Next generation growing and handling systems for almond

Dr Grant Thorp and Dr Michael Coates
Plant & Food Research

18th Australian Almond Conference
Pullman Hotel Melbourne, Albert Park, Victoria
October 30th - November 1st, 2018

SUPPORTED BY:
Horticulture Innovation Australia Ltd

HOSTED BY:
The Almond Board of Australia

Tree architecture and high density growing systems

Dr Grant Thorp

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Research Team and Collaborators

- PFR Australia: Grant Thorp, Michael Coates, Ann Smith
- PFR New Zealand: Carlo van den Dijssel, Stuart Tustin, Jill Stanley, Andrew Barnett
- University of Adelaide: Michelle Wirthensohn
- UQ Queensland: Neil White
- Australia: Anthony Wachtel, Ben Brown, John Kennedy, Daryl Winter, Lacton Farm, CMV Farms, Select Harvest, OLAM, RFM Ltd, Mossmont Nursery
- California: John Slaughter, Kaylan Roberts, Burchell Nursery, Grant Zaiger Gurreet Brar (CSU Fresno), Bruce Lampinen, Tom Gradziel (UC Davis)

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Related project work in California is funded by the Almond Board of California

Field trial sites in Australia and California

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Basic principles for high density plantings:

Canopy management:

- Involve no or minimal additional cost to the grower
- Reduce the time taken to produce the first commercial crop and reach break-even point on the orchard investment
- Increase productive yield per hectare and grower profit, with improved nut quality
- Be suited to “shake and catch” harvesting

Current model based on narrow central leader trees:

- Rows 4.5 m wide (across row)
- Trees 2.0 m apart (along row)
- Trees 5.0 m high x 2.5 m wide (2.0 m wide alley way)

How to grow narrow, central leader almond trees?

1. **Change the type of tree produced from the nursery**

   "Standard tree" (spring or dormant budded)

   "Late-budded tree" (January/February budded)

   "Unpruned tree" (full height tree, not headed back and no trimming of side shoots)

   "Dormant budded tree" budded in late-summer, planted same winter

2. **"Bare pole" pruning**

3. **"Narrow pruning"**

How to grow narrow, central leader almond trees?

1. **Change the type of tree produced from the nursery:**

"Standard tree" (spring or dormant budded) headed back (pruned) when planted – **expensive/detailed work for growers** to produce central leader tree

"Late-budded tree" – too small < 1.0 m tall when planted, **expensive/detailed work for growers** to produce central leader tree

"Unpruned tree" from nursery (>1.5 m) not headed back and no trimming – **large plants difficult for nursery** to handle/transport, but **simple and quick task for growers** to produce central leader tree

"Dormant budded tree" budded in late-summer at 70 cm height, planted that winter in orchard, scion shoot growth left to develop as central leader with no pruning – **reduced tree cost, minimal additional cost for growers**

Notes: Pruning in nursery to remove all shoots below 70 cm is standard nursery practice regardless of tree type

Pruning in orchard to remove suckers during spring/summer is standard grower practice regardless of tree type

Starting with unpruned trees from the nursery

Pruned Unpruned

Unpruned trees ready for planting

Dormant budded tree planted in same year as budding

Budded in late summer at 70 cm height

Planted same year as budding, trimmed to remove rootstock shoots

Promote dominant shoot on windward side, trim back less dominant shoot on leeward side

How to grow narrow, central leader almond trees?

2. **“Bare pole” pruning.** Start with “unpruned tree” from nursery (>1.5 m tall) not headed back but all shoots trimmed before dispatch to orchards – **additional work for nursery, easy plants to handle/transport, simple and quick task for growers** to produce central leader tree

September 2016

February 2017

August 2018

How to grow narrow, central leader almond trees?

3. **“Narrow pruning”.** Suitable for all tree types, including “standard tree” from nursery, grow as per normal practice for one or two years, then winter prune using heading cuts to cut back strong branches growing out into the row

Narrow pruned

Heading cuts used to produce new fruiting wood

With pruning

No pruning

The future will be with new cultivars

- Tree architecture and which cultivars are easy to grow as central leader trees?





From decurrent to excurrent to compact columnar growth habit

Harvesting and Drying

Dr Michael Coates

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Dust-less harvesting

The Californians been have looking at off-ground harvesting but for different reasons

Focus on visible dust reduction

- Sweepers and pickups

Some of the dust reducing options

- Modify existing equipment
- Off-ground harvesting (challenges every step in the harvest process.)
- Baby steps toward a dust-less solution

I helped the ABC conduct a small exploratory drying trial in Modesto where we looked at different ways of handling the fruit.

• PFR Australia	Michael Coates
• ABC	Guangwei Huang, Robert Axelrod
• California	David Pohl (Hughson Nut)

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california almonds
Almond Board of California

Drying - Non aerated

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- Control (leaving fruit where it lands)
- Windrow drying on tarps (conditioned with leaves removed)
- Concrete pad drying (conditioned with leaves removed)

Control

Tarp

Concrete Pad

Drying - Aerated

- Small aerated stockpiles
  (conditioned with leaves removed)

- Batch drying in pots with heat
  (conditioned with leaves removed)

Mini Stockpile

Batch

Overall drying results

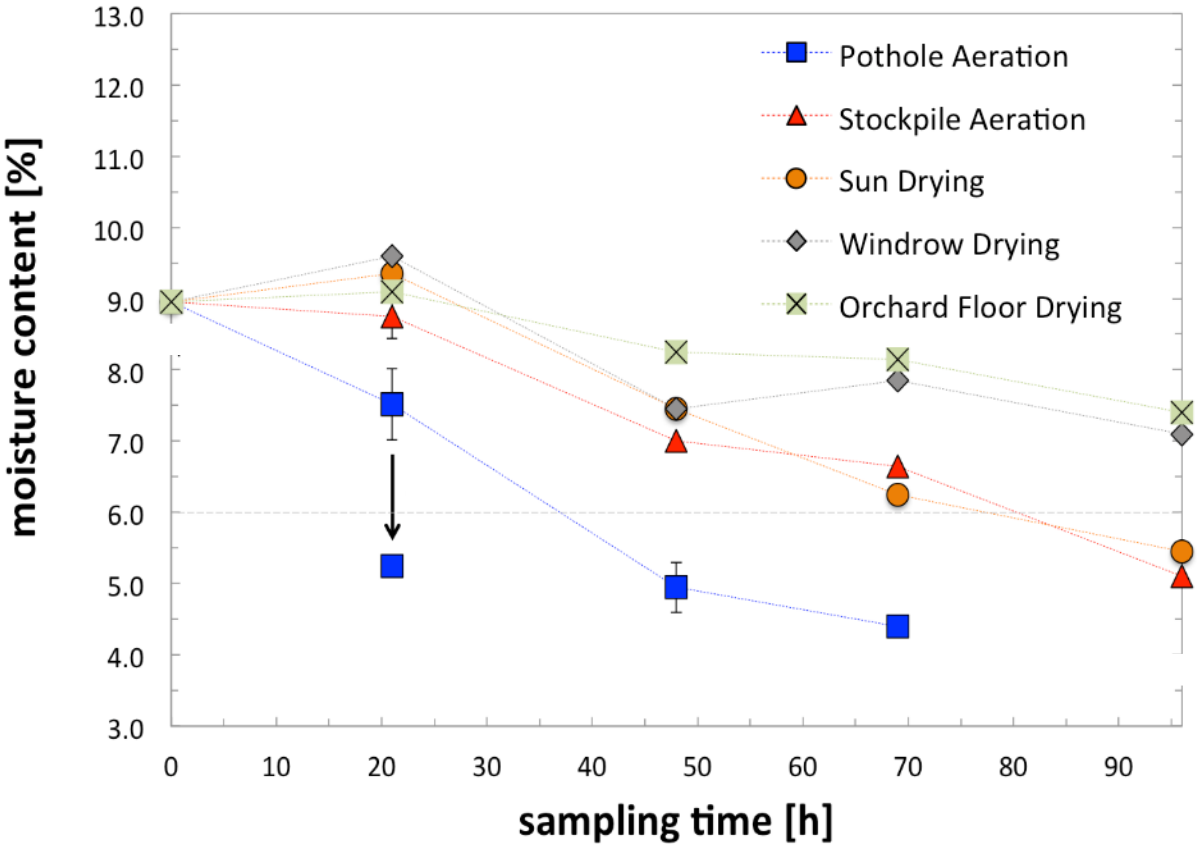
17 year old Carmel trees, overgrown canopies, still had decent light penetration

Starting moisture content 9% kernel (E and F categories)

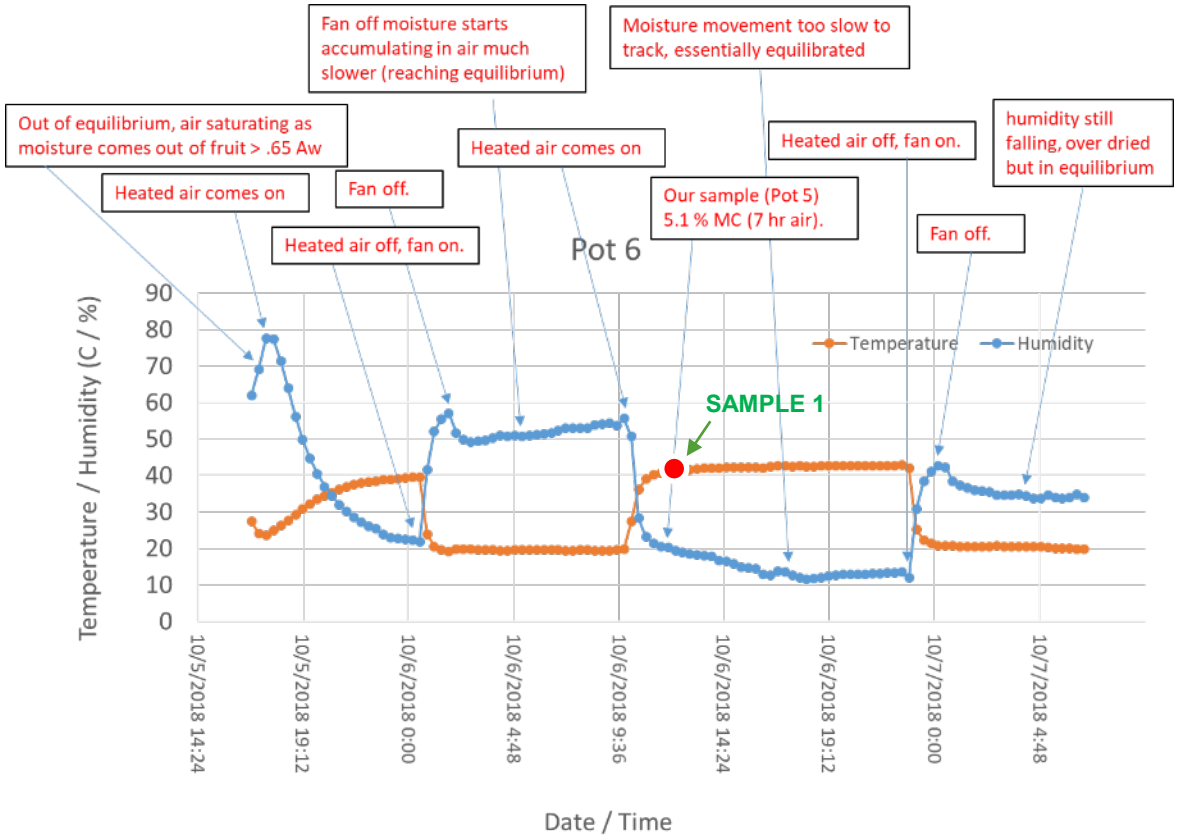
UCIPM categories for hull split (adapted from Strand L. 2002)

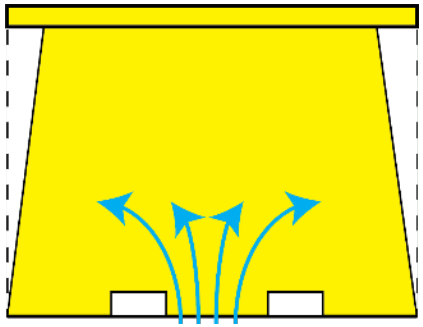
- Harvest delayed 4 days by potential rain.
- Fruit was too dry for potential quality problems.

Evaluated for mold and insect damage With no real trend.



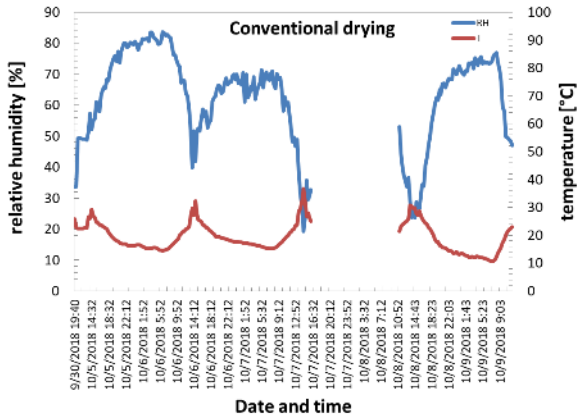
Aerated pot drying

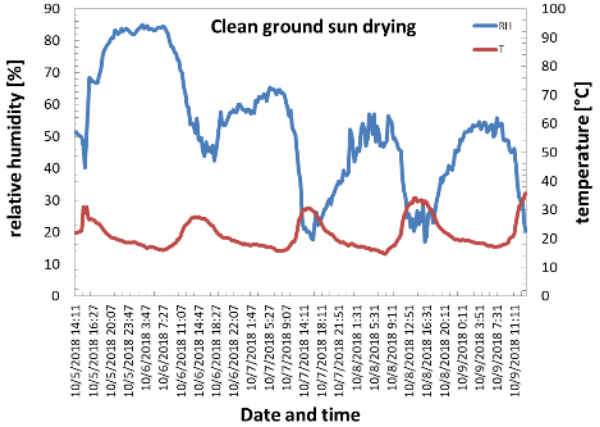


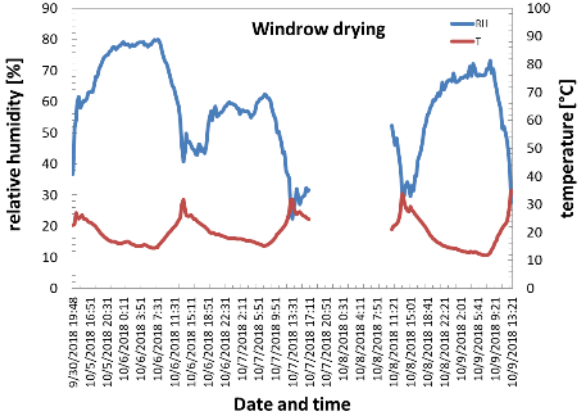


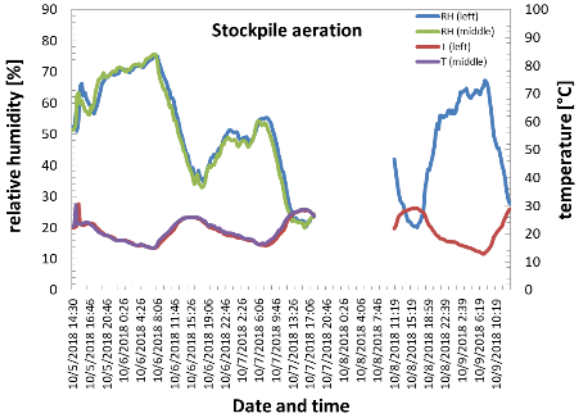
0.4 m/s @ 38ºC for 6 hrs
+ equilibrium time (<48 hrs)

Temperature and humidity

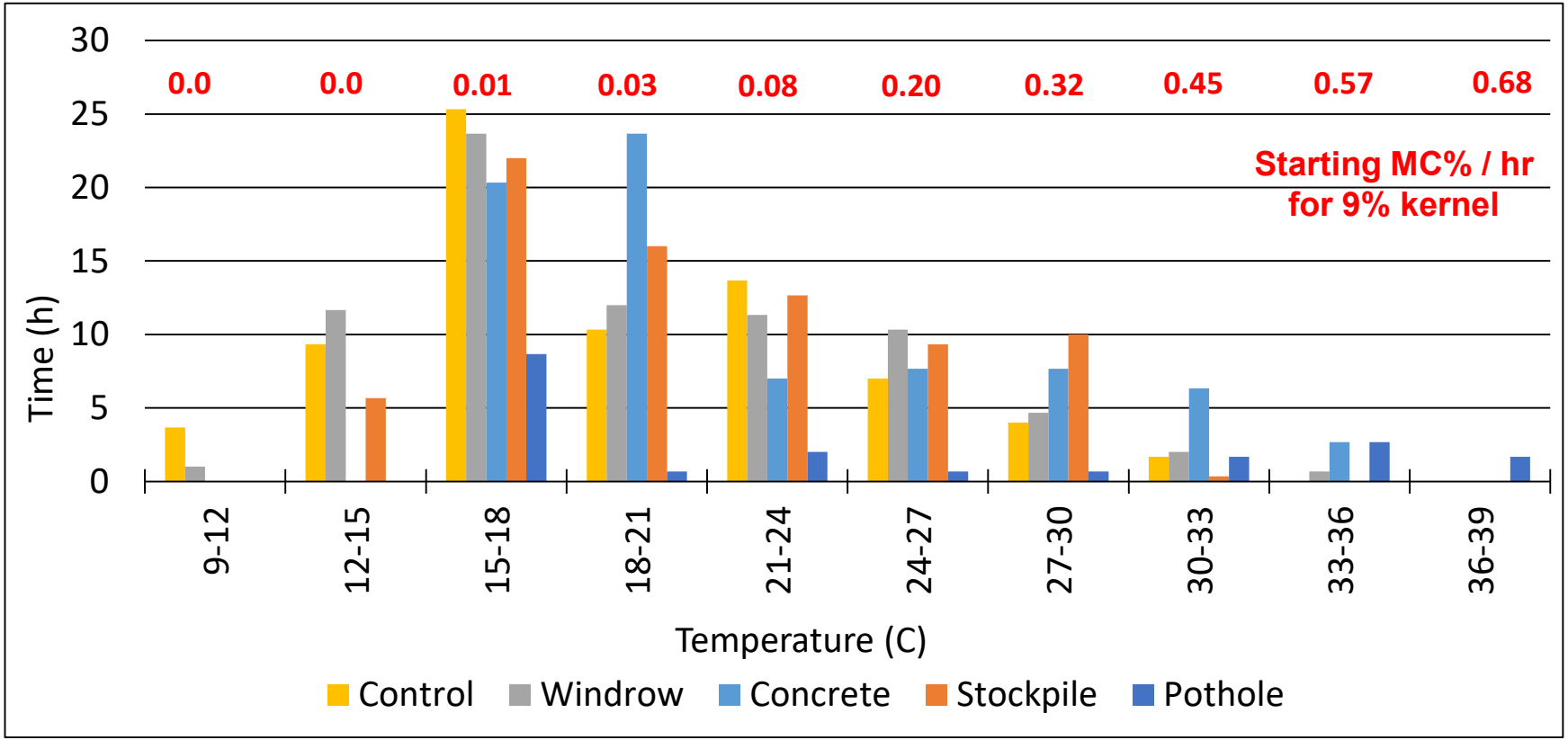








Drying hours



Summary

- No adverse effects using a tarped windrow under the trial conditions. (9% kernel MC, conditioned)
- Batch drying with heat accelerates the drying from 180 hrs to 6 hrs + equilibrium time
- Ambient temperatures in both AU and CA reach 40ºC without burners.
- Time spent under 21ºC has very little influence on reducing moisture content in the fruit.
- Trial needs to be repeated with fruit representing a more typical harvest to test for concealed damage and cavities (kernel MC >15%).

Thank you

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