Red Drupelet Disorder in Blackberries: Update 2016

Max Edgley
PhD Candidate
Tasmanian Institute of Agriculture (TIA)
University of Tasmania
max.edgeley@utas.edu.au

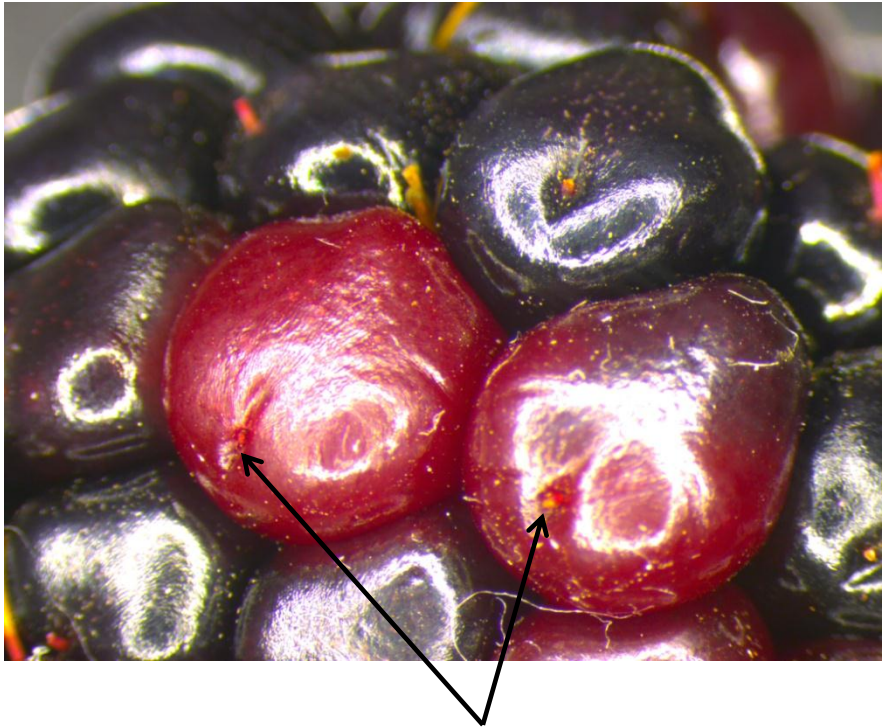
TIA is a joint venture of the University of Tasmania and the Tasmanian Government

Project Overview

- Three years, commenced in August 2015
- *Year one:* Inducing the disorder and understanding the underlying physiology behind drupelet reversion
- *Year one/two:* Mechanisms responsible for causing or increasing susceptibility to the disorder
- *Year two/three:* Evaluating potential management techniques for reducing the disorder

Red Drupelet Disorder

- Postharvest reddening of previously black individual drupelets
- Can affect up to 50% of a fruit – up to 30% of a crop
- Reduces marketability – consumer perception is defective fruit
- Very little research into the disorder
- Loss of anthocyanin pigment is the underlying factor (cyanidin 3-glucoside)



Red drupelets showing signs of physical damage

Causes of Reversion

- Rapid temperature and/or humidity changes seem to cause increased expression of the disorder
  - Rapid swelling and shrinking of the cell wall
  - Fruit harvested >22.5C suffers the most
- More exposed areas in storage suffer
  - Cool quicker, more moisture loss
  - Top of pallets, front of cool room
- Physical damage a major cause
  - Blackberries are very fragile
  - Picking, packing, and shipping all add to risk
- Nutrition may also play a role

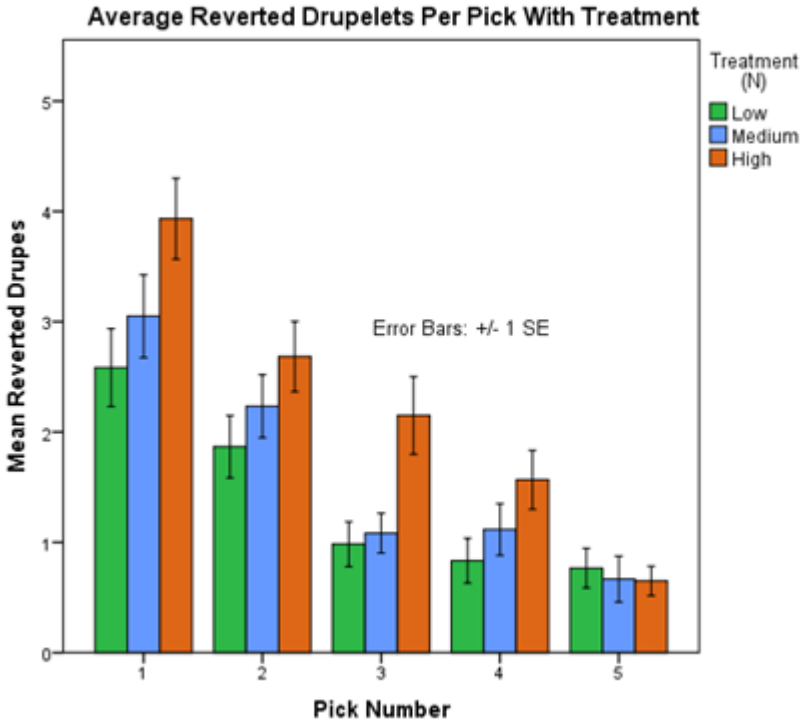
Season One Trials

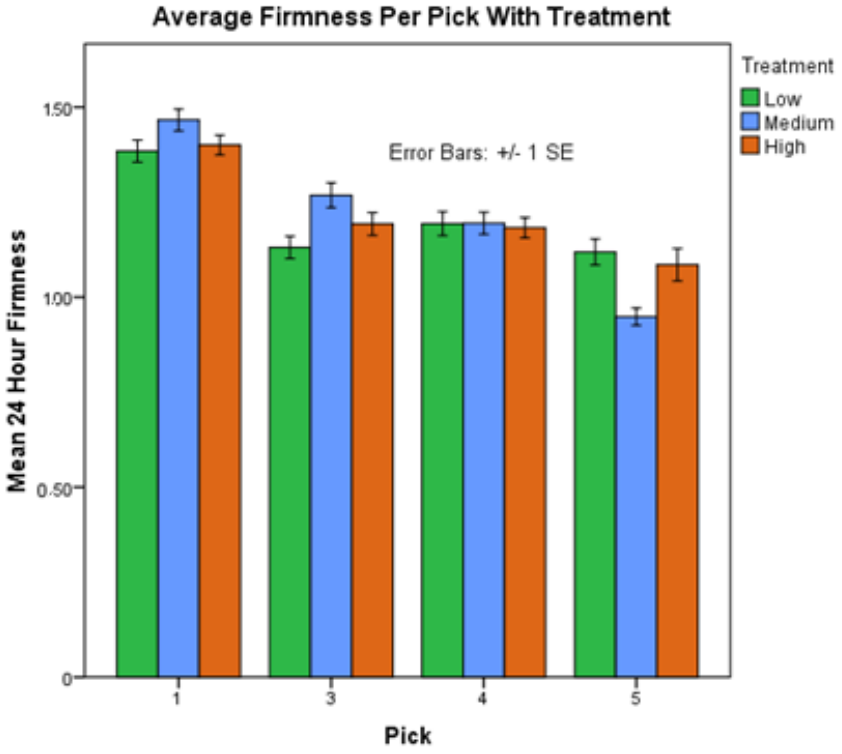
- Nitrogen manipulation trial
  - High N identified as a possible factor
- Inducing reversion with physical damage and temperature manipulation
  - Bruising and manipulating storage temp
- Assessing effectiveness of staged cooling
- Detailed analysis of the biochemistry in affected drupelets
  - Soluble solids, pH, titratable acidity, full anthocyanin pigment analysis

Season One Trials
Nitrogen manipulation

- Some growers indicated that high nitrogen applications during harvest increased susceptibility to RDD
- High, medium, and low applications were applied via fertigation during harvest
- Randomised complete block design
- Harvested five times through the season
- Fruit assessed for RDD, firmness, yield, berry weight, pH, TA, brix, anthocyanin content

Season One Trials: Preliminary Results





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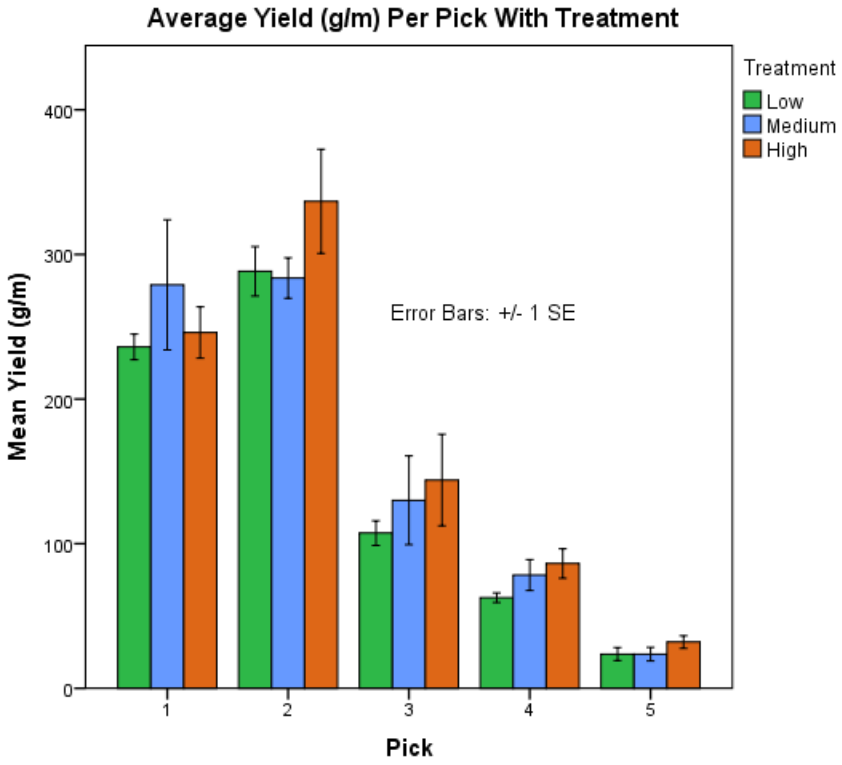

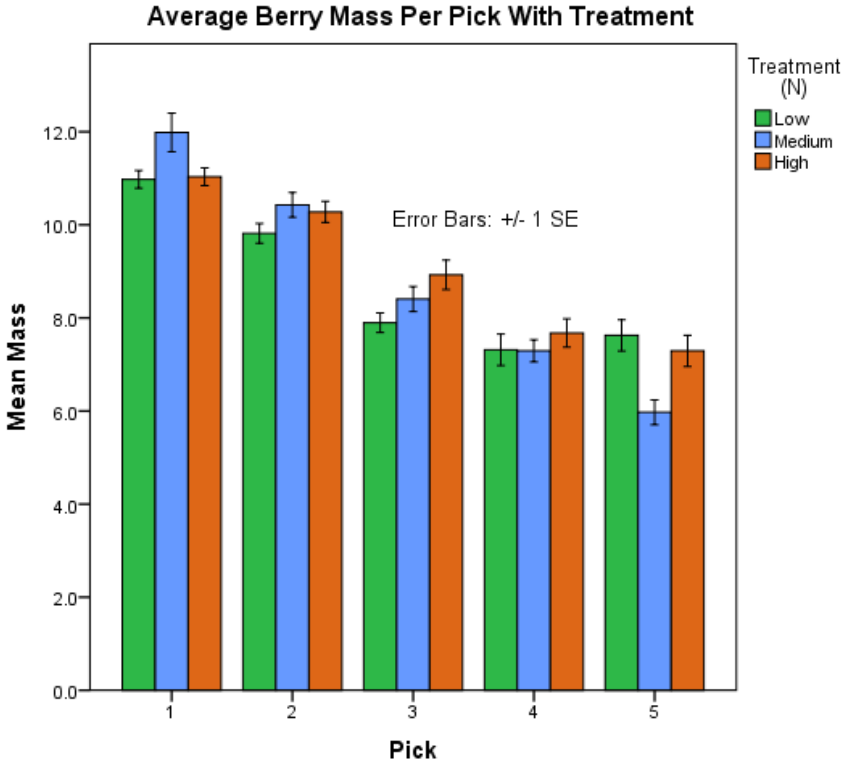

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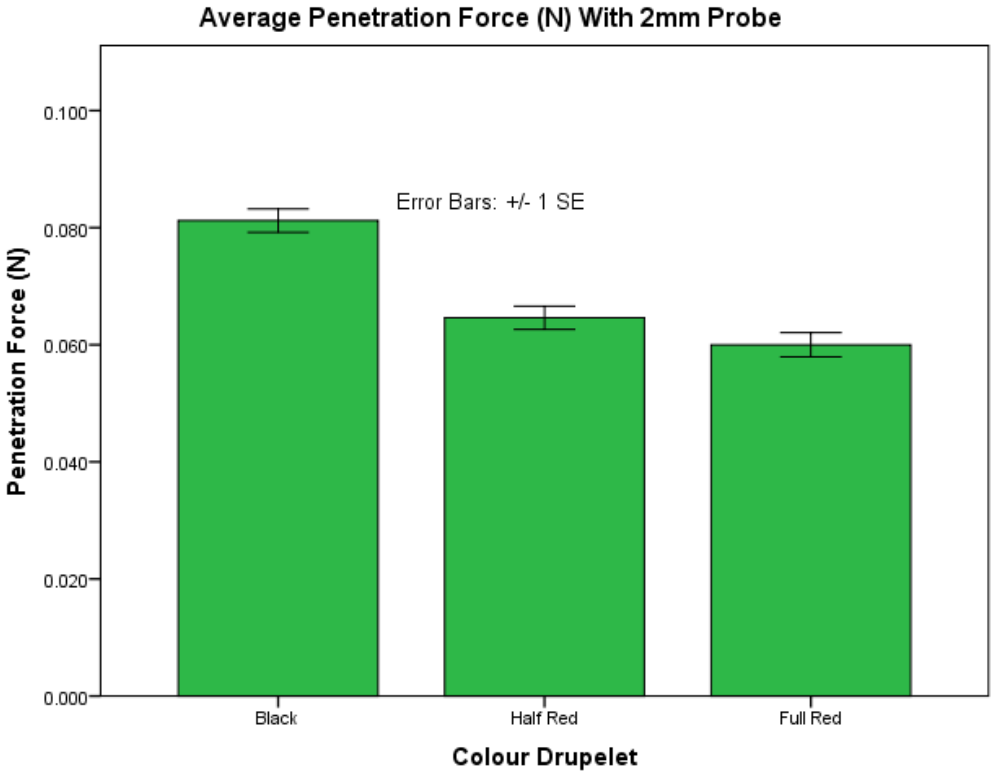


Season One Trials : Staged Cooling

- Fruit was harvested on three dates early in the season
- Two treatments:
    1. Precooled: 8C for two hours, 2C for 22 hours
    2. No precooling: 2C for 24 hours
- Assessed for drupelet reversion and quality

Season One Trials : Staged Cooling

Treatment	Number of fruit assessed	% Fruit with no reversion	% Fruit with 1-4 reverted drupelets	% Fruit with 4+ reverted drupelets
Pre-cooled	400	41.5	36.9	22.4
Non Pre-cooled	400	23.4	45.4	30.4

- 23.4% of 2C stored fruit showed no reversion compared to 41.5% of pre-cooled fruit
- Smaller difference in total number of reverted drupelets – severe reversion still affected pre-cooled fruit

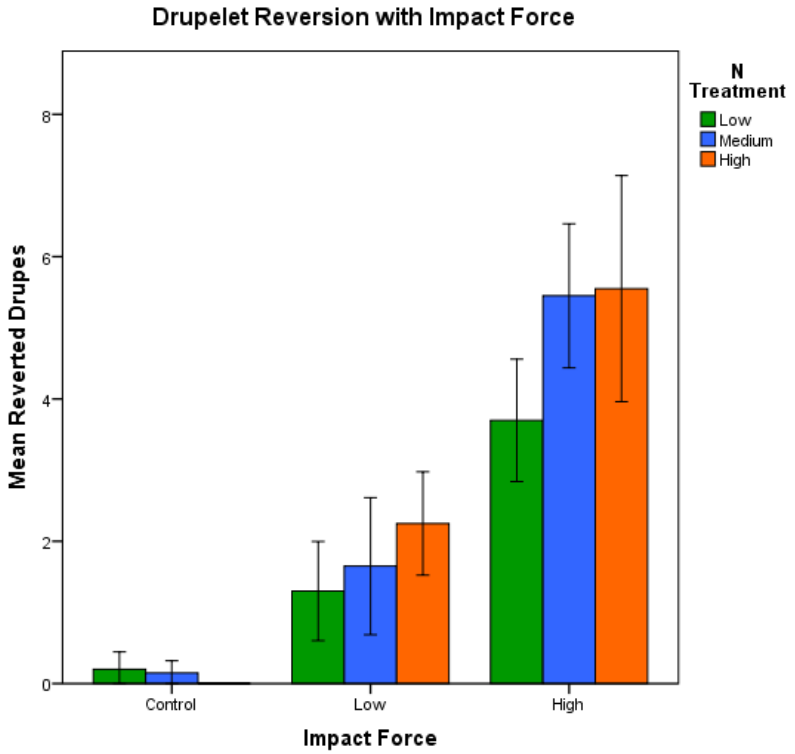
Season One Trials : Inducing Reversion

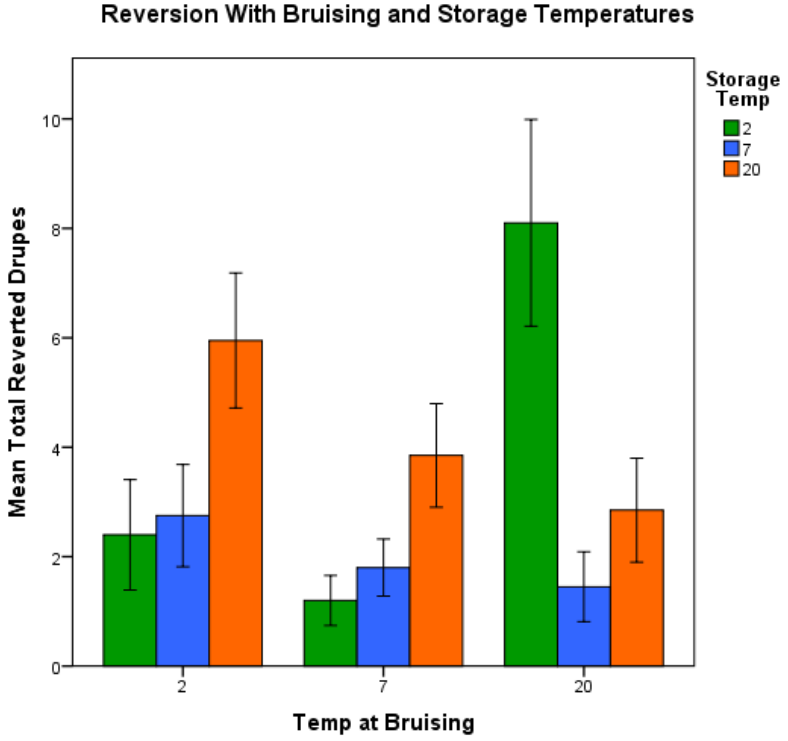
- *Temperature manipulation*
  - Exposure of fruit to rapid cooling from warm temperatures
- *Bruising*
  - Fruit was bruised with different levels of physical impact and compression forces at different temperatures
- *Fruit had to be harvested extremely carefully to avoid unwanted damage prior to the work*

Season One Trials : Inducing Reversion

Season One Trials : Inducing Reversion

Preliminary Results





Season One Trials : Inducing Reversion

A: Control – no physical force applied to fruit

B: Fruit with physical force applied at 0-2°C

C: Fruit with physical force applied at 7-9°C

Moving Forward

- Staged cooling has potential, particularly in warm environments
- Bruising and temperature management during handling
- Manage picking techniques to reduce double handling
- Punnet design is worth considering
- Modified/controlled atmosphere may play a role
- Potential agronomic techniques

Thanks

- Costa Berries – David Bardon and Cameron Folder
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- TIA – Penny Measham and Dugald Close