



Implications of Good Nutrition & Orchard Management

For Production of High Quality Tropical (Low-Chill)
Stone Fruit

By

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Good management putting it all together with nutrition

- Growth retardant Paclobutrazol & its interaction with nutrient management
- Mechanical pruning to reduce on farm labour costs & increase fruit quality
- Autumn pre-conditioning to increase fruit quality
- Calcium & Nitrogen to increase fruit size, quality & shelf life
- Conclusions

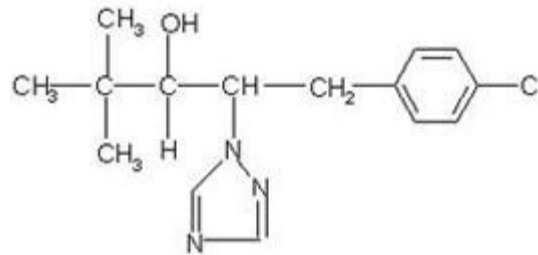
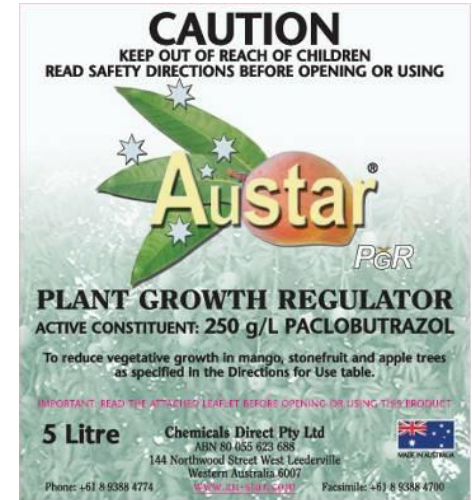




Use of Growth Retardants (Paclobutrazol)

Little or no work on red soils of Australia had been carried out

- Determine the rates
- Determine the best application method



Paclobutrazol



Active Constituent(s):
250g/L paclobutrazol ()

Registered For

Commercial Use Domestic Use





Interactions of growth retardants and nutrients

Paclobutrazol when applied in combination, significantly increased fruit quality, yield and fruit size.

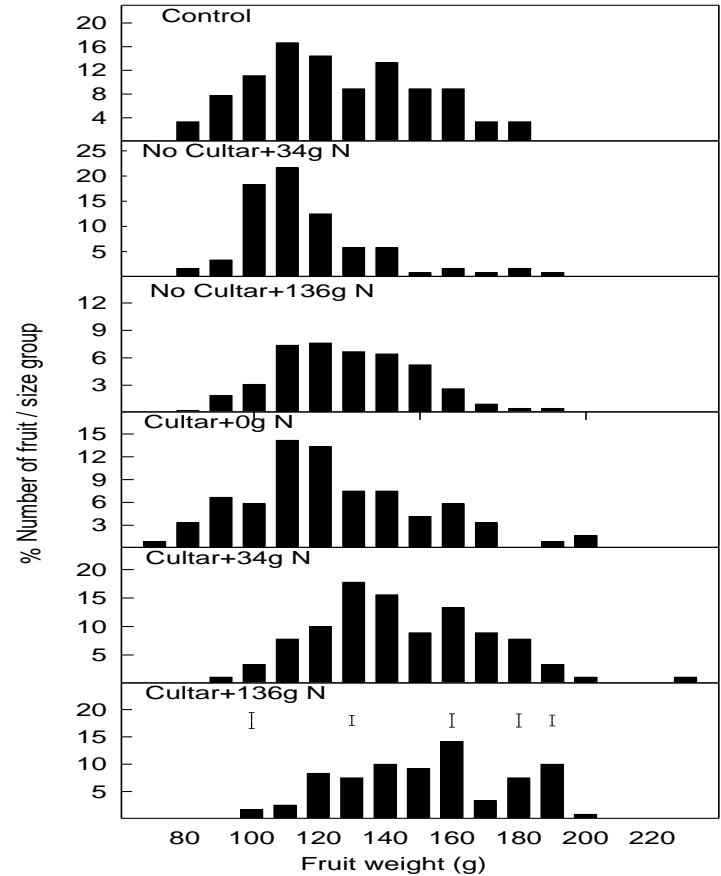


Figure 7 Effect of N and Paclobutrazol on fruit size distribution of low-chill stonefruit



Effects on fruit quality

- Fruit size response to higher rates of net CO₂ assimilation (A)
- Associated with higher leaf N levels (DeJong, 1982)
- Improved partitioning of carbohydrates and nutrients to fruit and not vegetative growth.

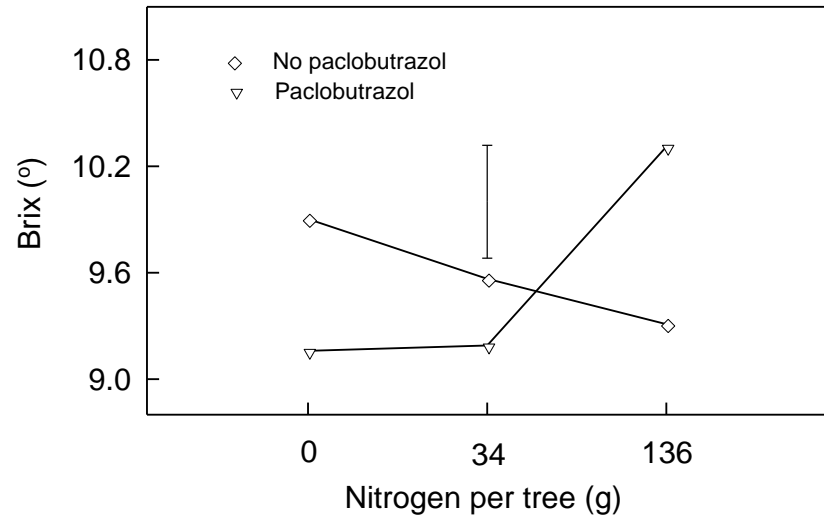


Fig. 6 Effects of nitrogen and paclobutrazol on Brix





Paclobutrazol is an essential tool in management

- Red soil
 - Split applications
 - *First application is applied after harvest to limit the excessive vegetative growth*
 - *advance and enhance floral bud differentiation*
 - increase the accumulation of photosynthetic reserves





Paclobutrazol is an essential tool in management

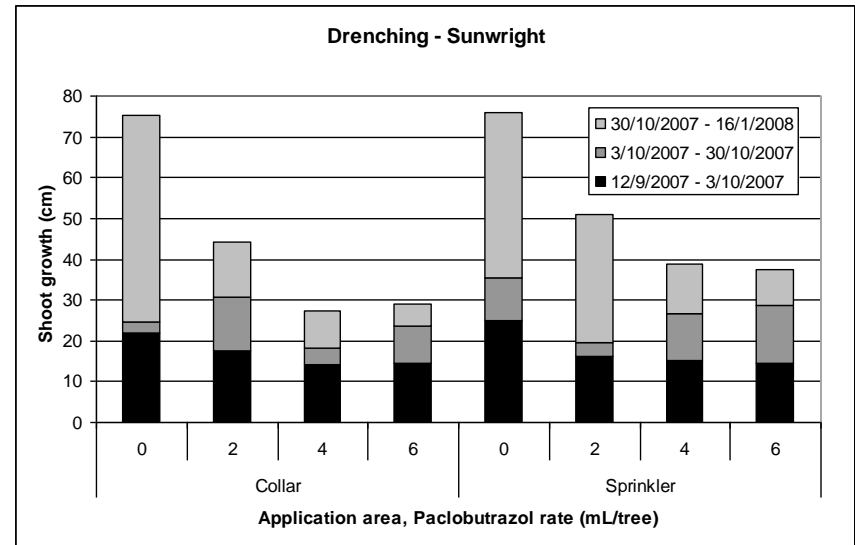
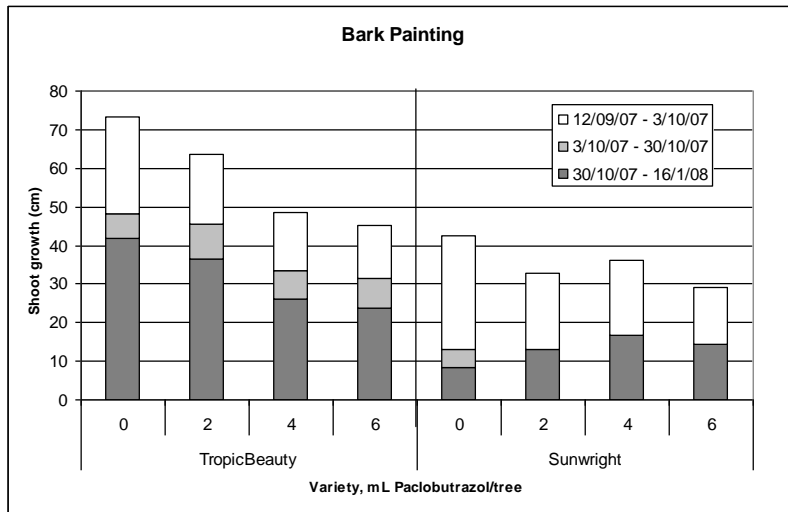
- *Second application before budbreak to limit excessive vegetative growth*





Rates & application methods for red soils of Australia

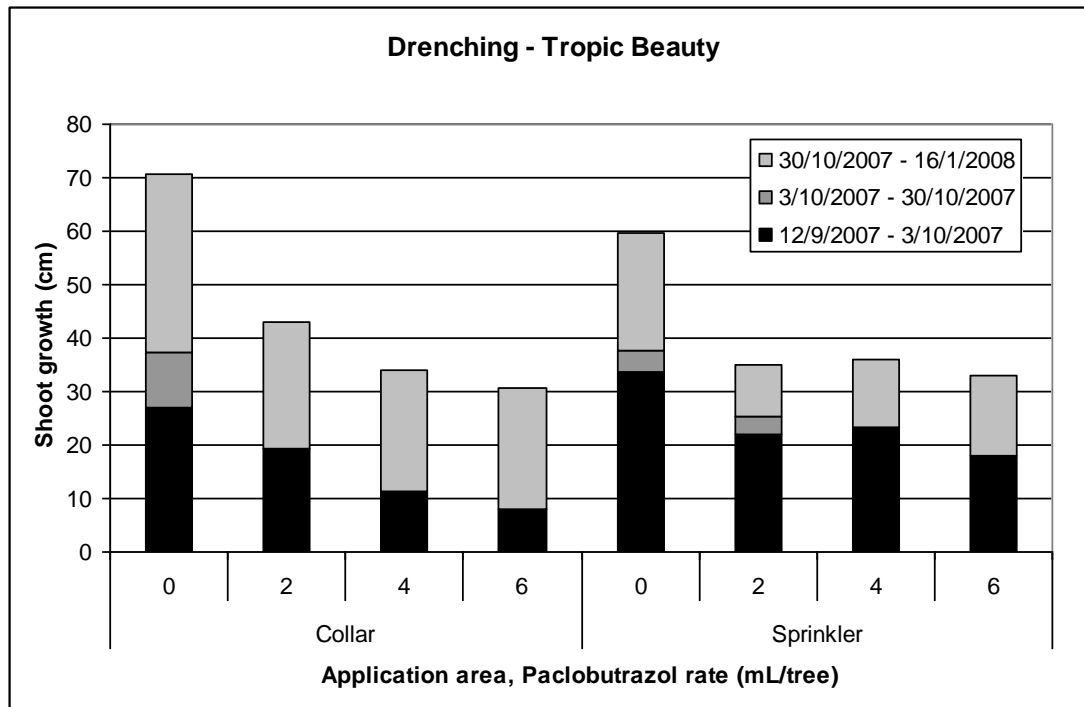
- Red soils have little or no response to Paclobutrazol until absorption sites are saturated
- Trailed Bark painting vs drenching
- Tested foliar sprays of Paclobutrazol, Sunny (Uniconzol) & Regalis (Prohexadione-Ca)





Paclobutrazol is an essential tool in management

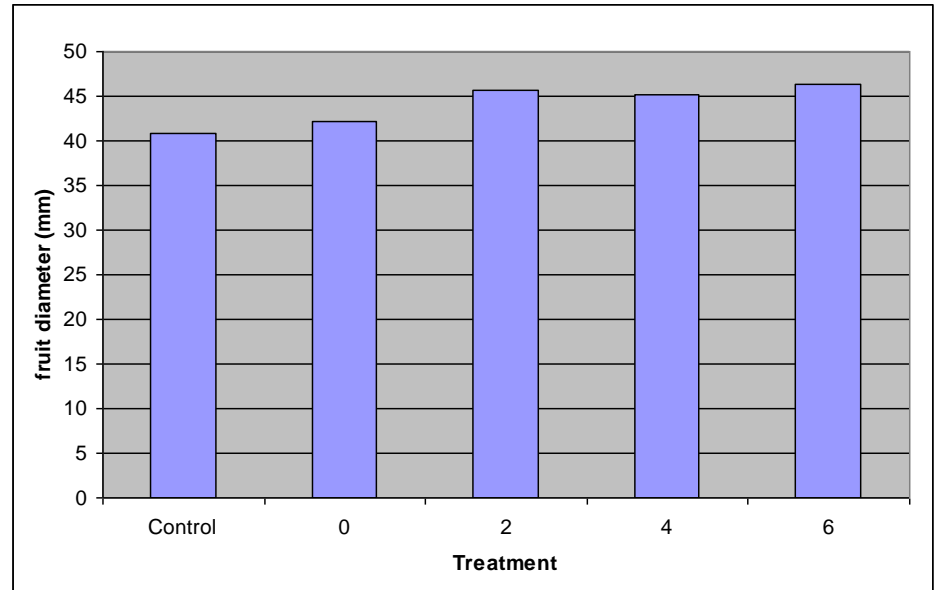
- Drench simplest application method with no residues
- Key for red soils:- have a moist soil and the water in immediately after application of Paclobutrazol





Conclusion - Paclobutrazol is an essential tool in management

- Research findings show Paclobutrazol will significantly improve farm gate returns by 19% and reduce labour costs for pruning by 50%



The effect of different Paclobutrazol rates on TropicBeauty fruit diameter (mm), measured on October 30, 2007.



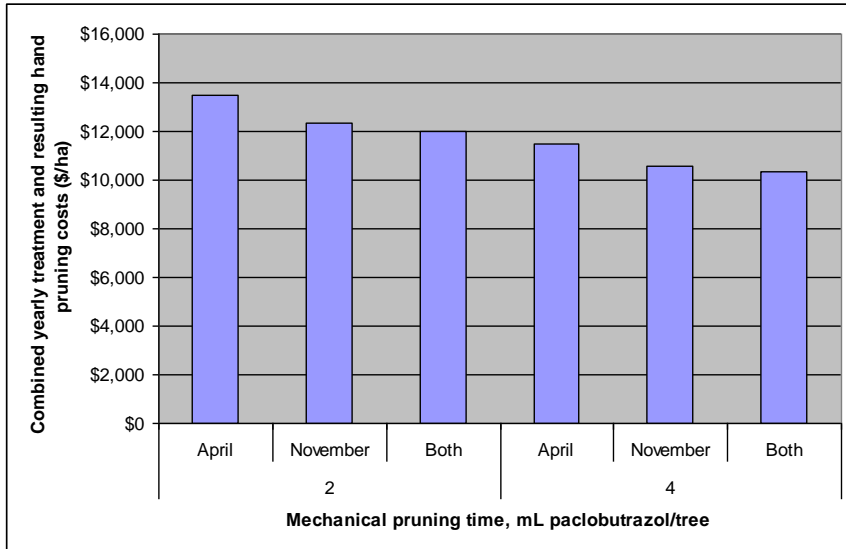
Mechanical Pruning Trials

- Two mechanical pruning times
 - Autumn – (March – April – May)
 - (control vegetative growth & increase light interception for flower bud development)
 - Spring & Summer – (September – October – November)
 - (control growth & increase light interception for fruit development and enhance fruit quality)

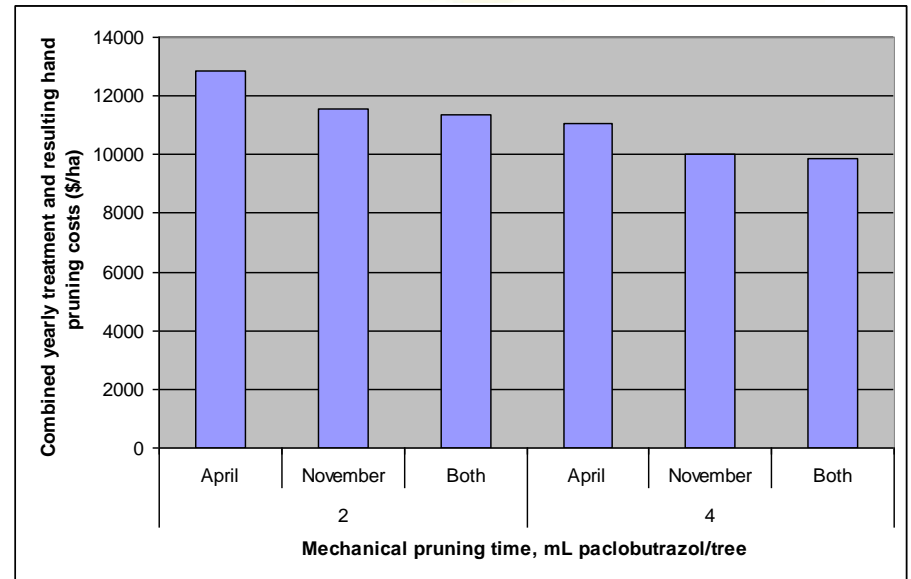




Mechanical pruning significantly reduced labour pruning costs



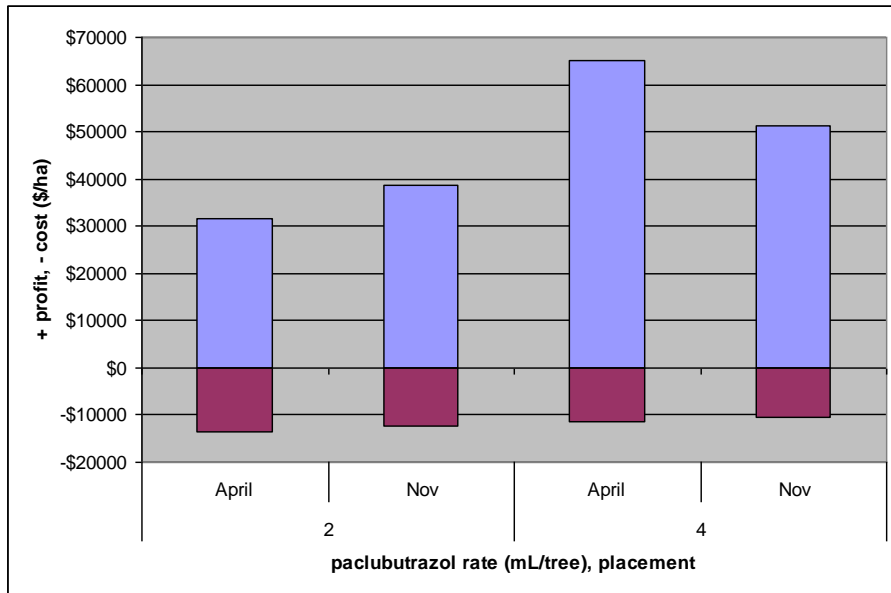
SunWright



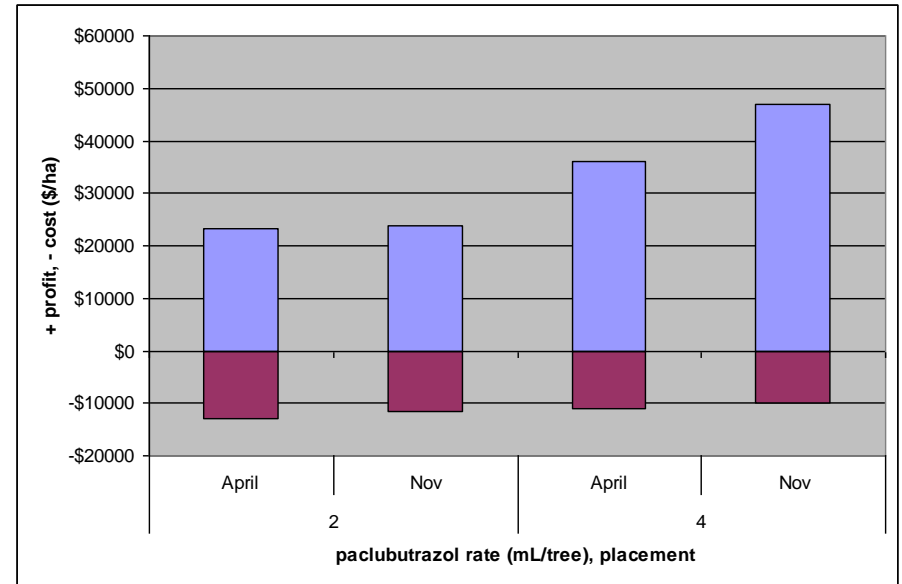
TropicBeauty



Effects of mechanical pruning on farm gate profits



SunWright



TropicBeauty



Pre-conditioning treatment – Potassium Nitrate (KNO₃)

- Every 7-10 days, from mid- to late-April
- Spray 5% Potassium Nitrate solution onto leaves, applying a maximum of three sprays
- One week after the last Potassium Nitrate spray, apply a 3-5% Zinc Sulfate foliar-spray to defoliate the tree.





Critical orchard maintenance practices for pre-conditioning

- **Summer pruning and growth control** (remove water shoots & unwanted vigorous growth plus treat with growth retardant Paclobutrazol)
- **Keep leaves healthy and on the tree until mid-late May**
 - maintain good leaf Nitrogen levels – apply Calcium Nitrate $\text{Ca}(\text{NO}_3)_2$
 - *Do not use pre-conditioning treatments on trees that have severe shot hole, rust, water stress, mite damage and are starting to loose their leaves in March*
- **Pre-condition using Potassium Nitrate (KNO_3) (mid- to late- April)**





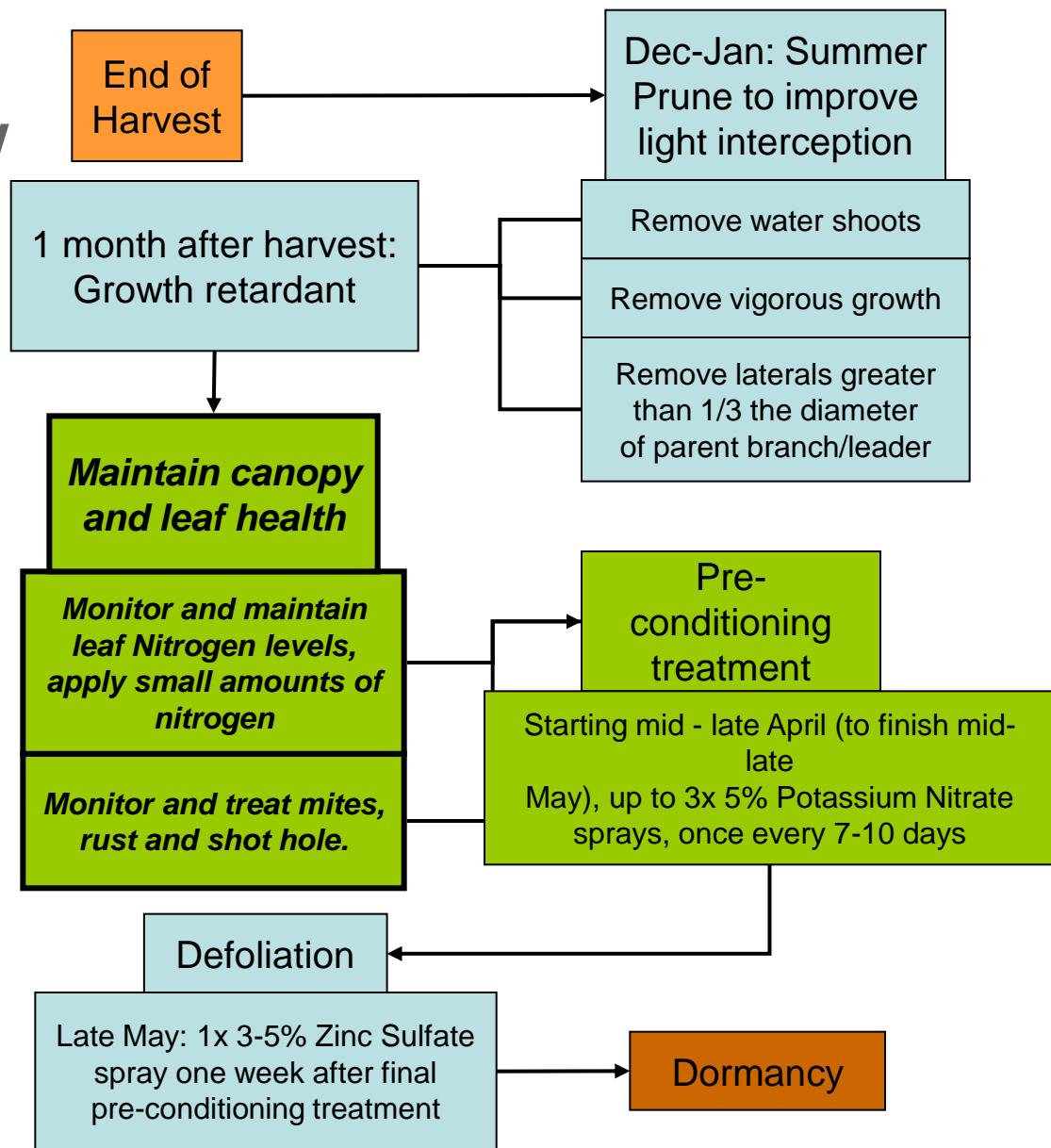
Maintaining leaf health for pre-conditioning

Monitor leaf Nitrogen levels (leaf sampling) and apply Calcium Nitrate $\text{Ca}(\text{No}_3)_2$ through fertigation

Element	Fertiliser rate for March for crop yield of 25 t/ha	Fertiliser rates for crop yield of 25t/ha
Nitrogen	21 kg/ha	50 kg/ha
Phosphorous	10 kg/ha	10 kg/ha
Potassium	35 kg/ha	70 kg/ha
Calcium		16 kg/ha
Magnesium		6 kg/ha



Pre-conditioning flow chart

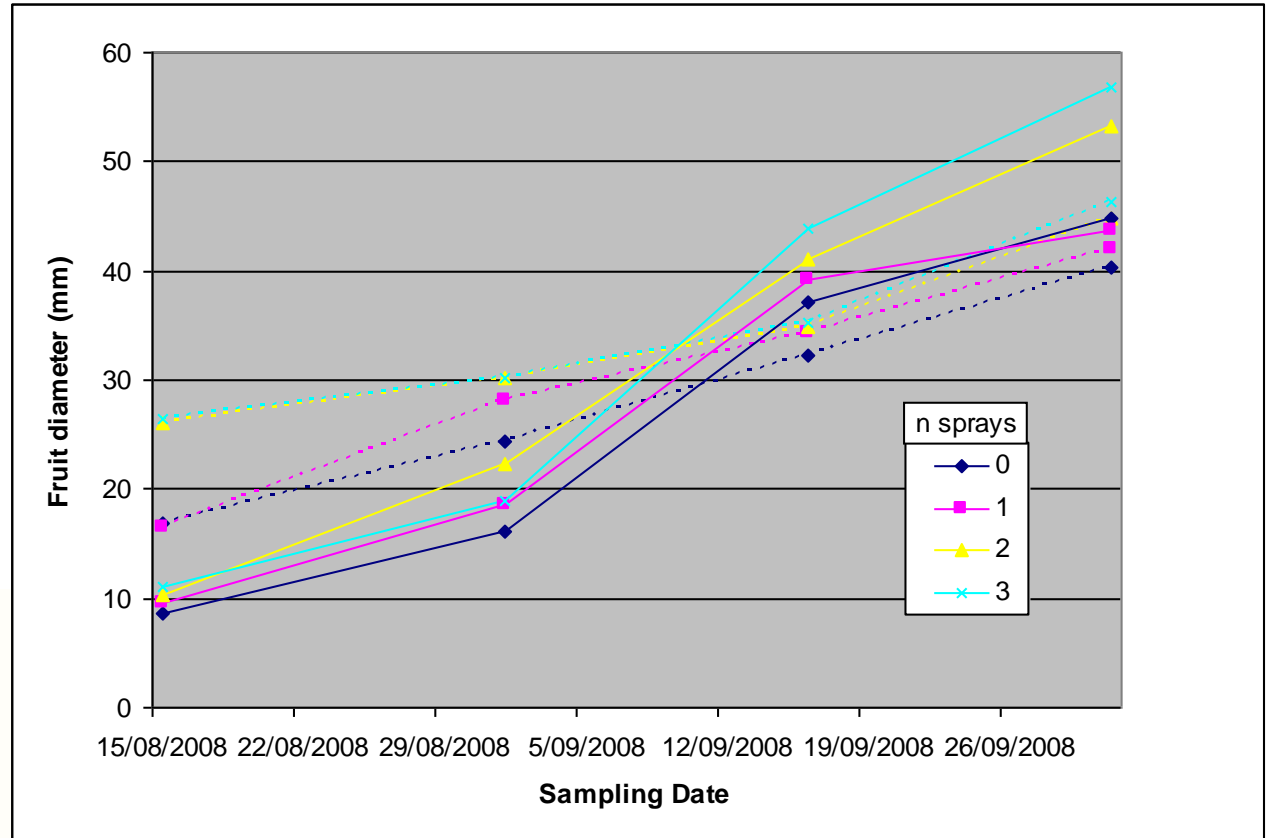




Pre-conditioning treatment

Defoliation + pre-conditioning increases farm gate returns by approximately 30%

This is due to condensed harvest period and larger fruit size



TropicBeauty



Advantages of autumn pre-conditioning - Potassium Nitrate (KNO₃)

- increase carbohydrate reserves for the next years crop
- increase floral bud size and the fruit size of next years crop
- advance floral bud development
- reduce the chilling requirement
- advance flowering and fruit set
- help concentrate your flowering, thereby reducing the number of required picks
- it may even improve your fruits shelf life and reduce soft tip disorder due to better nutrient uptake and transpiration rates.





Nutrients

- Nitrogen (N) , Phosphorus (P) and Potassium (K) are plant mobile nutrients



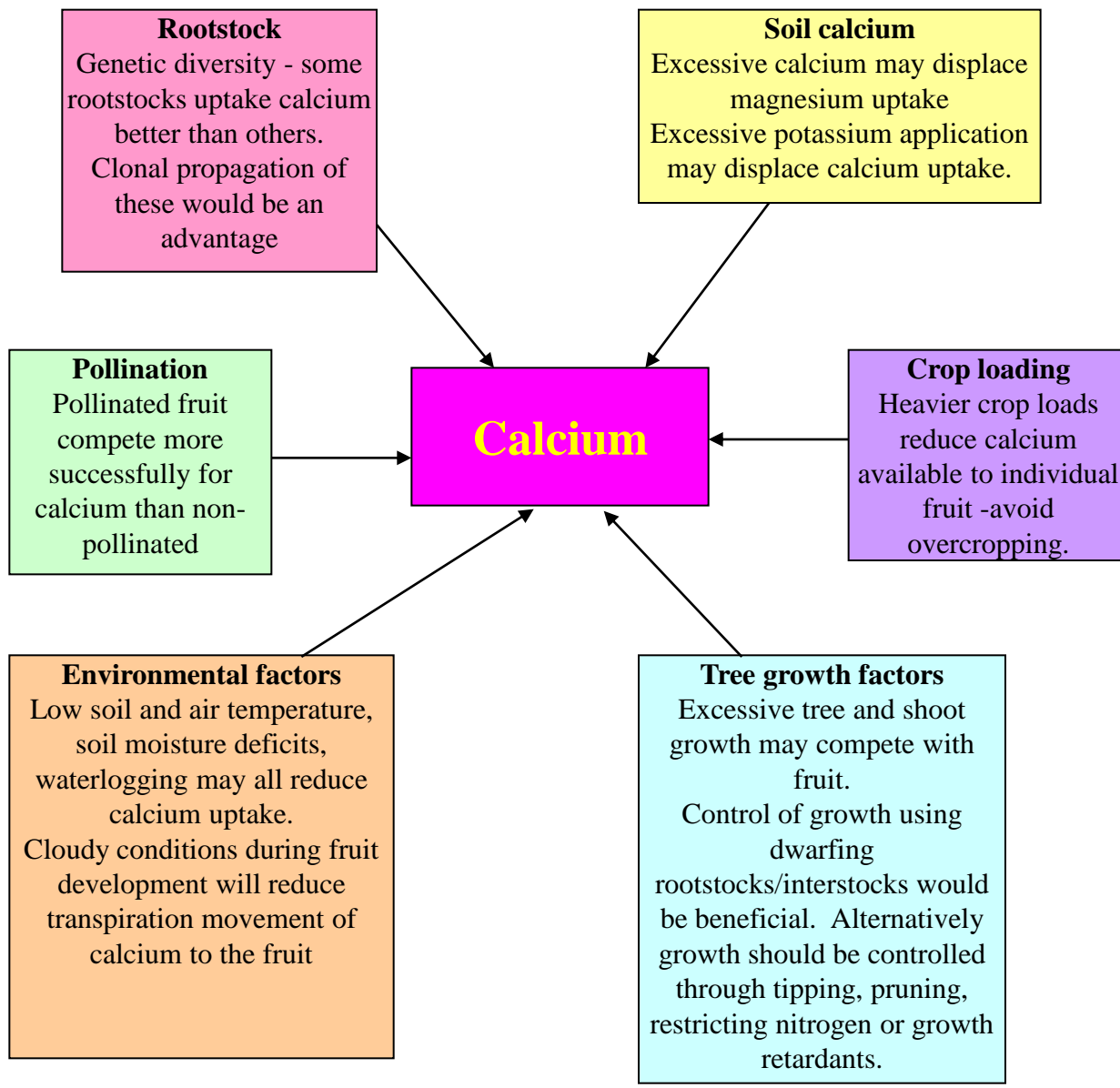
- Calcium (Ca) and Boron (B) are plant immobile nutrients





Nitrogen & Paclobutrazol effects

- Calcium is moved passively in the conducting tissue
- Good nitrogen levels aids in the movement of calcium and other elements
- This results in larger & firmer fruit with increased shelf life





Calcium & Nitrogen

- Calcium is another critical nutrient used for cell elongation (affecting fruit size) and in cell walls (affecting fruit firmness)
- Function of growing points and root tips, and plays an important role in the nitrogen metabolism
- Plays an important role in the fruit quality, fruit ripening, disease resistance and post-harvest life



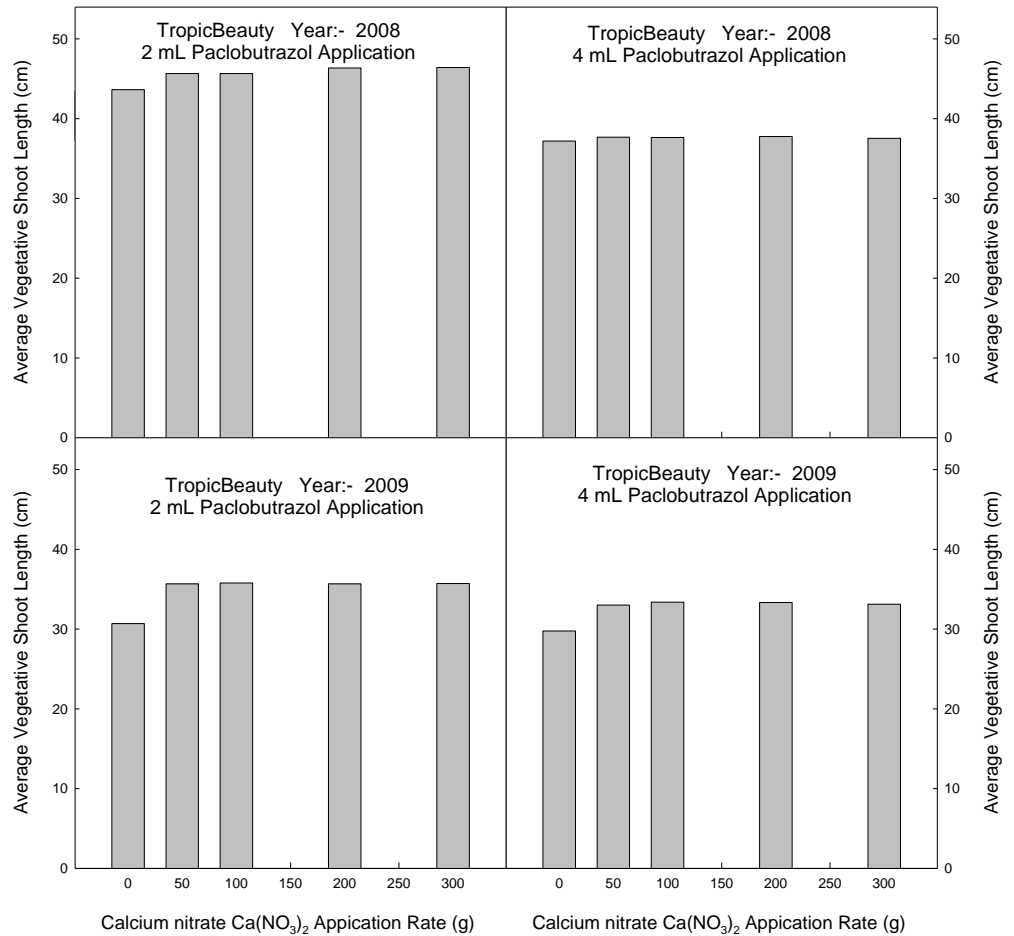


Calcium Nitrate $\text{Ca}(\text{NO}_3)_2$

Trial Results

Mid August Application on top of normal fertiliser applications

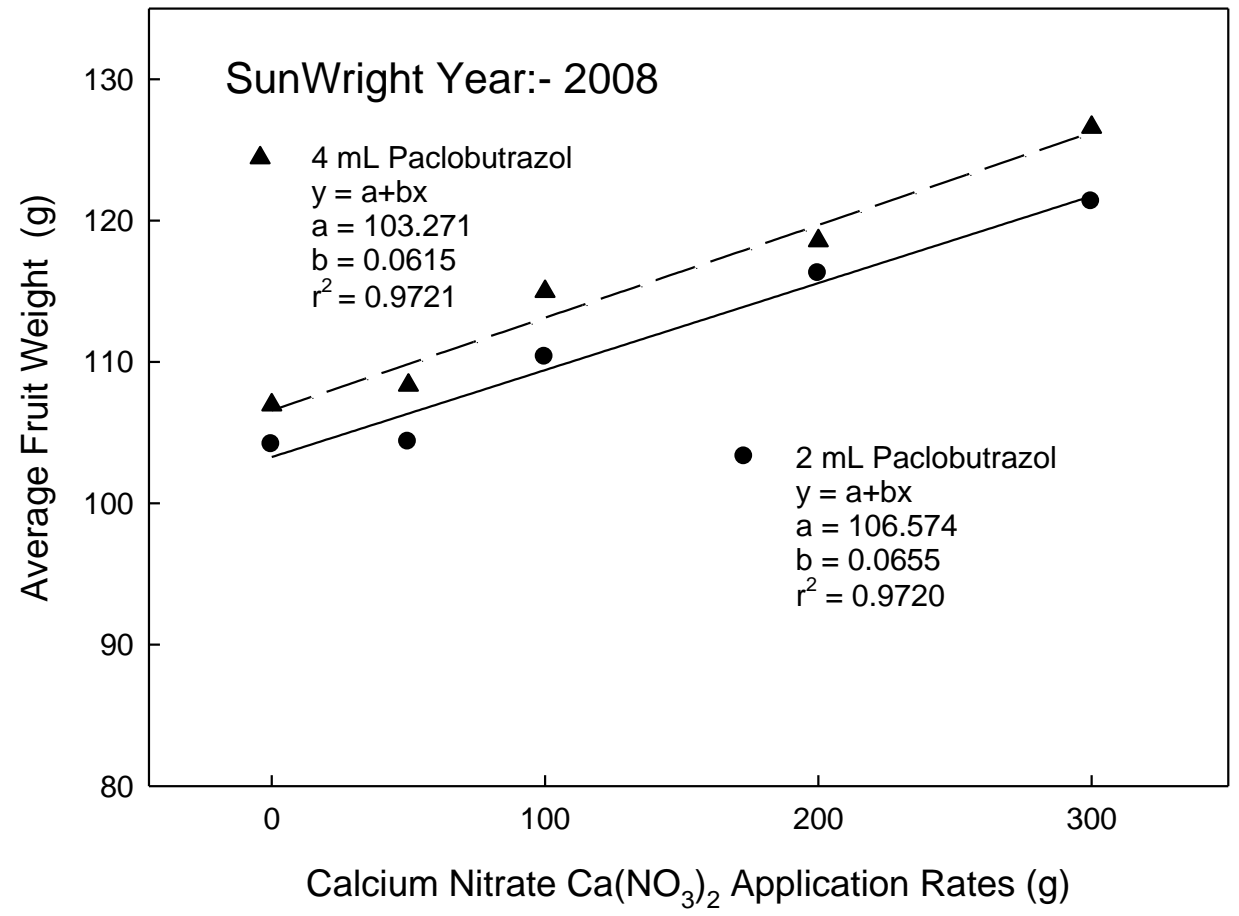
Watered in with in 24 hours of application





Calcium Nitrate $\text{Ca}(\text{NO}_3)_2$

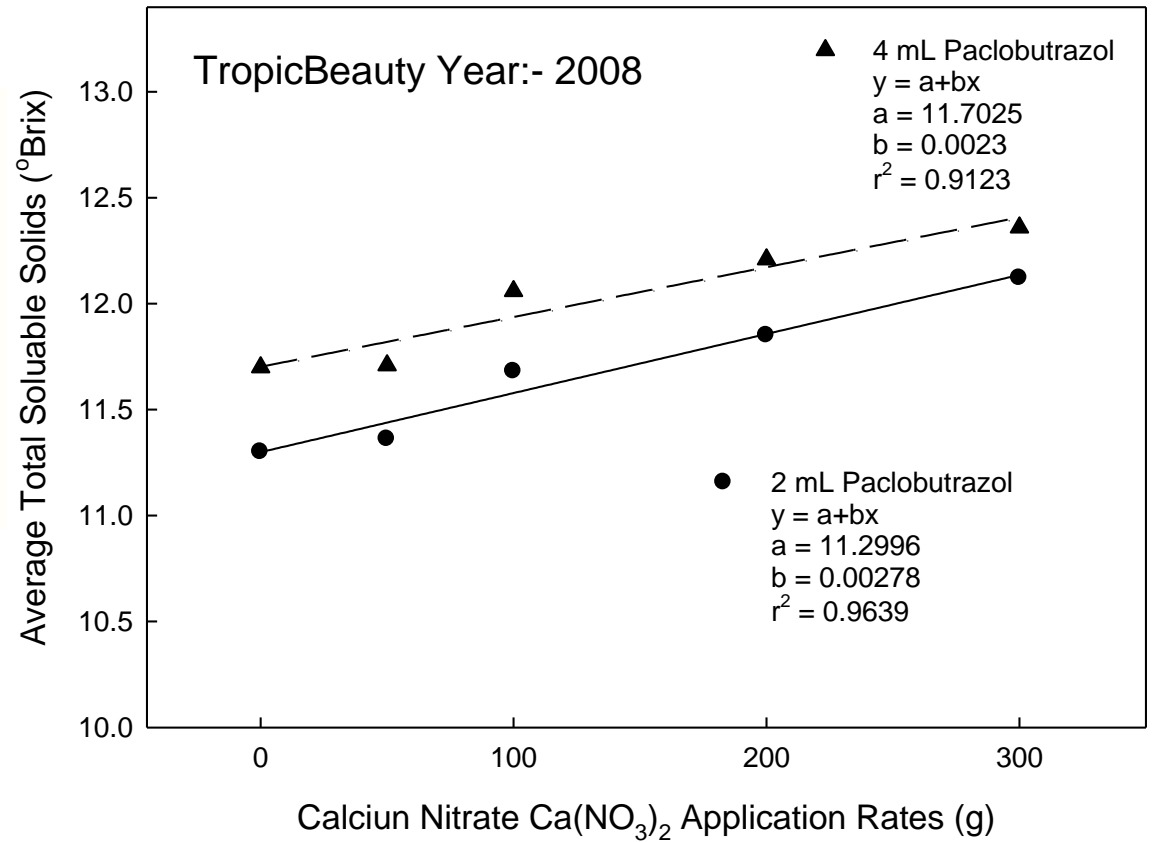
Trial Results





Calcium Nitrate $\text{Ca}(\text{NO}_3)_2$

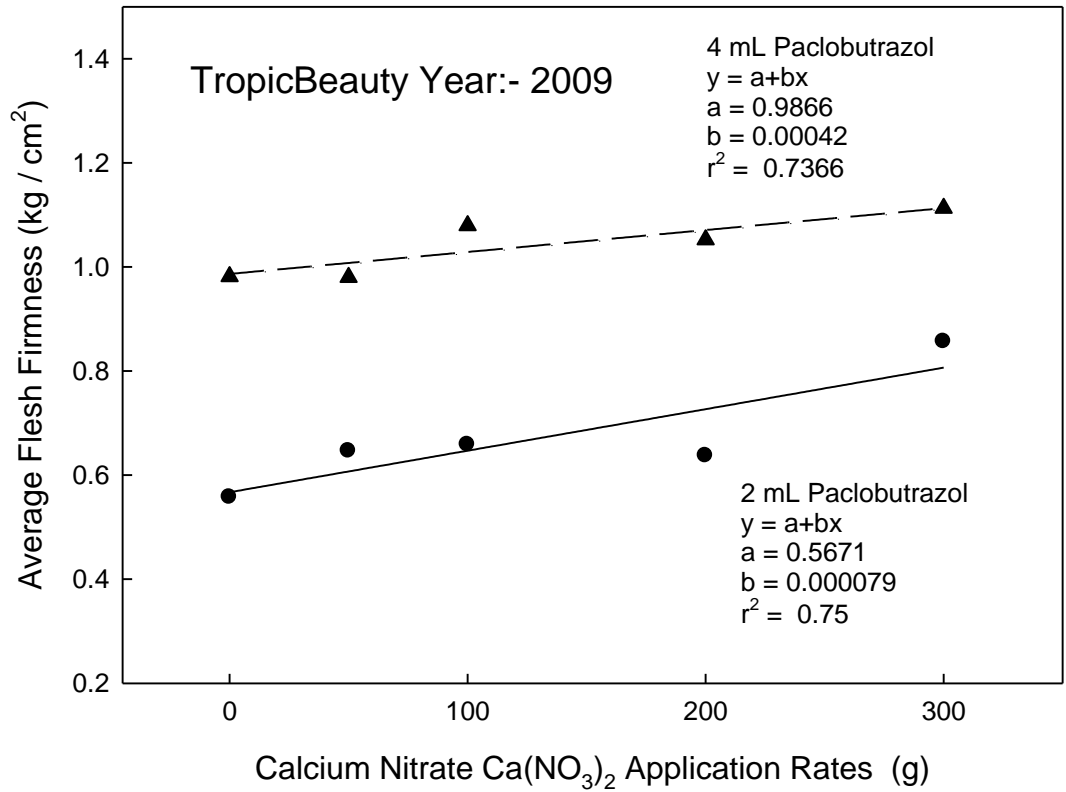
Trial Results





Calcium Nitrate $\text{Ca}(\text{NO}_3)_2$

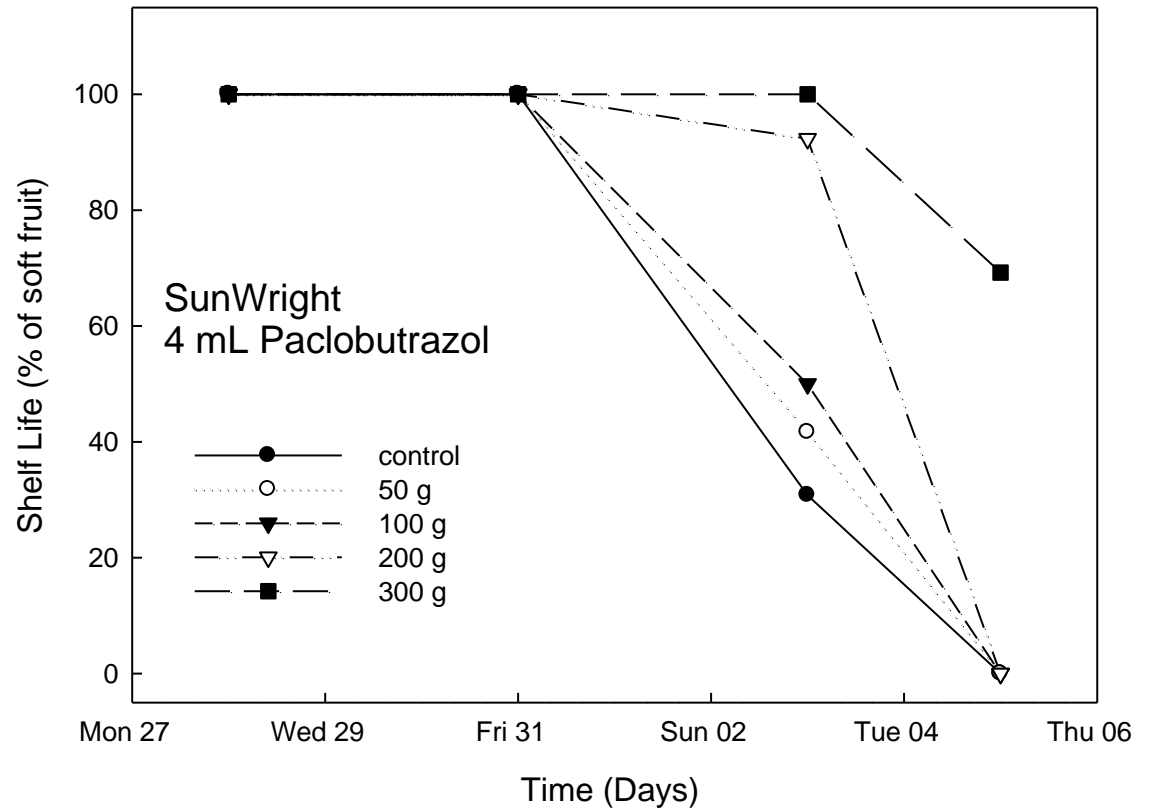
Trial Results





Calcium Nitrate (CaNO₃)₂

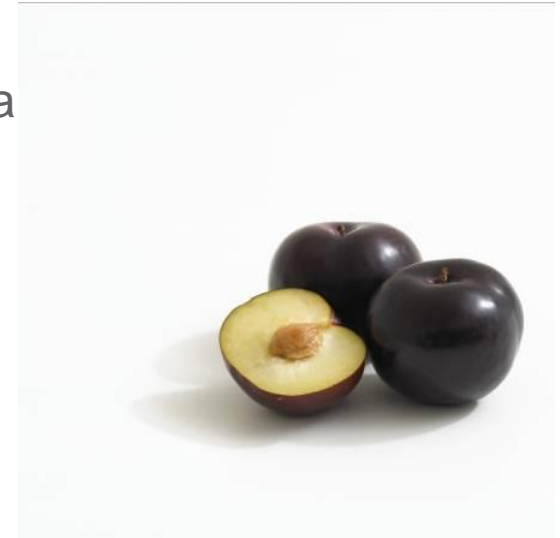
Trial Results





Calcium Nitrate

- Can be used safely at 300g (granular) / bearing 3 year old tropical stone fruit tree
- Still cost effective, especially with split paclobutrazol application rates of 2ml per tree after harvest and before bud break (4ml per tree per year).
- Additional Calcium Nitrate applications have the potential to improve tree health and increase pest and/or disease resistance.





Conclusions – Management Practices



- Paclobutrazol (split applications)
 - 19% increase in farm gate returns & 50% reduction in pruning costs
- Mechanical pruning gives a 25% reduction in pruning costs
- Pre-conditioning gives a 30% increase in farm gate returns (due to larger size fruit)
- Calcium Nitrate applications increase
 - fruit size by about 20%
 - Brix by about 7%
 - 50% of fruit stored longer





We wish to extend many thanks to

- The staff and management of Rewards Group Limited for assisting us with this research work
- To Horticulture Australia Limited (HAL) and Rewards Group Limited for providing the funding to conduct this research
- Department of Employment, Economic Development and Innovation
- Without your kind contributions this work would not be possible.



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