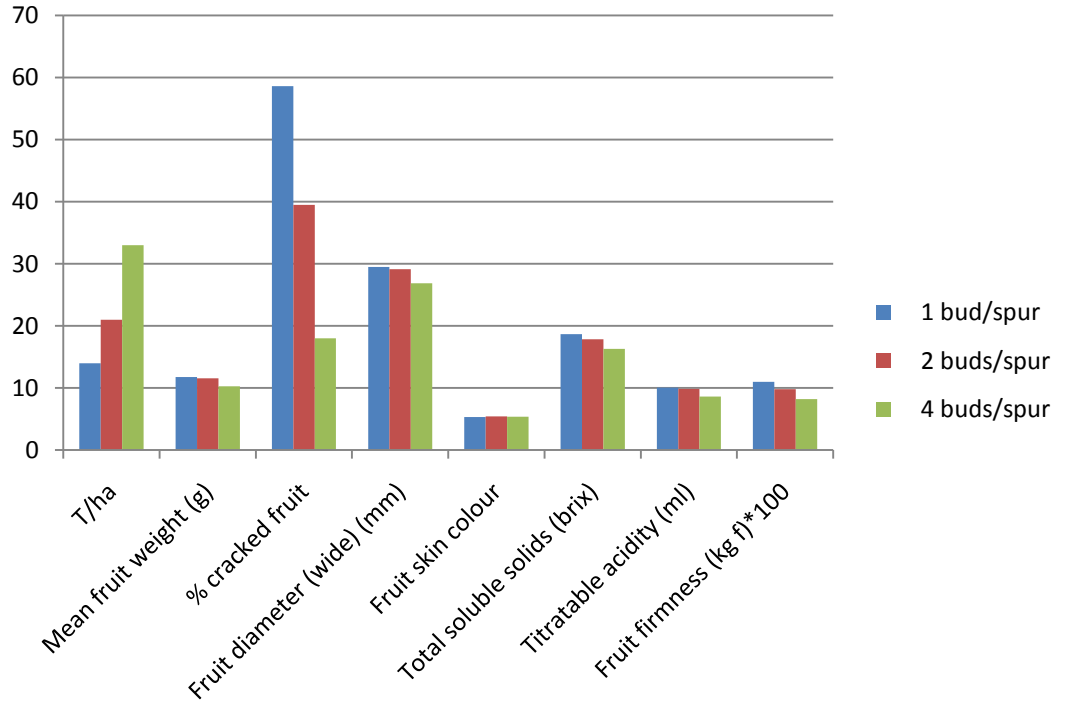
- Positive effects on firmness and stem-pull

Crop load management

i. What is the optimum crop load and post-bloom thinning for yield/size?

Results (Van at Reids Fruit - same trends in Sweetheart):

- 14-33 T/Ha
- Fruit weight and diameter lower at high crop load
- Sugar, acid and firmness lower at higher crop load
- Cracking 59% at low crop load compared to 18% at high – a challenge!

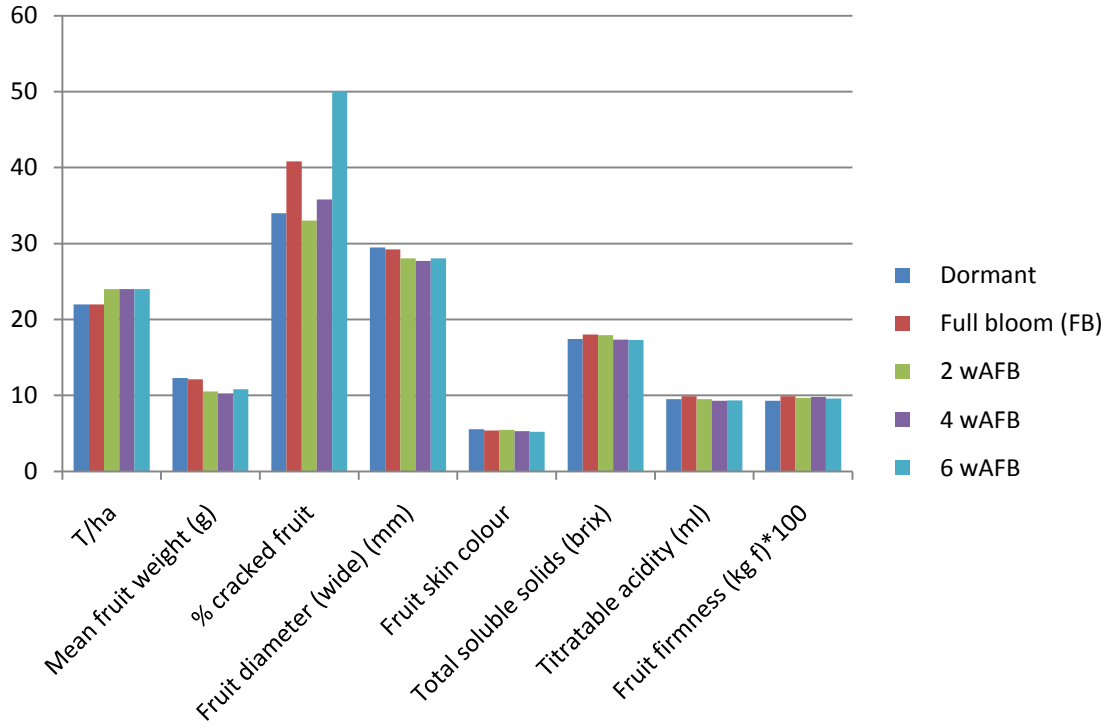


Crop load management

ii. When is the best time to thin to the targets?
2010/11 results (using Van):

- Fruit from thinning at dormant or FB larger
- % Cracking similar
- Fruit from 4 and 6 wAFB less colour
- Sugar, TA and firmness similar

Audrey and Hawa thinning Sweetheart 6 wAFB



Crop load management

iii. Which buds have the greatest quality potential?

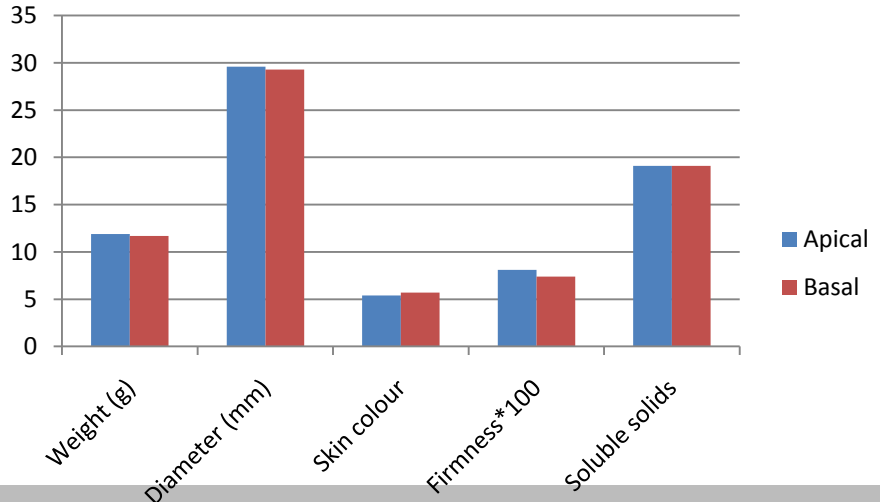
Methods:

- Simone, Kordia and Van
- Apical and basal buds labelled **or**
- Spurs thinned to apical or basal bud only

Above: apical and basal buds labelled
Right: Experimental tree

Results:

- Little differences – industry advice to discontinue this line of research



Summary:

Fruit set:

i. Timing of flowering did not affect quality

ii. Application of retain at 30 or 80% bloom increased fruit set and firmness but decreased fruit size of Kordia

iii. Trunk girdling increased Regina yield, fruit size, firmness and stem pull

Crop load management:

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

ii. Thinning buds or thinning at full bloom leads to increased fruit size relative to later thinning

iii. No difference was found in fruit quality from apical or basal buds

Fruit nutrient matrix

i. What are the nutritional characteristics of high-quality fruit?

ii. Can we develop a nutrient matrix for fruit quality?

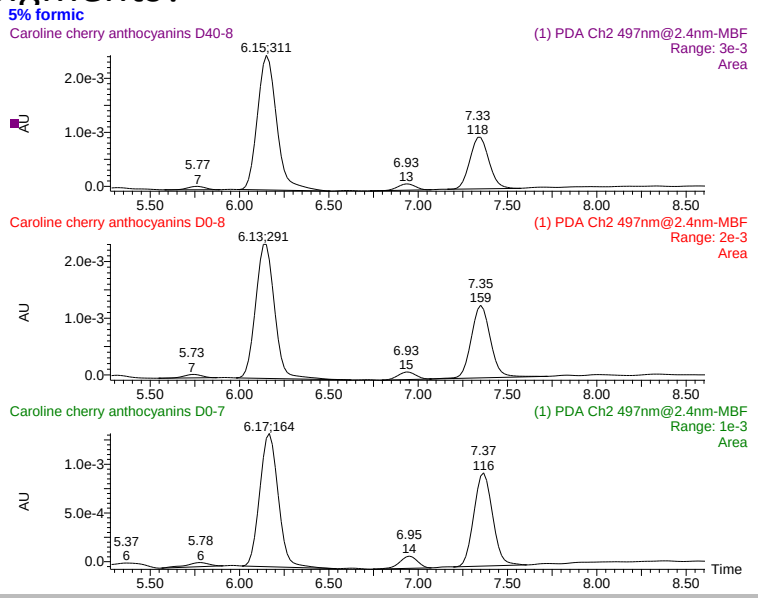
•Fruit from 7 orchards of wide range of nutrient content

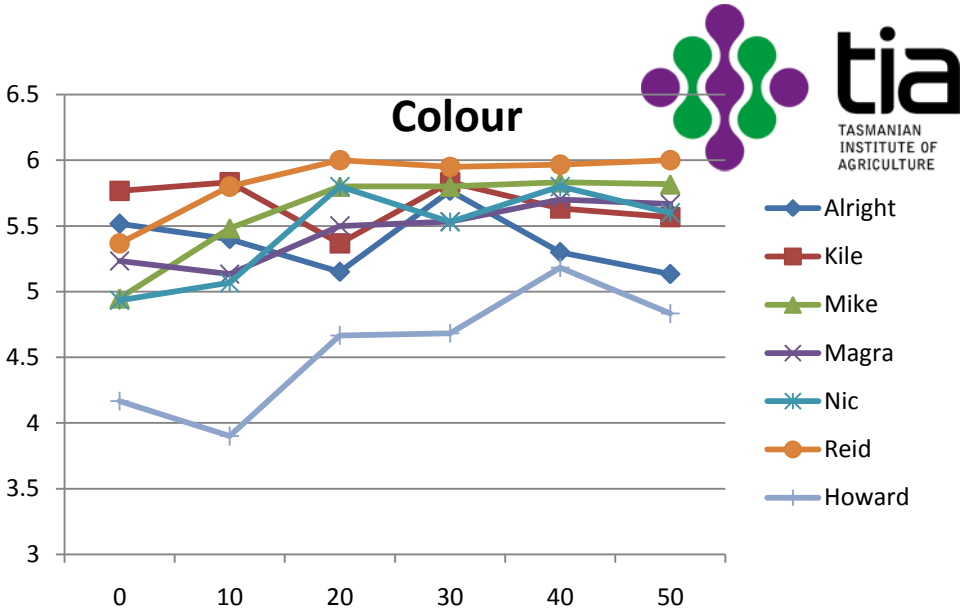
•Postharvest quality:

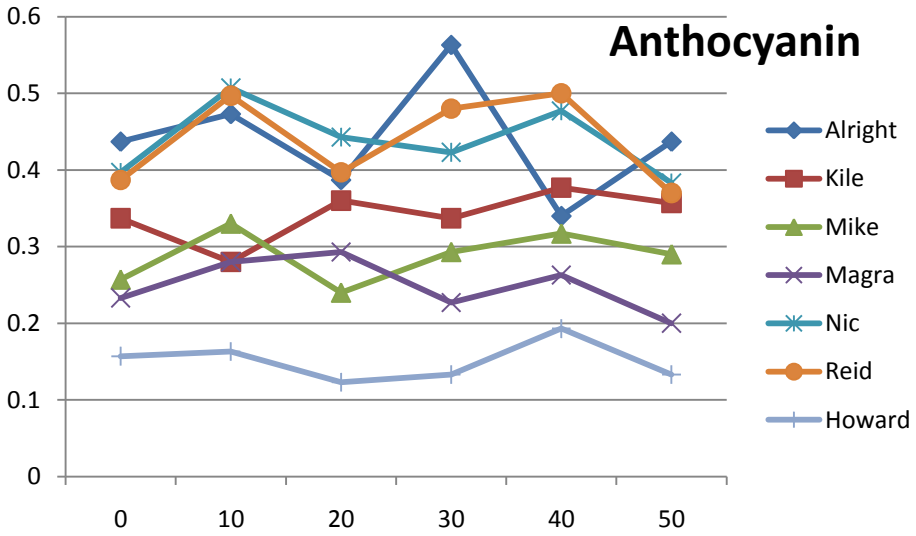
- Sugar levels steady
- Acid gradually decreased with time
- Firmness gradually increased with time (due to dehydration)
- Given the linear responses can we predict post-harvest quality based on fruit quality at harvest?

Quality post-harvest

- Colour generally increases with physiological ripening then stays constant
- Anthocyanin does not correlate with colour indicating that increases in colour due to oxidation of pigments? i.e. a general 'blackening' of tissues
- But HPLC indicates that this is not due to oxidation of anthocyanin pigments, or changes in general phenolic profiles – oxidation of chlorophyll and carotenoid pigments?

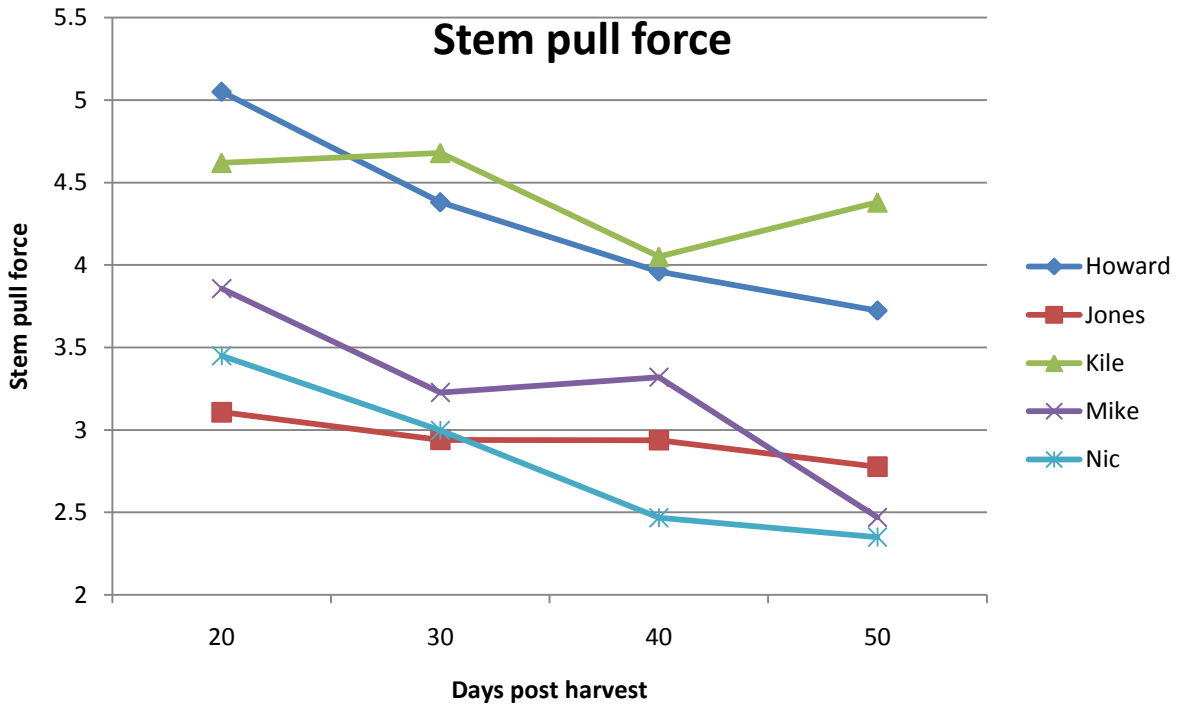






Quality post-harvest

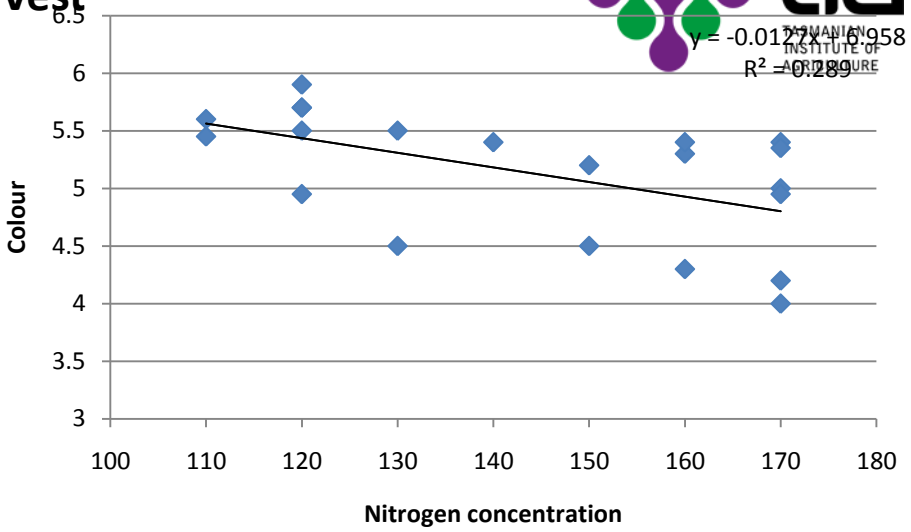
• Stem pull force gradually decreases with time since harvest (excellent potential for prediction given straight-line relationship)

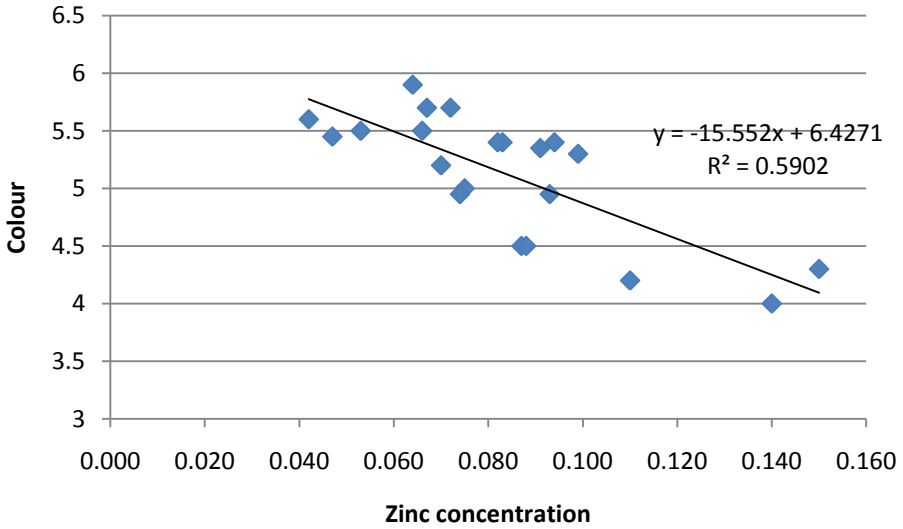


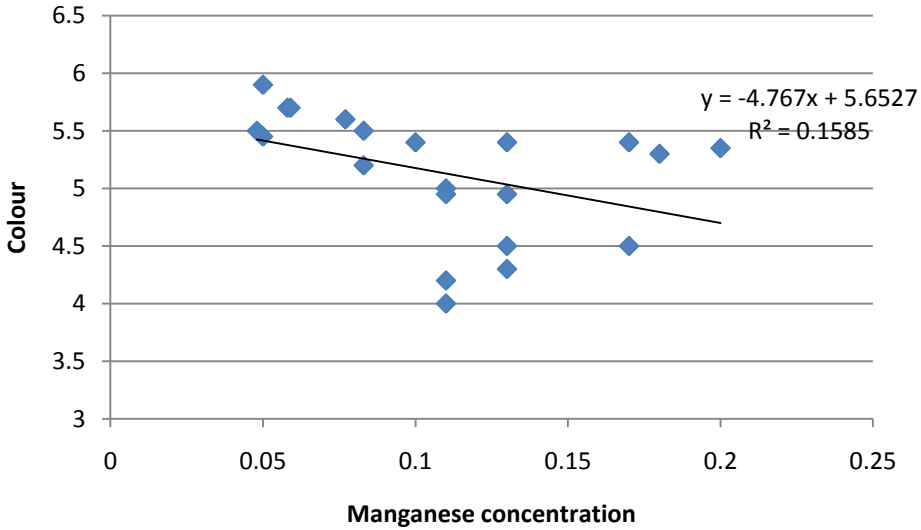
Correlations of nutrition with quality at harvest

- Significant correlations of decreased fruit colour with increased fruit nitrogen, zinc and manganese concentrations

- No other significant correlations of any nutrients with any of the measured quality attributes at harvest



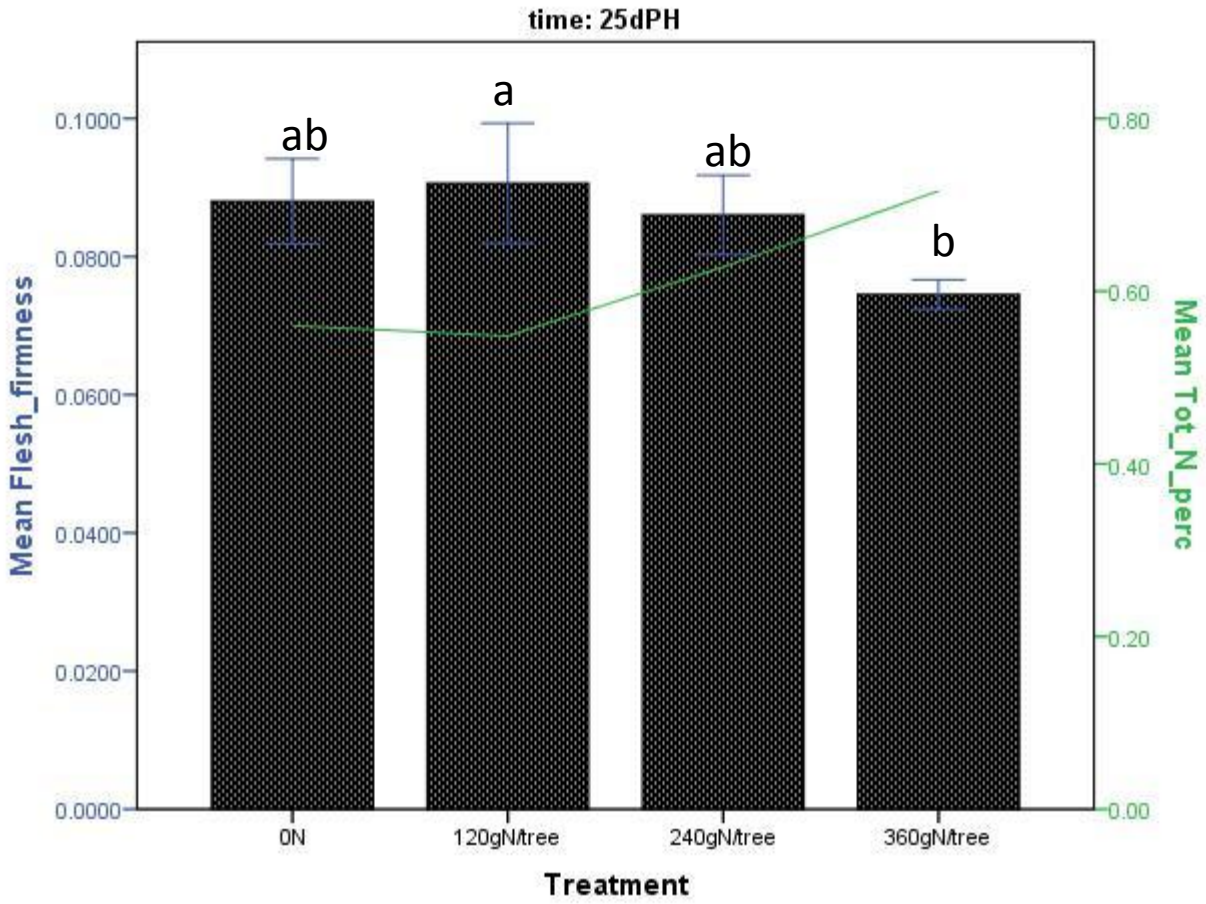




2011/12 season:

Can we manipulate fruit nutrition through fertigation and will this benefit quality post-harvest?

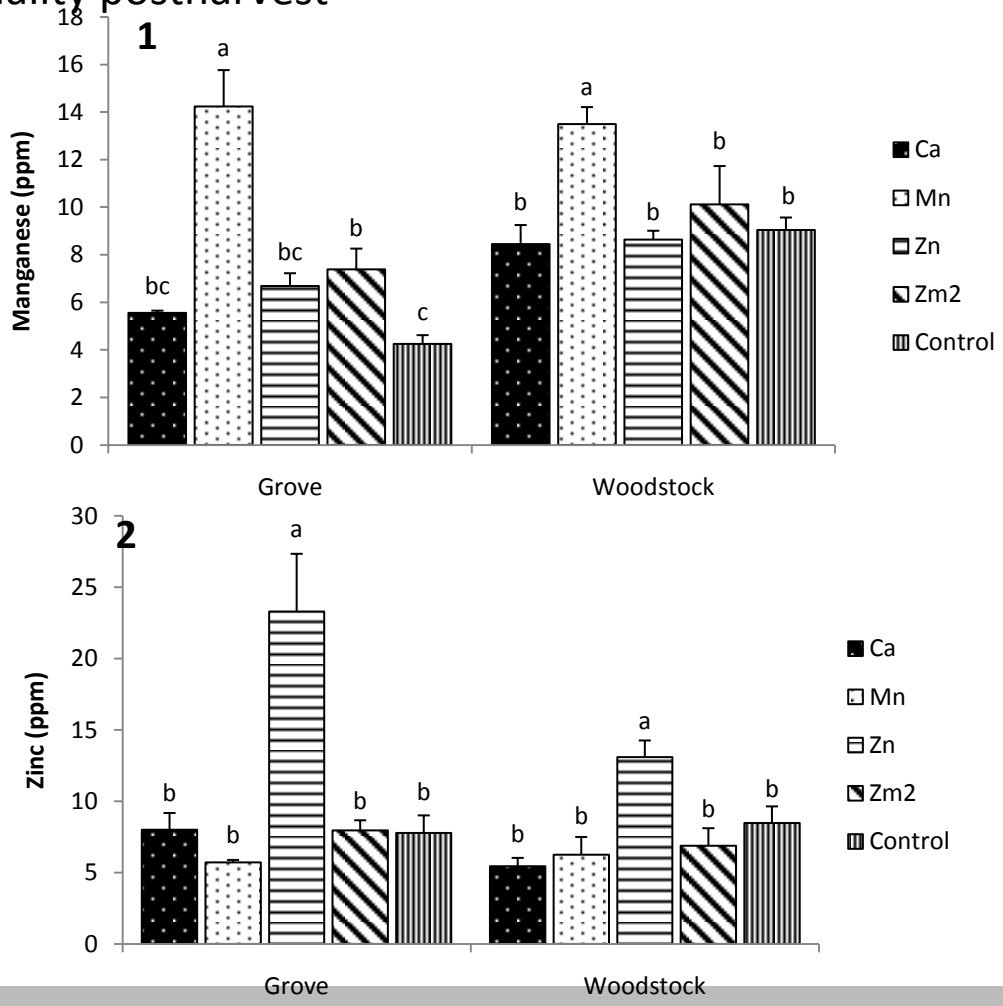
- Yes – we can manipulate fruit nitrogen content
- Yes - increased fruit nitrogen content correlates with decreased firmness at the upper end of nitrogen applications



2011/12 season:

Can we manipulate fruit nutrition through foliar sprays and will this benefit quality post-harvest?

- Yes – we can manipulate fruit manganese and zinc, (but not with Zm^2)
- No – we cannot manipulate fruit calcium
- No impacts on quality postharvest



Summary:

- There was large variation between orchards in fruit nutrition and quality at harvest
- As previously shown firmness (Guss flesh texture) increased (due to dehydration = decreased perception of firmness to the consumer?), sugar was constant and acids and stem pull force decreased linearly with time since harvest
- At harvest Colour decreased with increasing fruit nitrogen, zinc and manganese concentration
- High N fruit = soft fruit post-harvest
- Foliar zinc and manganese sprays increase fruit content of these nutrients, but there was no positive effect post-harvest

Improving marketable yield of premium quality cherries

Penny Measham and Sally Bound

Three year project 2009-2012

Aims to Improve marketable yield by

a) Reducing cracking
b) Maintaining quality

Final season results support previous trends;

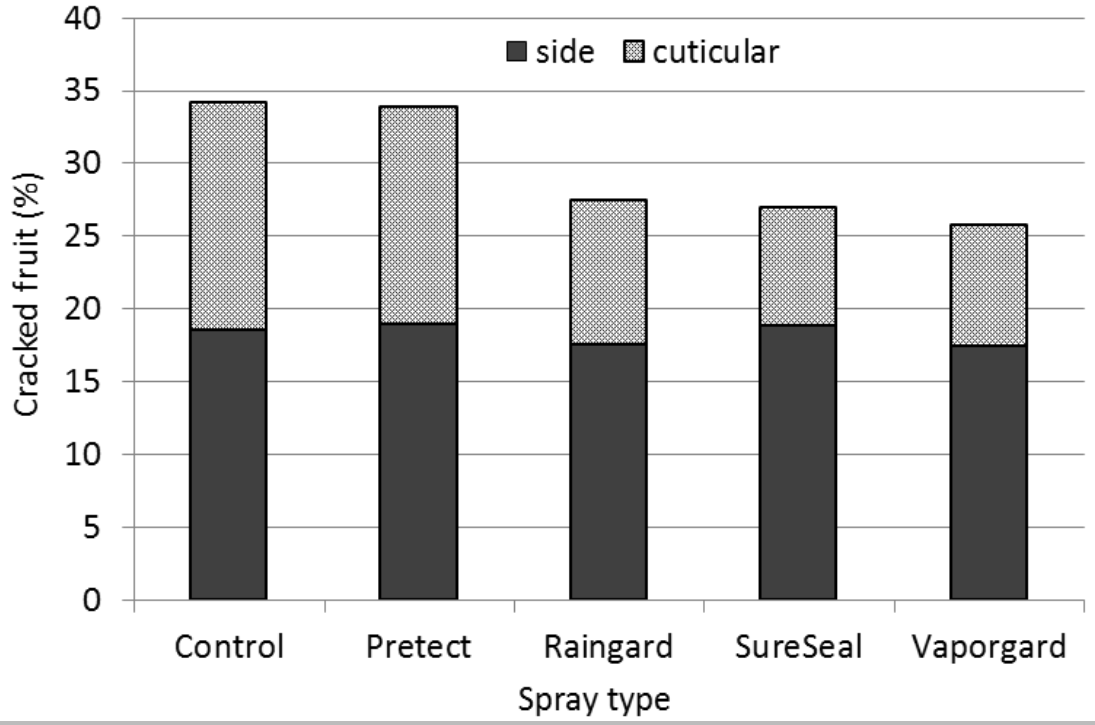
Strategies to reduce cracking include sprays, irrigation regimes, crop load and pruning

(Slides provided by Penny Measham)

Sprays reduced cracking by up to 50% in 2010/11 and 33% in 2011/12

Majority of reductions in **cuticular** cracks (apical and stem end)

Quality parameters not adversely affected

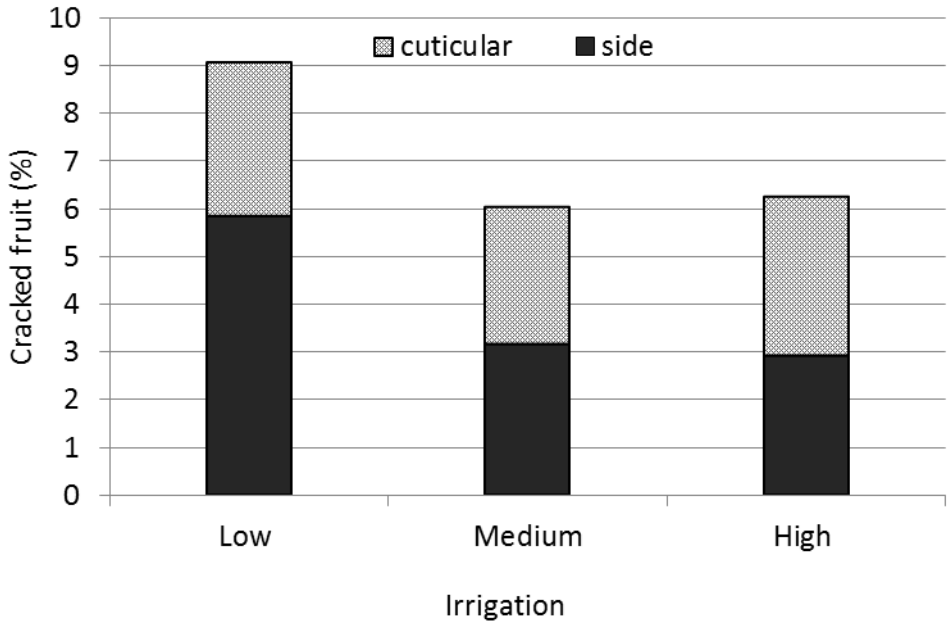


Maintaining higher soil moistures reduced cracking by up to 33% in 2011/12

Reduced cracking index values in all years

Majority of reductions in **side** cracks

Quality parameters not adversely affected

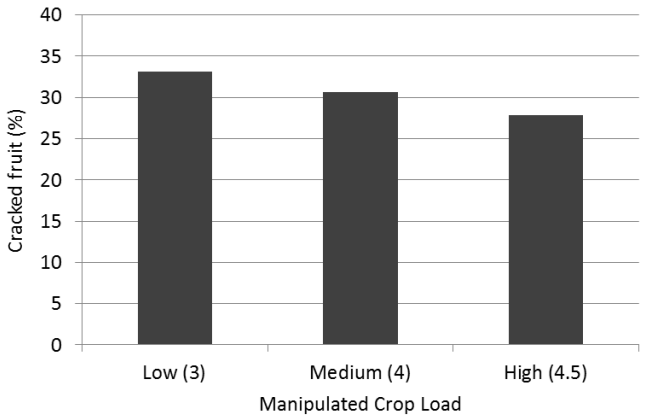


Crop load influenced cracking in all years

Measham, PF and Bound, SA and Gracie, AJ and Wilson, SJ, 'Crop load manipulation and fruit cracking in sweet cherry (*Prunus avium* L.)', *Advances in Horticultural Science*, **26** (1) pp. 25-31.

Pruning dependant on fruit maturity, and timing (rainfall)

- During rainfall, reduced cracking
- Just before rainfall, no impact
- Within three weeks before harvest, improved quality
- At Stage II, reduced quality



Effect of cherry variety and fruit density on fruit rot

Penny Measham, Karen Barry, Katherine Evans

One year project 2011/2012

Aims;

- Literature review of brown rot in cherries (and management options)
- Investigate effect of crop load and fruit quality on rot incidence
- Investigate incidence of latent infection over time
- Investigate relationship of fruit phenolic chemistry with latent infection

Chemical analyses underway

Sustaining production in marginal climates

Penny Measham, Audrey Quentin

One year project 2012/2013

Aims;

- Quantify chill requirement of two varieties
- Investigate relationship between chill conditions and bud burst uniformity
- Investigate relationship between bud carbohydrate levels (pruning) and bud burst uniformity
- Investigate response to chill requirements of buds with different carbohydrate levels

Trials commencing

Acknowledgements

• Industry for support of our research

• Growers for generous donation of fruit and for discussions:
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• FGT honours scholarships to Eric Mertes and Nick MacNair

• Peter Morrison and Andrew Hall for discussions on fertigation and fruit nutrition

• The projects were funded by HAL using the cherry industry levy, voluntary contribution from the Washington Tree Fruit Commission and matched funds from the Australian Government

• A great team of researchers