STONEFRUIT FIELD LABORATORY

Mark O'Connell
DEDJTR
Agriculture Research
Tatura
August 2017

VICTORIA State Government | Economic Development, Jobs, Transport and Resources

Acknowledgments

Tatura Horticulture Team

Dave Haberfield

Mark O'Connell

Jim Selman (casual)

Dario Stefanelli (AgriBio)

Bruce Tomkins (AgriBio)

Stonefruit Field Laboratory Advisory Committee

Name	Position	Affiliation
Mark O'Connell	Project Leader	DEDJTR Victoria
Ian Goodwin	Research Manager	DEDJTR Victoria
Bruce Tomkins	Senior Technical Specialist, Horticulture	DEDJTR Victoria Member Summerfruit Australia IAC
Martin Bluml	Key Project Manager, Horticulture	DEDJTR Victoria
John Moore	CEO	Summerfruit Australia Limited
Adrian Conti	Summerfruit Orchardist	Deputy Chair Summerfruit Australia Ltd Board Member Summerfruit Australia IAC
Byron de Kock	Program Manager	HIAL
Rowan Little	General Manager	Montague Fresh Member Summerfruit Australia IAC
Nick Paris	Summerfruit Orchardist	Local stonefruit grower representative
Jason Size	Summerfruit Orchardist	Member Summerfruit Australia Ltd Board Manager Bookpurnong Fruits

STONEFRUIT FIELD LABORATORY
(Est. 2013)

Horticulture Innovation Australia

VICTORIA State Government

Summerfruit AUSTRALIA

STONEFRUIT
Background

- Inconsistent fruit quality = under consumption & low prices
- Low consumer satisfaction due to high variability in fruit quality
- Poor understanding of impact of orchard management on fruit quality & variability
- Many cultivars
- Asia drives export opportunity
- Linking: agronomy – consumer research – sensory studies – non-destructive technologies

STONEFRUIT - ASIA

13,000 t/yr
Aust. Grown produce
Sweetness key driver
Yellow flesh
Red skin colour

colmar brunton.

Innovative high density, high yielding orchards

ORCHARD MANAGEMENT OPTIONS?

fruit yield, quality & variability

- ✓ Tree density
- ✓ Variety
- ✓ Rootstock
- ✓ Canopy management, tree training, trellis design
- ✓ Crop load
- ✓ Irrigation management

RESEARCH QUESTIONS

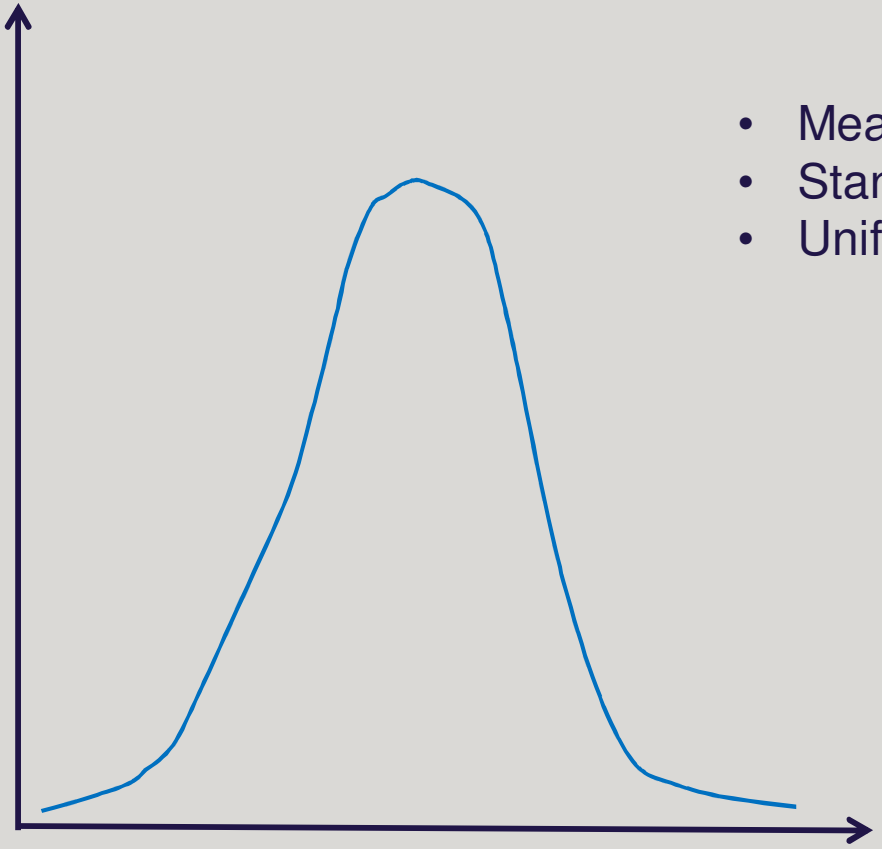
To evaluate how orchard management (crop load, light interception, rootstock, irrigation) affects fruit quality and its variability in selected cultivars of peach, nectarine, plum and apricot

Research hypotheses

1. High vigour rootstock will result in increased fruit quality variability
2. Reduced fruit number will result in reduced fruit quality variability
3. Reduced irrigation inputs will result in higher fruit quality

FREQUENCY DISTRIBUTIONS

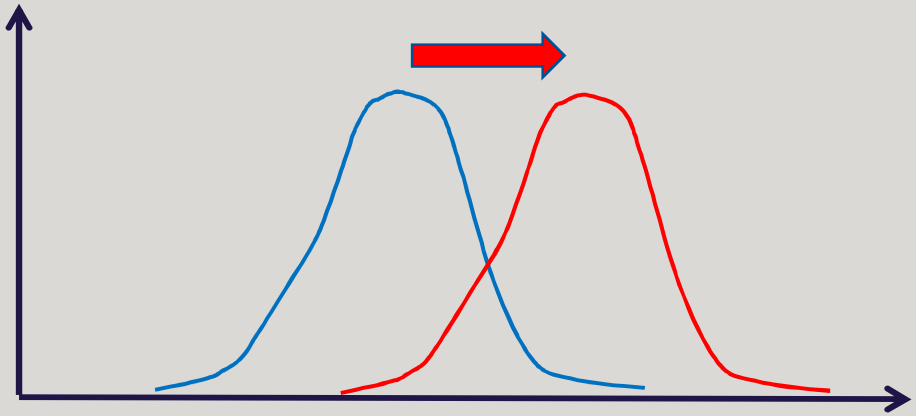
Number of observations



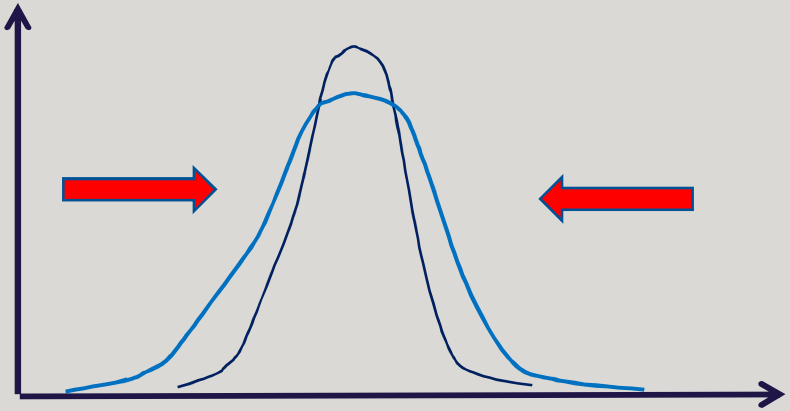
Fruit size, fruit sweetness

- Mean
- Standard Deviation
- Uniformity (coefficient of variation)

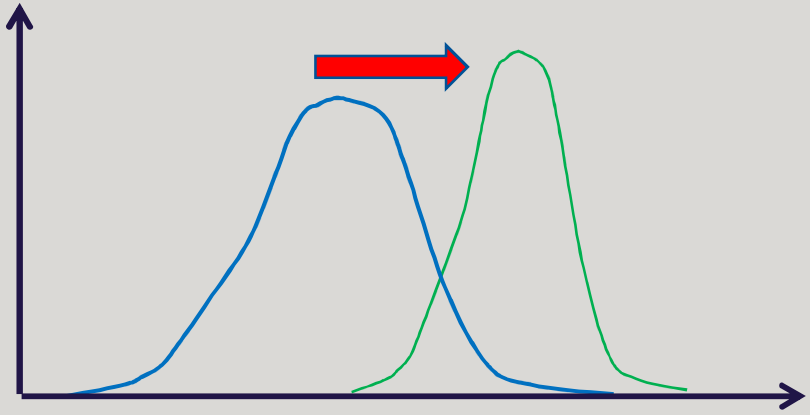
FRUIT SIZE, FRUIT SOLUBLE SOLIDS



✓ Higher mean value
✗ Same variation, same uniformity



✗ Same mean value
✓ Lower variation, more uniform



✓ Higher mean value
✓ Lower variation, more uniform

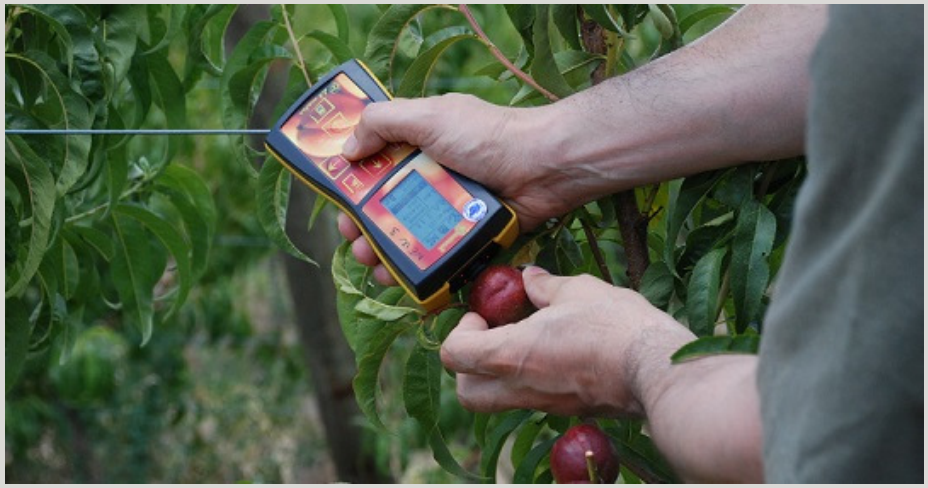
2016/17 SEASON

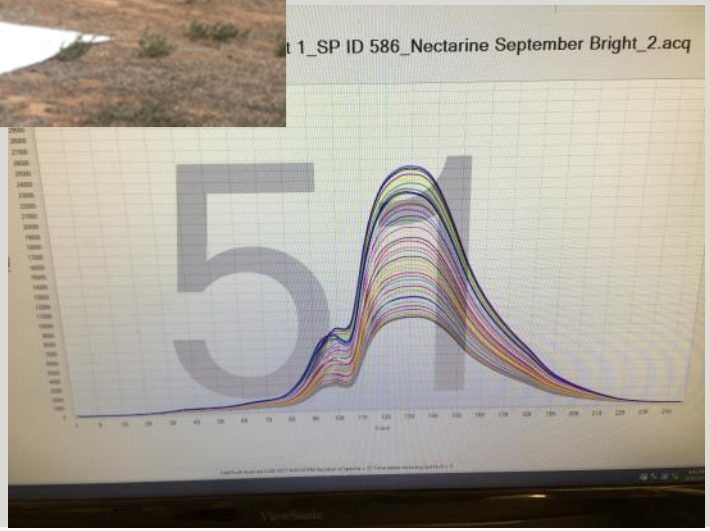
Crop load x Rootstock experiments
Crop load x Canopy experiments
Irrigation experiment
Demonstration sites

Summary of field experiments and demonstration blocks of the Stonefruit Field Laboratory, Tatura.

Experiment	Species, cultivar	Treatment[A]	Tree training	Number of leaders per tree	Row spacing (m)	Tree spacing (m)	Year planted
1a	Peach, September Sun	Rootstock x Crop load	Vase	4	4.5	2	2013
1b	Nectarine, Rose Bright	Rootstock x Crop load	Vase	4	4.5	2	2013
2a	Peach, August Flame	Crop load	Vertical	2	4.5	1	2013
2b	Peach, August Flame	Crop load	Tatura Trellis	2	4.5	1	2013
2c	Nectarine, Autumn Bright	Crop load	Vertical	2	4.5	1	2013
2d	Nectarine, Autumn Bright	Crop load	Tatura Trellis	2	4.5	1	2013
3a	Apricot, Golden May	Crop load	Vase	4	4.5	1	2014
3b	Apricot, Golden May	Crop load	Tatura Trellis	2	4.5	1	2014
3c	Plum, Angeleno	Crop load	Vase	4	4.5	1	2014
3d	Plum, Angeleno	Crop load	Tatura Trellis	2	4.5	1	2014
4	Nectarine, September Bright	Irrigation level x Timing	Open Tatura	2	4.5	1	2014
Buffer 1	Nectarine, Ice Princess	Demonstration 1	Central Leader	1	4.5	2	2014
Buffer 2	Nectarine, August Bright	Demonstration 2	Palmette	2	4.5	2.4	2014
Buffer 2	Nectarine, Snow Flame 23	Demonstration 3	Palmette	2	4.5	2.4	2014
Buffer 2	Nectarine, Snow Flame 25	Demonstration 4	Palmette	2	4.5	2.4	2014
Buffer 2	Peach, O'Henry	Demonstration 5	Palmette	2	4.5	2.4	2014
Buffer 2	Peach, O'Henry	Demonstration 6	Cordon	2	4.5	2.4	2014
Buffer 3	Peach, Snow Fall	Demonstration 7	Central Leader	1	4.5	2	2015
Buffer 3	Peach, Red Haven	Demonstration 8	Central Leader	1	4.5	2	2015
Buffer 3	Nectarine, September Bright	Demonstration 9	Central Leader	1	4.5	2	2015

[A]Crop load and irrigation treatments to be implemented once trees become fruit bearing (3rd leaf).

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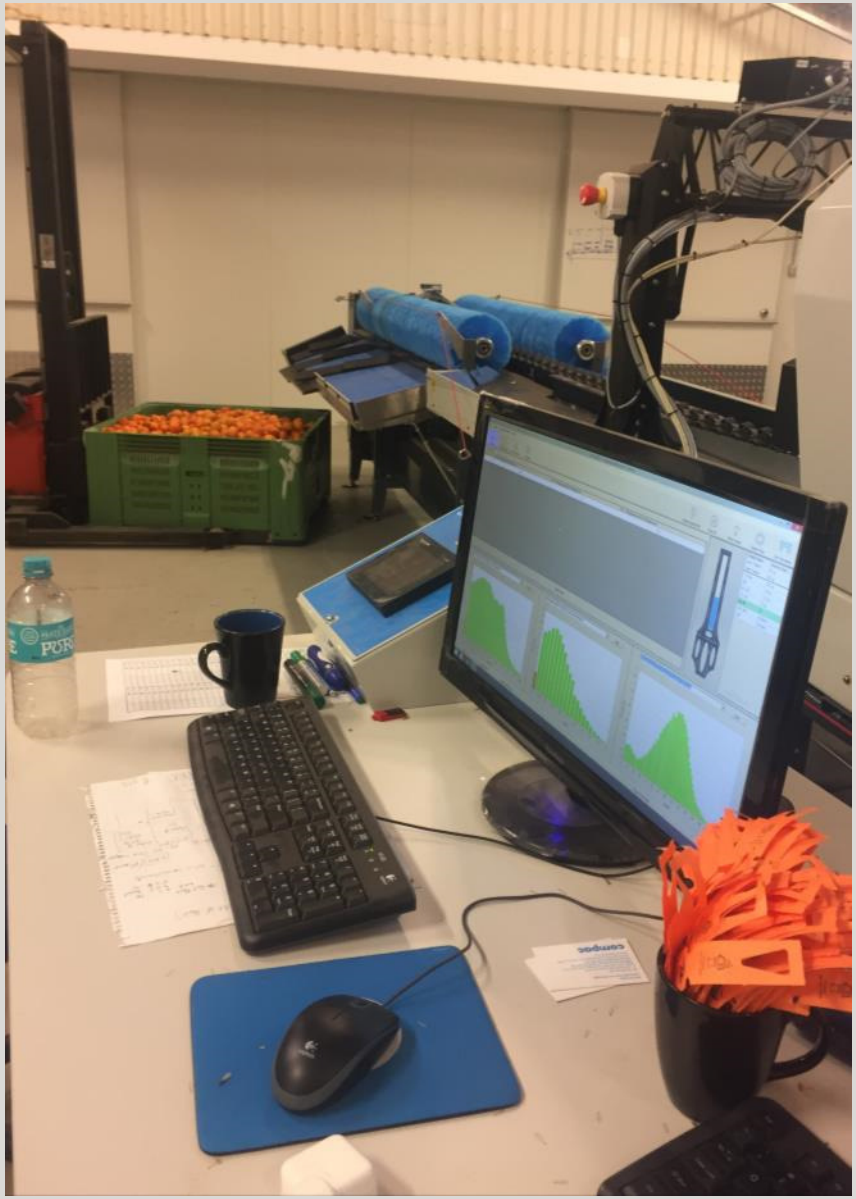
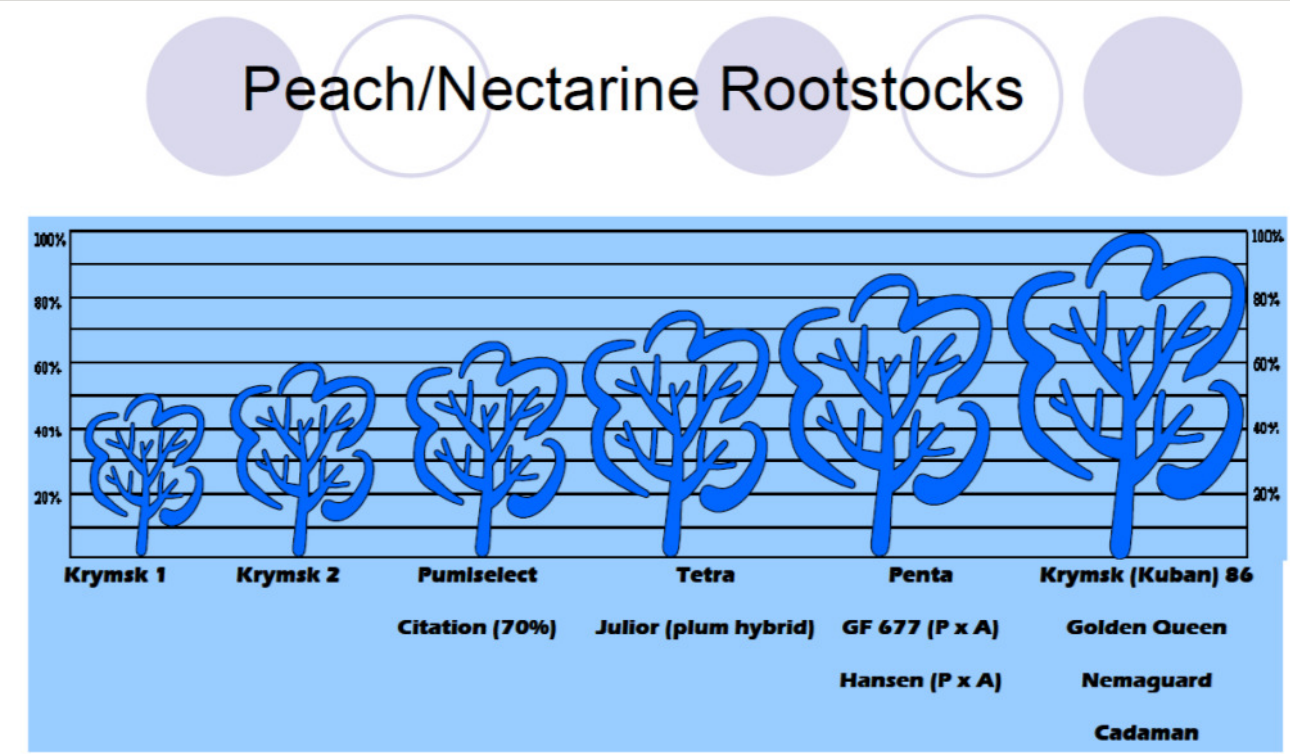


ROOTSTOCKS

Traits…

1. Nemaguard - very common vigorous rootstock, used in new sandy soils
2. Elberta - used in heavier soils
3. Krymsk86 – new vigorous rootstock, tolerant to drought, high pH and wet soil
4. Cadaman – new rootstock, an alternative to GF677
5. Cornerstone - new rootstock, high vigour and disease resistance (nematodes, crown gall)
6. Kyrmsk1 – new dwarfing rootstock, cold, drought and waterlogging tolerant



ANFIC
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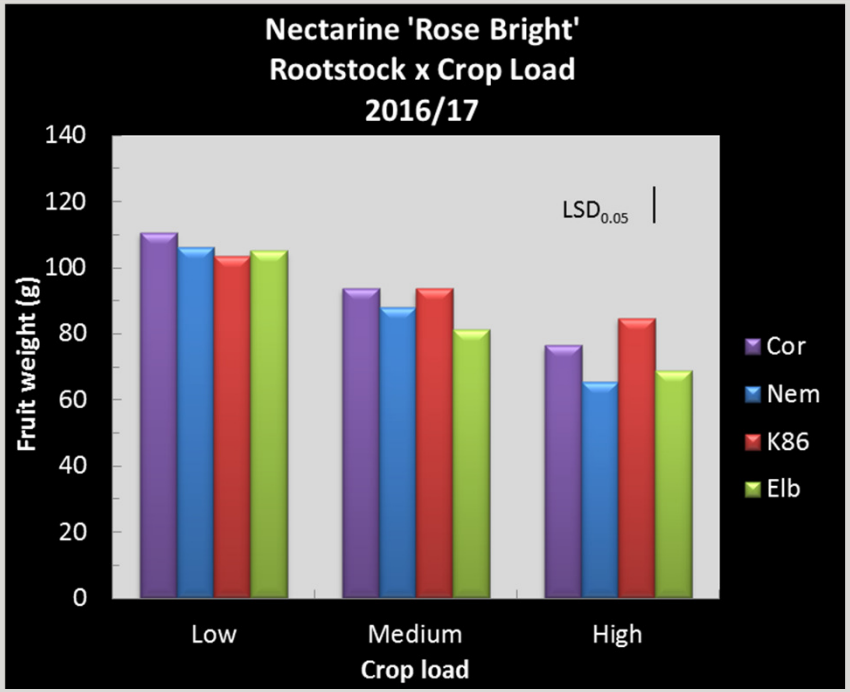
Orcharding for the Future

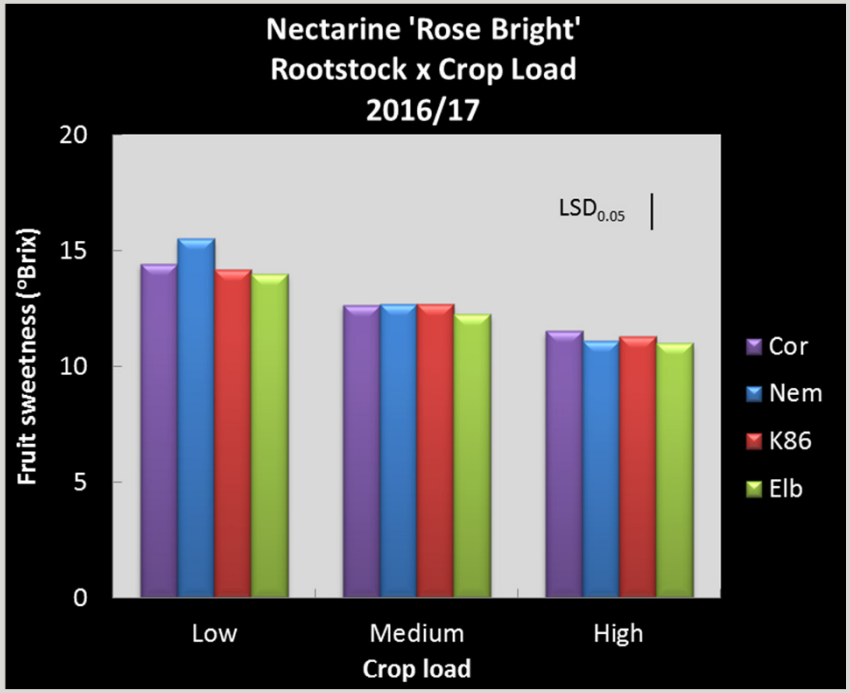
YIELD AND FRUIT QUALITY IN PEACH, NECTARINE, PLUM & APRICOT UNDER CROP LOAD MANAGEMENT AND CANOPY ARCHITECTURE

Crop load (fruiting level) treatments:

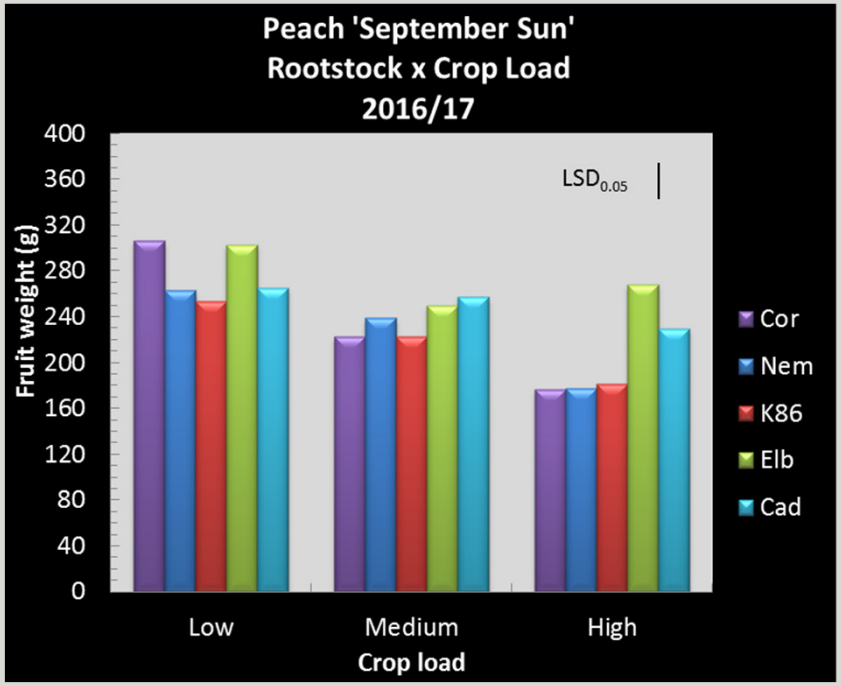
- high: minimally thinned to maximise competition between fruit and available assimilate,
- medium: moderate thinned to reduce competition between fruit and available assimilate and,
- low: heavily thinned to minimise competition between fruit and available assimilate.

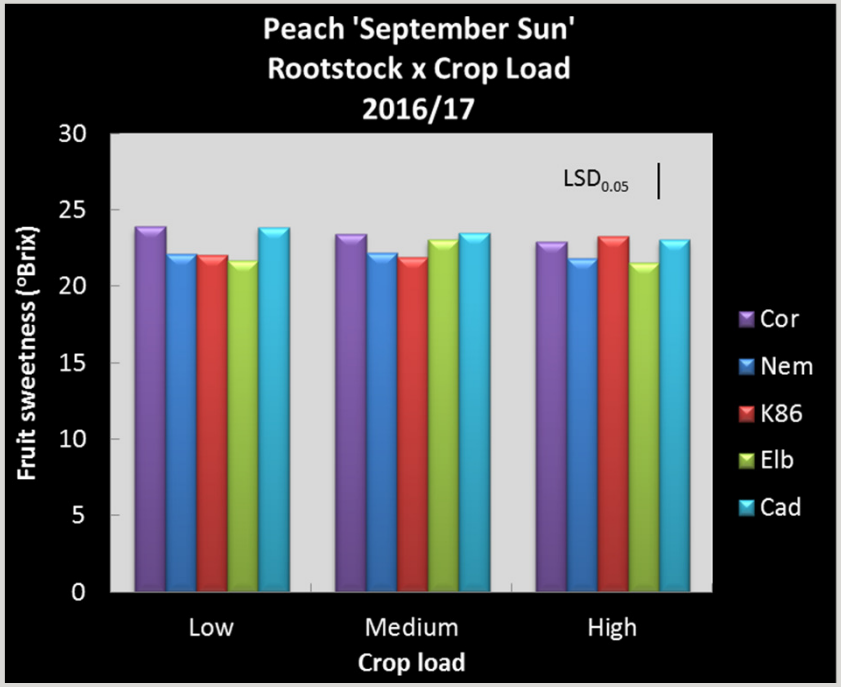
ROOTSTOCK X CROP LOAD



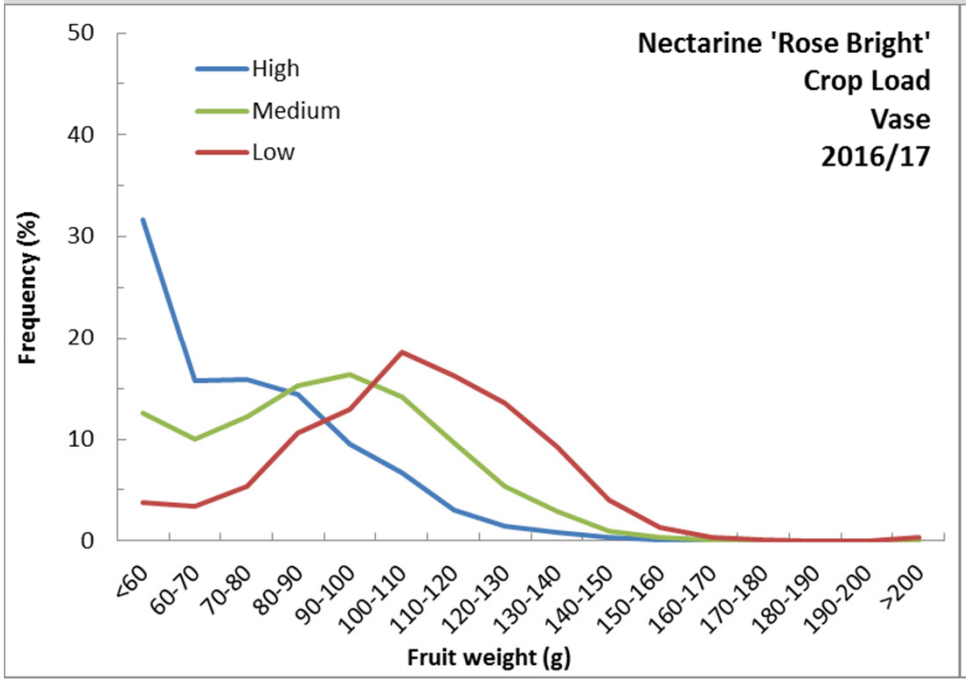


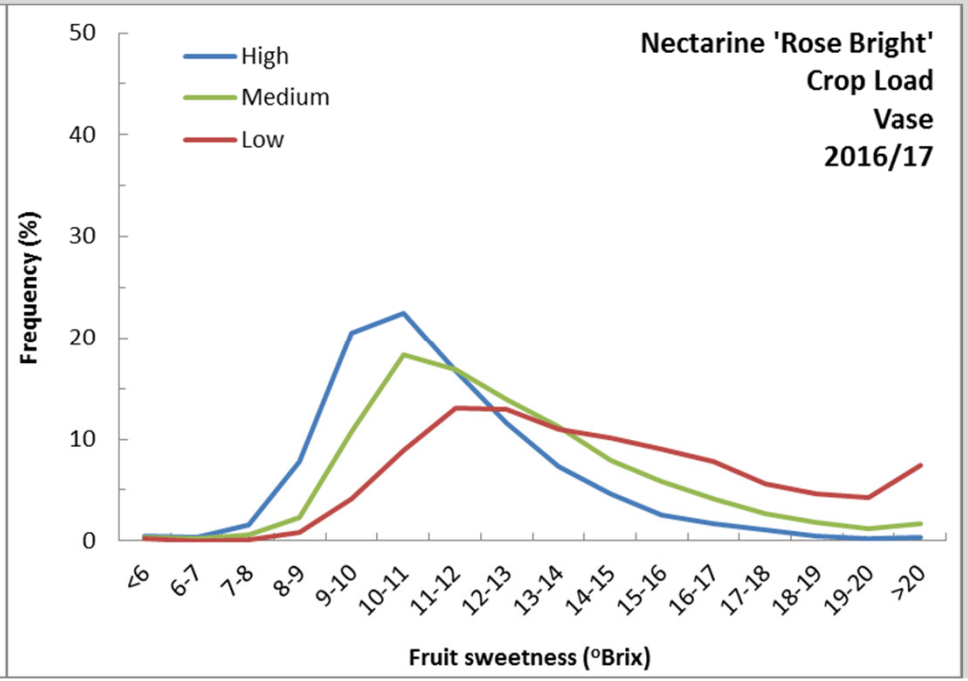
ROOTSTOCK X CROP LOAD



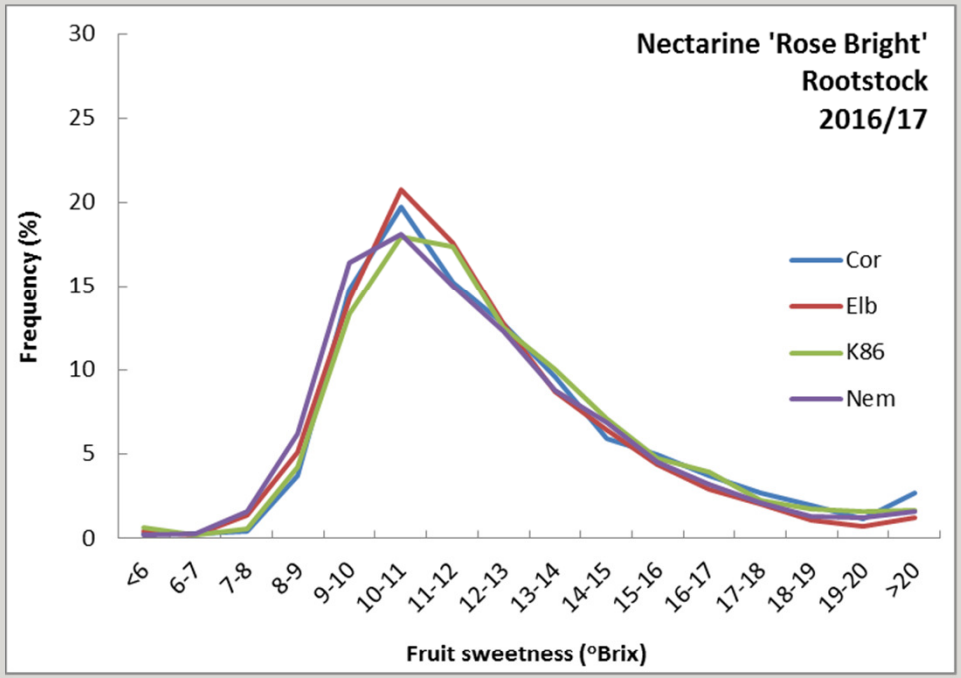


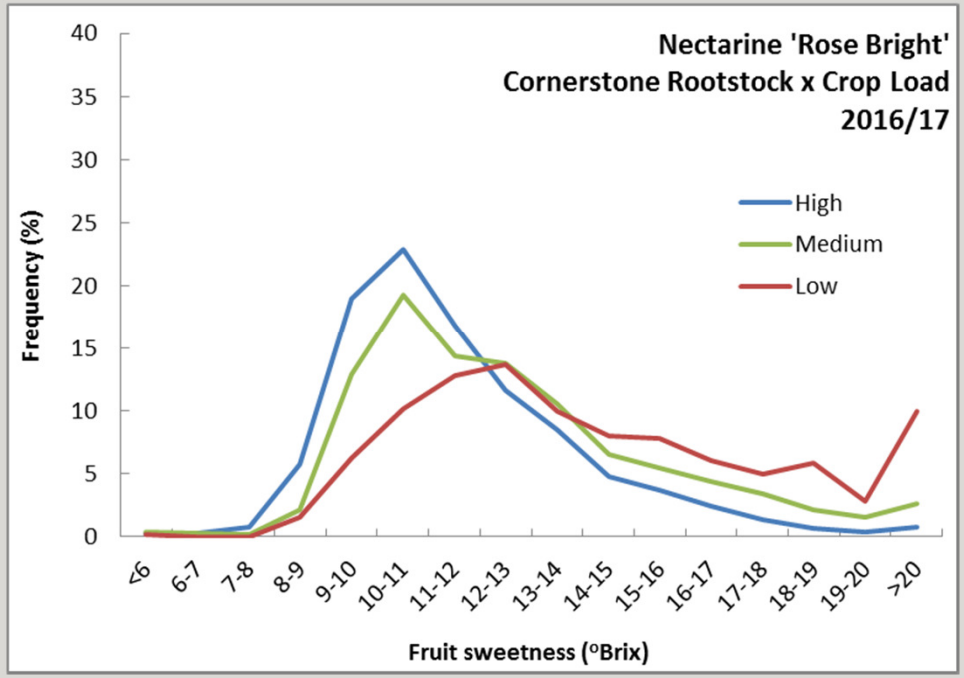
NECTARINE ‘ROSE BRIGHT’



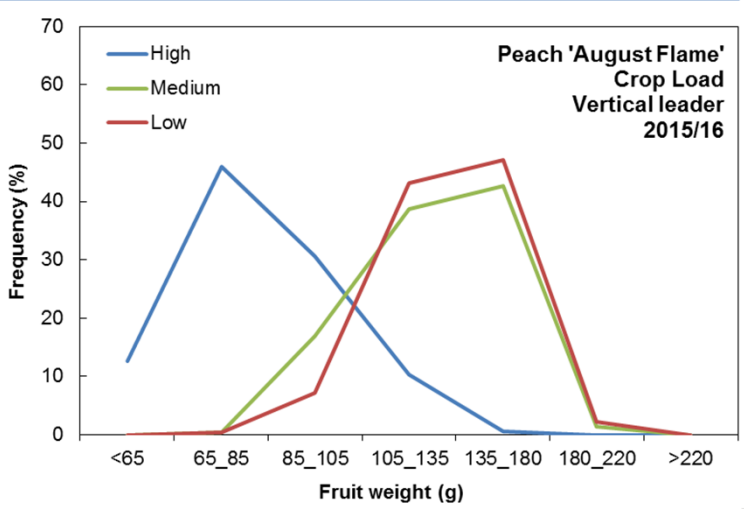


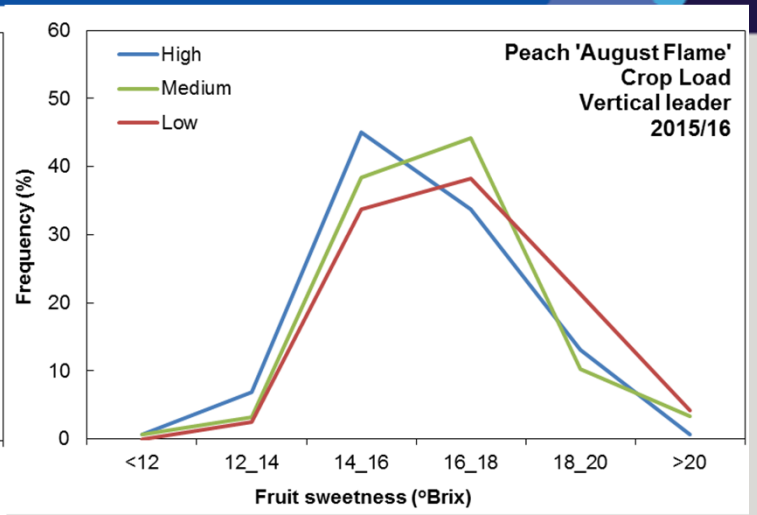
ROOTSTOCK X CROP LOAD

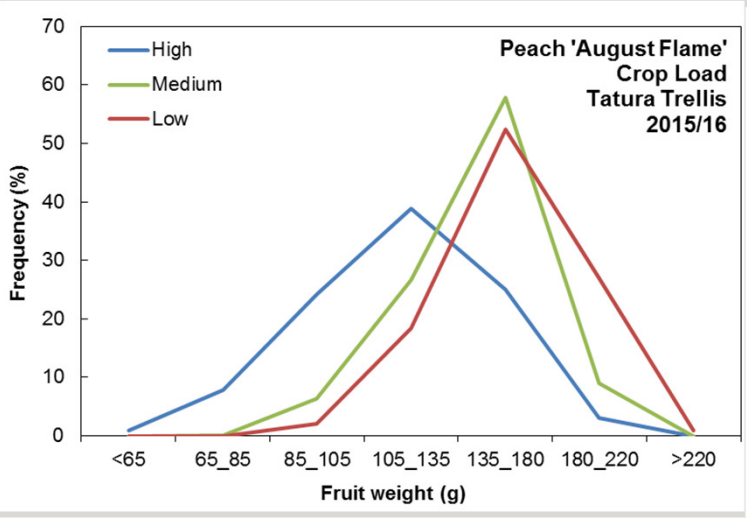


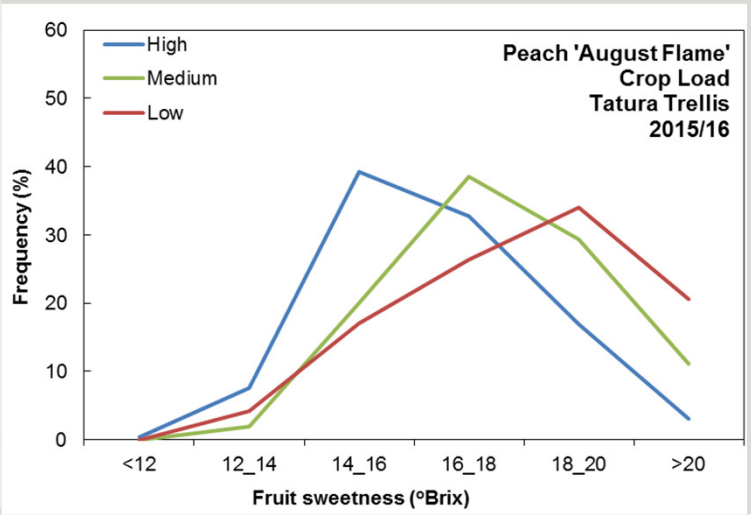


PEACH ‘AUGUST FLAME’

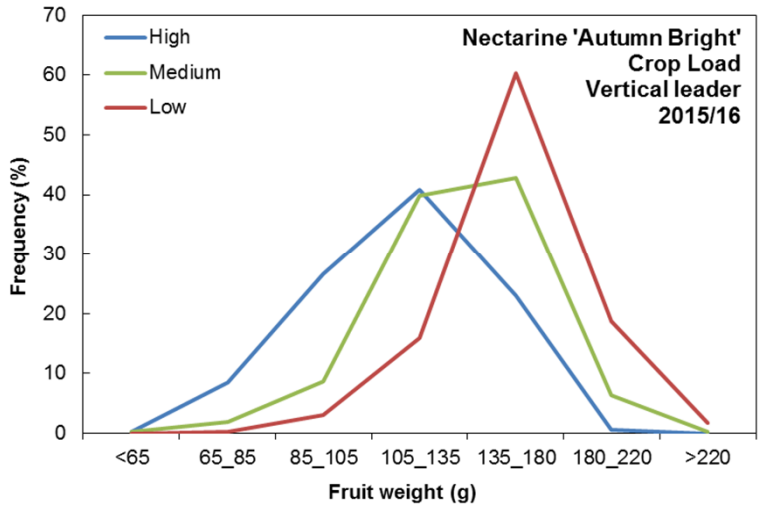


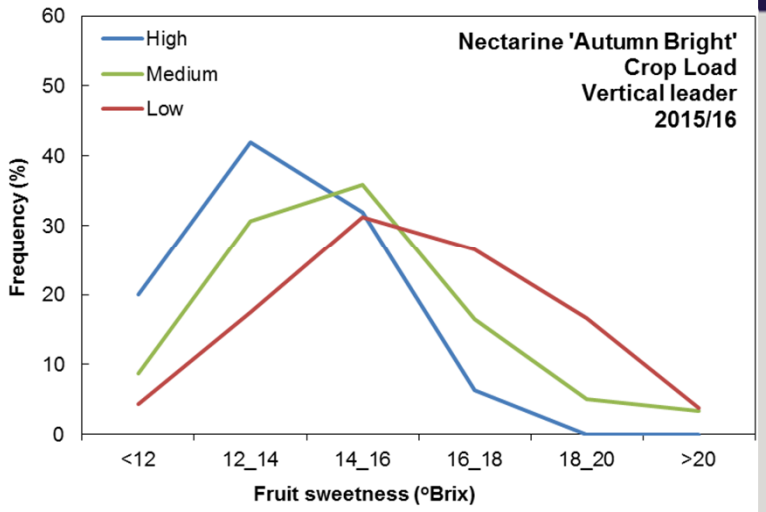


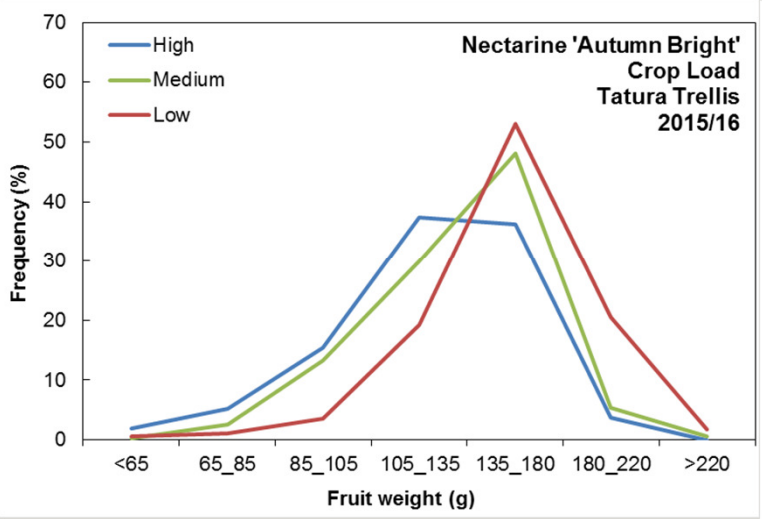


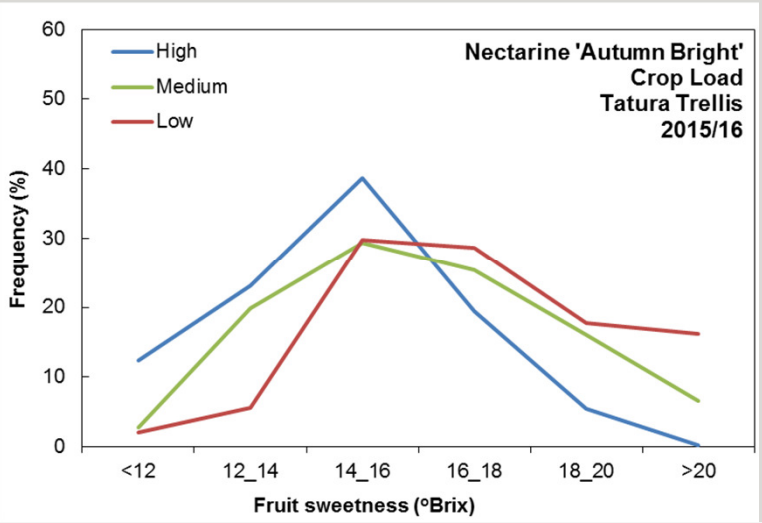


NECTARINE ‘AUTUMN BRIGHT’

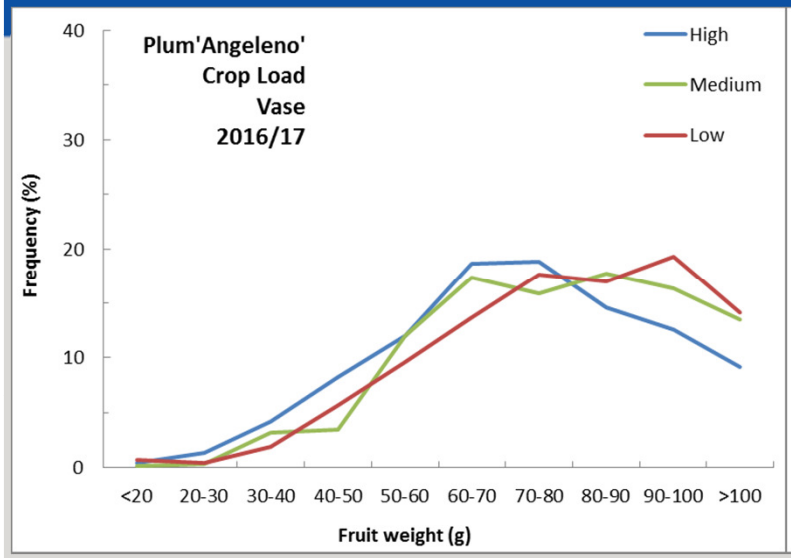


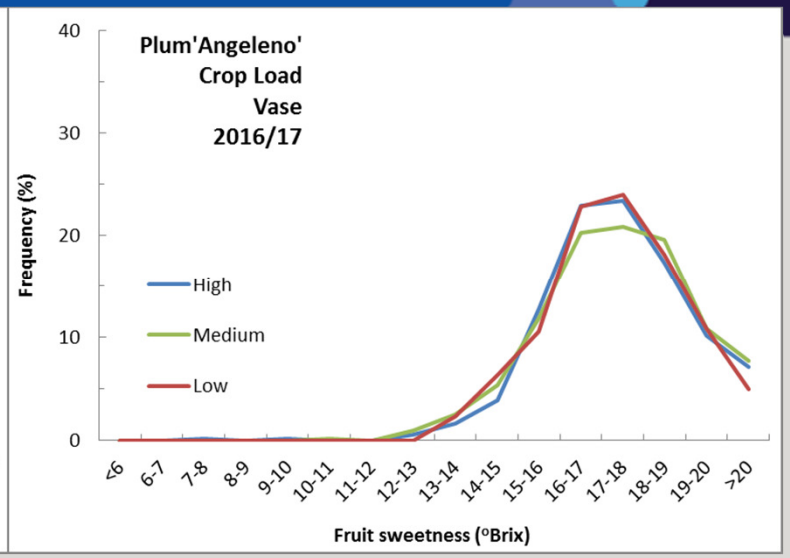


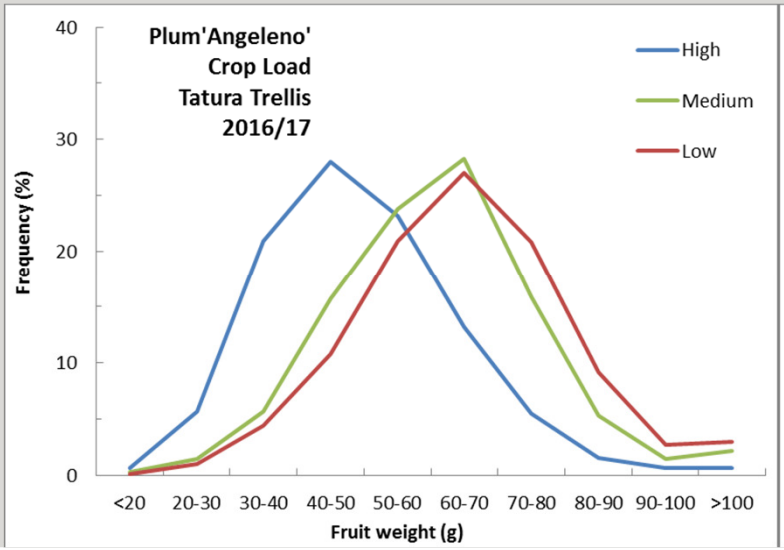


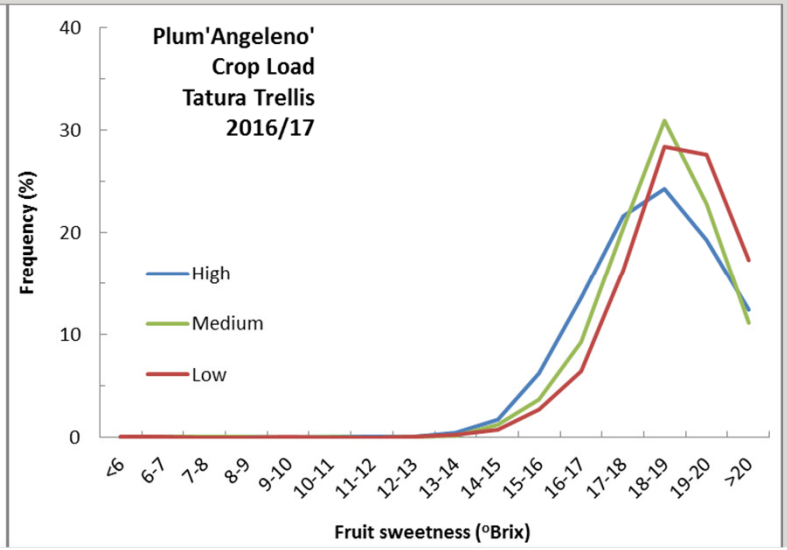


PLUM ‘ANGELENO’

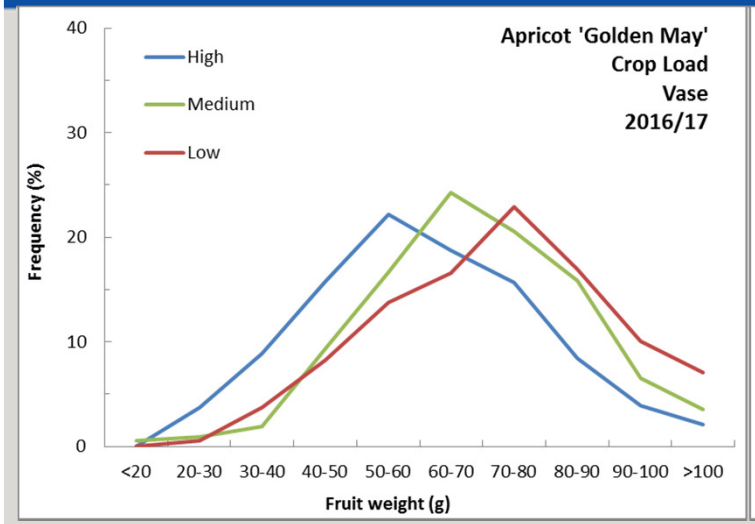


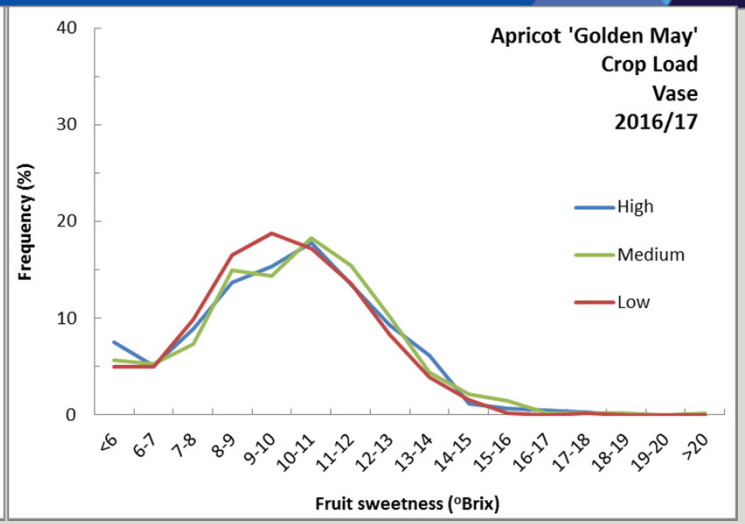


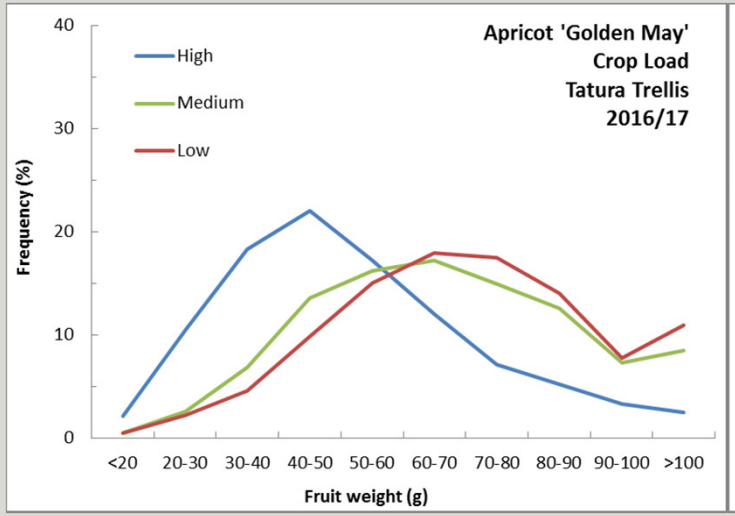


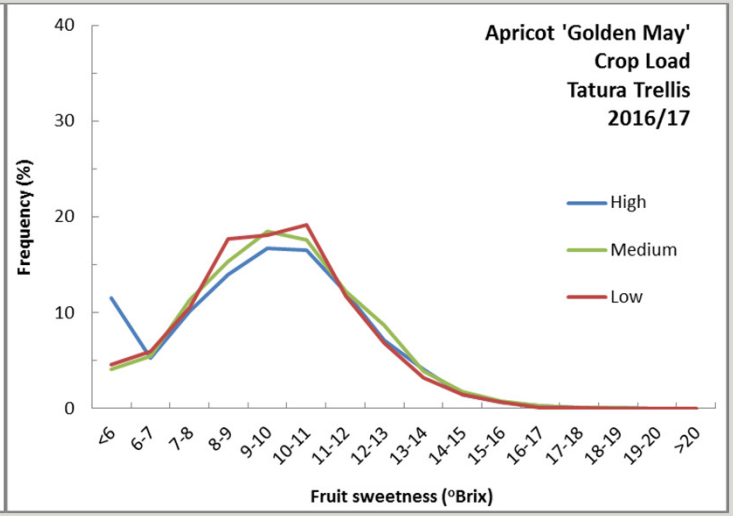


APRICOT ‘GOLDEN MAY’

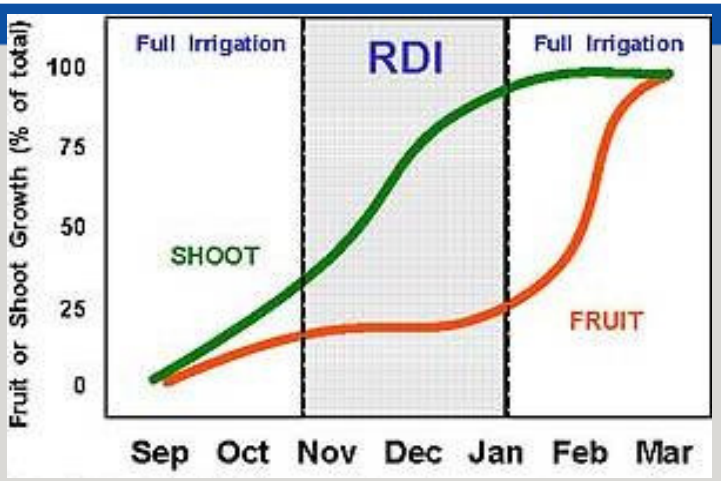






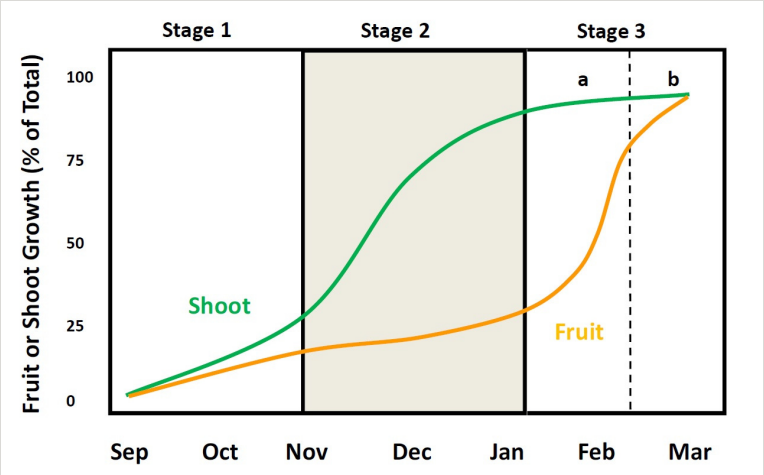


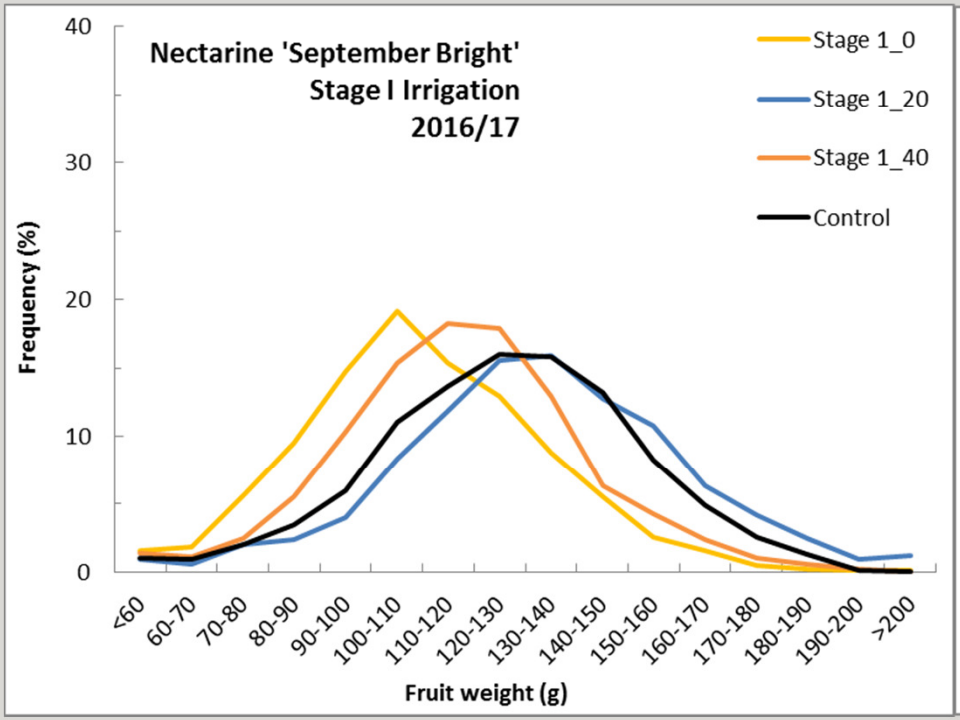
IRRIGATION (TIMING X LEVEL)

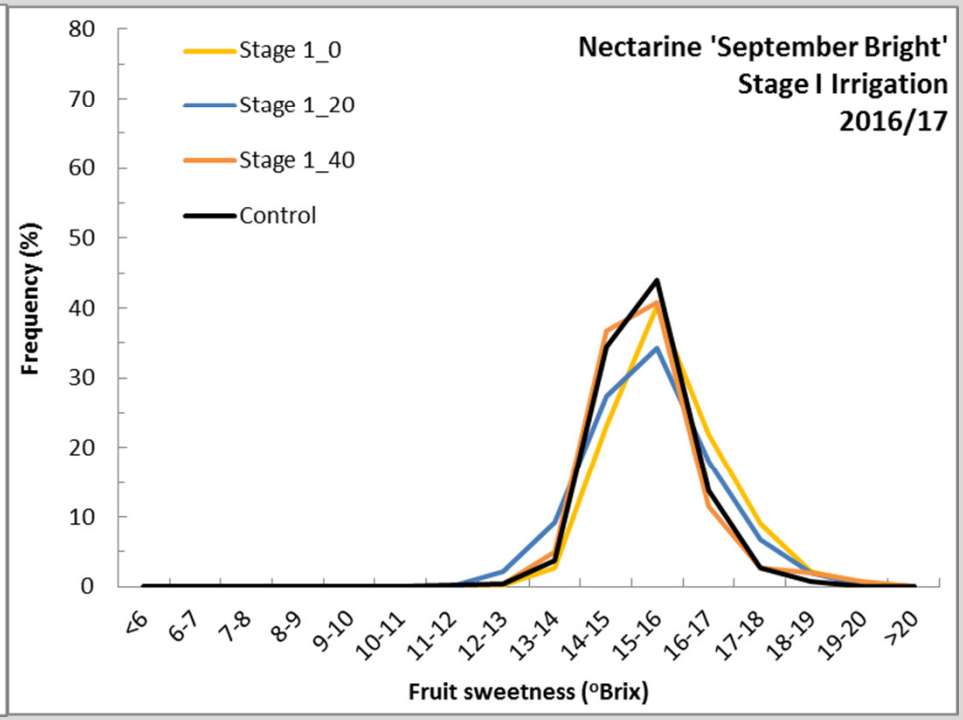


Code	Treatment	Stage I	Stage II	Stage IIIa	Stage IIIb	Stage IV
1	Control	100	100	100	100	100
2	0_I	0	100	100	100	100
3	0_II	100	0	100	100	100
4	0_IIIa	100	100	0	100	100
5	0_IIIb	100	100	100	0	100
6	20_I	20	100	100	100	100
7	20_II	100	20	100	100	100
8	20_IIIa	100	100	20	100	100
9	20_IIIb	100	100	100	20	100
10	40_I	40	100	100	100	100
11	40_II	100	40	100	100	100
12	40_IIIa	100	100	40	100	100

IRRIGATION (TIMING X LEVEL)







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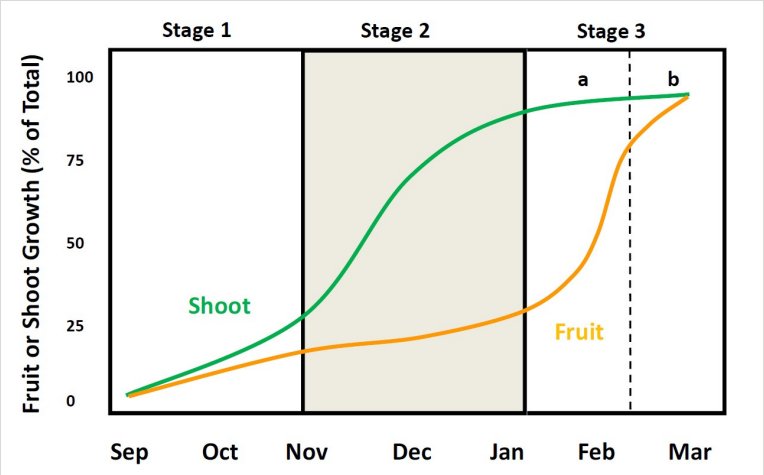

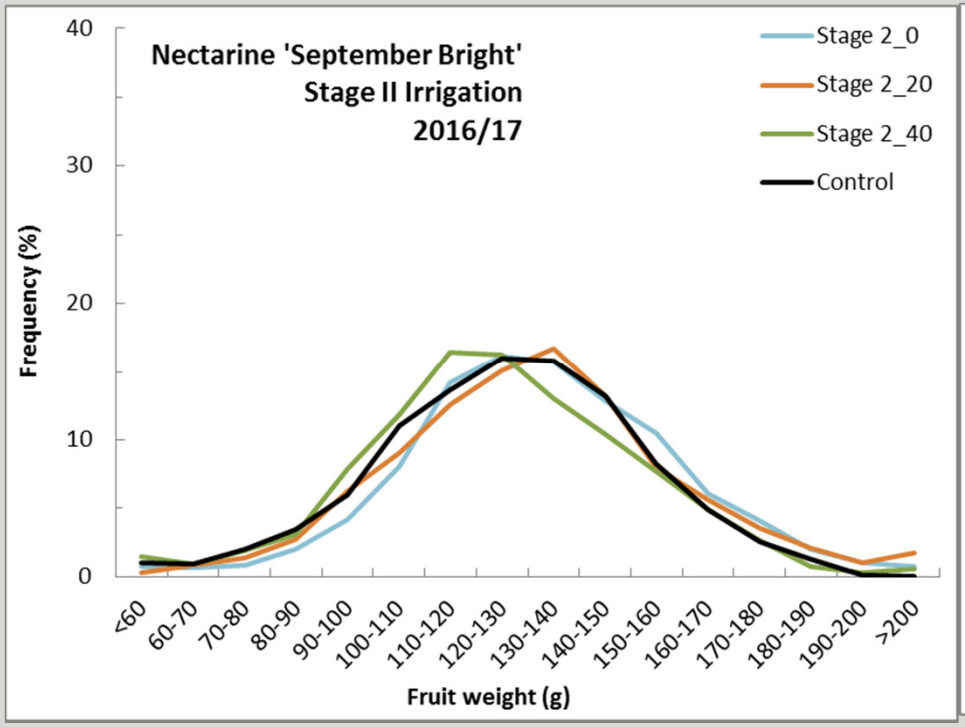

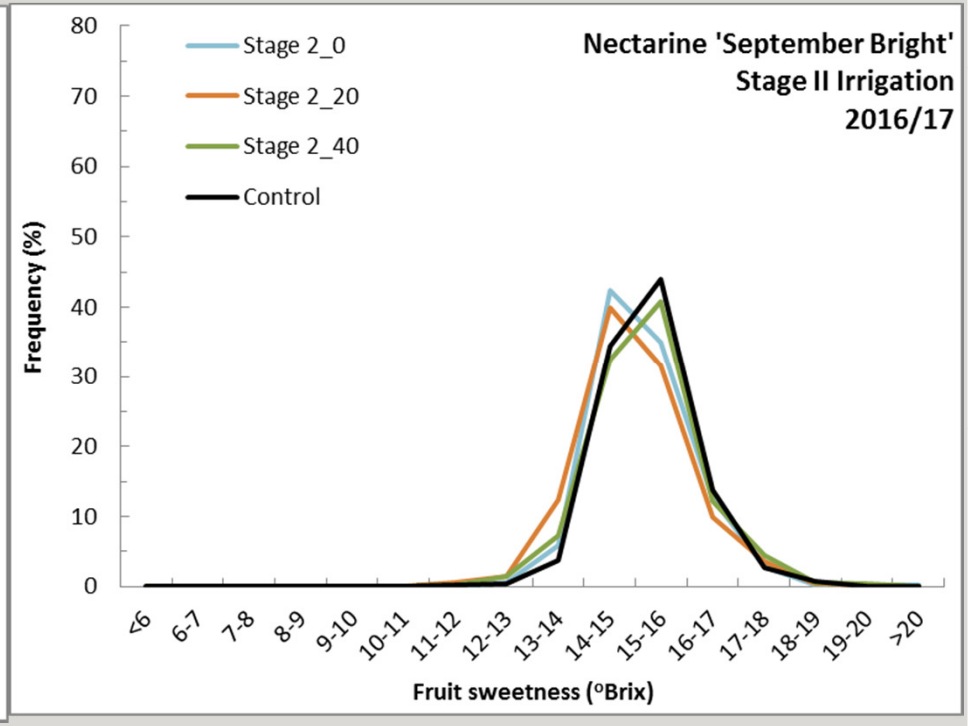

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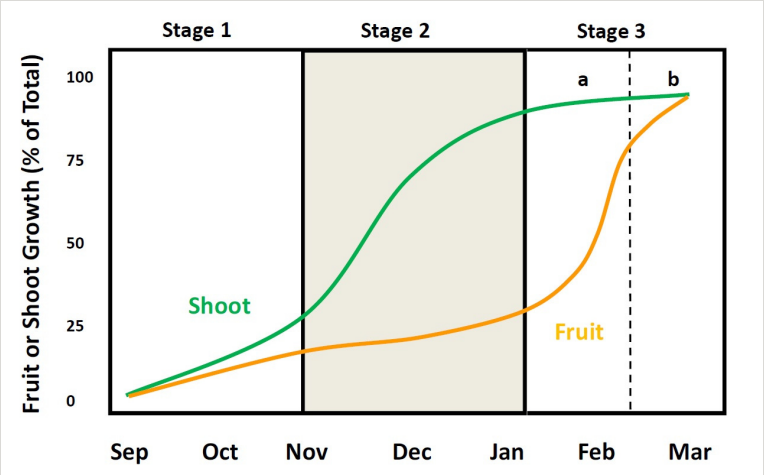
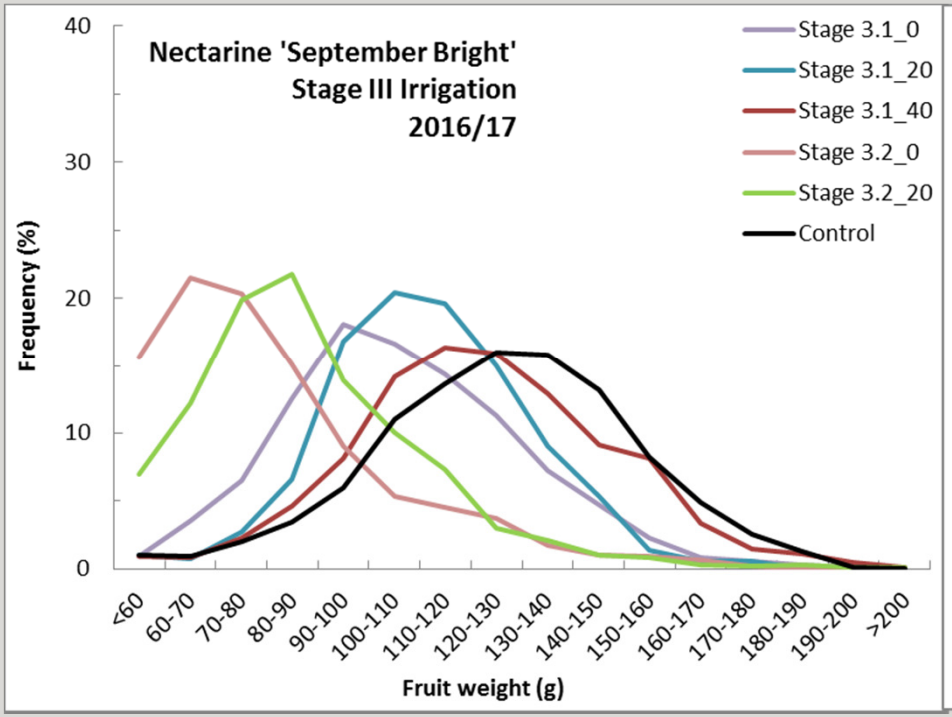
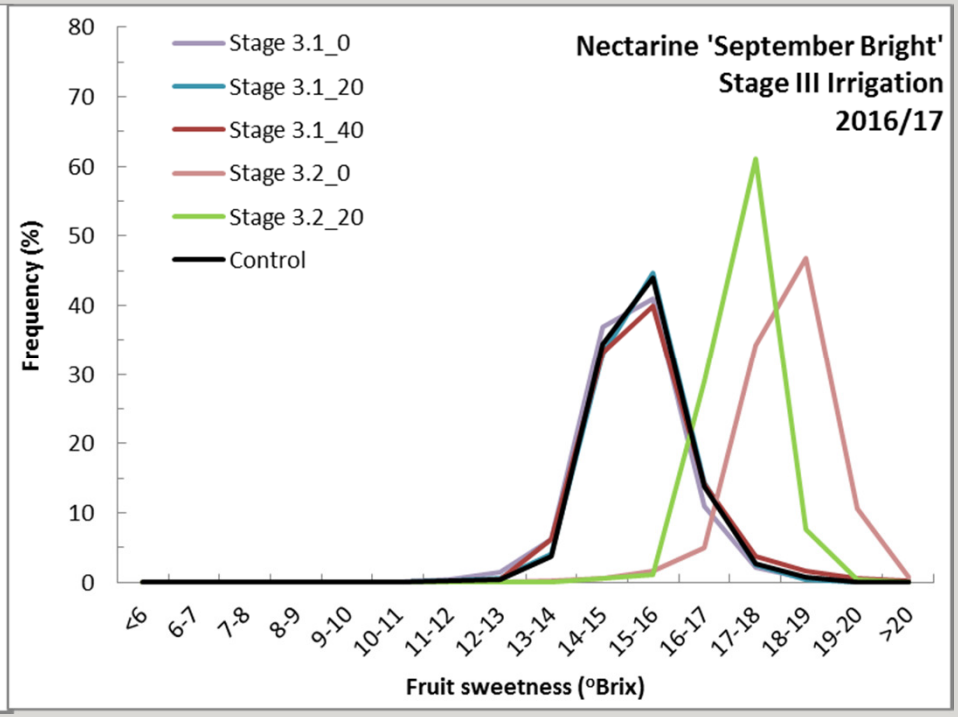
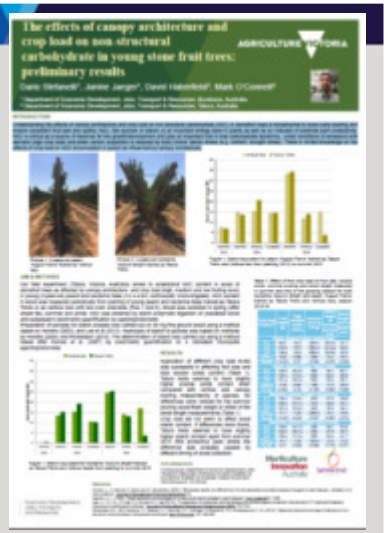






COMMUNICATIONS

- Site tours
- Roadshows
- Grower articles
- Conferences
- Hosting visiting scientists
- HIN communications
  - Fact sheets
  - Videos (demos, time series)



IHC2018 ISTANBUL

Table 1. Summary of project outputs

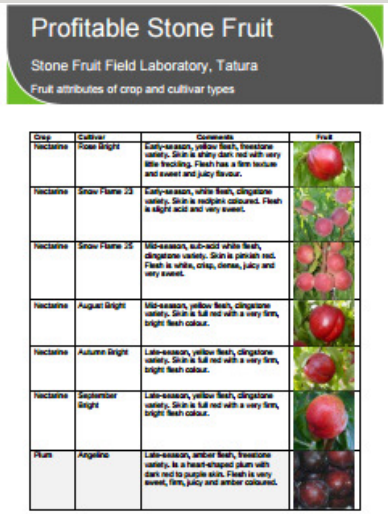
Outputs	Number
Magazine articles	5
Flyers / newsletters	3
Site (orchard) visits / tours	76
Conference presentations (international and domestic)	18
Workshops / Roadshows	4
HIN videos (YouTube)	44
HIN website links / updates	10
Journal articles submitted / in prep.	7
Project steering committee meetings	7

Further information

http://www.hin.com.au

Professor Luca Corelli Grappadelli, from university of Bologna (Italy) with Dr Mark O'Connell from Agriculture Victoria (Tatura), discuss the development of growth models for irrigation management systems for plums.

New scientific fruit grader at Tatura's New Research Harvest Facility (Agriculture Victoria).



Crop	Cultivar	Comments	Fruit
Nectarine	Fidan Bright	Early-season, yellow flesh, freestone variety. Skin is shiny dark red with very little freckling. Flesh has a firm texture and sweet and juicy flavour.	
Nectarine	Snow Flame 23	Early-season, white flesh, clingstone variety. Skin is redpink coloured. Flesh is slight acid and very sweet.	
Nectarine	Snow Flame 25	Mid-season, sub-acid white flesh, clingstone variety. Skin is pinkish red. Flesh is white, crisp, dense, juicy and very sweet.	
Nectarine	August Bright	Mid-season, yellow flesh, clingstone variety. Skin is full red with a very firm, bright flesh colour.	
Nectarine	Autumn Bright	Late-season, yellow flesh, clingstone variety. Skin is full red with a very firm, bright flesh colour.	
Nectarine	September Bright	Late-season, yellow flesh, clingstone variety. Skin is full red with a very firm, bright flesh colour.	
Plum	Angeline	Late-season, amber flesh, freestone variety. Is a heart-shaped plum with dark red to purple skin. Flesh is very sweet, firm, juicy and amber coloured.	

Apricot	Golden May	Early-season, orange flesh, freestone variety. Skin is bright orange. Flesh has a very firm texture with a sweet and juicy flavour.	
Peach	Red Haven	Mid-season, yellow flesh, freestone variety. Has a bright red blush over yellow skin. Firm, creamy textured yellow flesh.	
Peach	Ice Princess	Mid-season, white flesh, sub-acid freestone variety. Skin is full pink to red. Flesh has a firm texture and very sweet flavour.	
Peach	O'Henry	Early and Late-season, yellow flesh, freestone variety. Skin is bright blush red with a yellow flesh that contains some red streaking. Flesh has a firm texture with a sweet and juicy flavour.	
Peach	September Sun	Late-season, yellow flesh, freestone variety. Skin is red coloured on yellow/orange background with medium thickness. Flesh is firm, crisp, juicy and bright yellow coloured with bleeding to red near pit.	
Peach	August Flame	Late-season, yellow flesh, freestone variety. Has a bright red blush over warm yellow to orange skin.	
Peach	Snow Fall	Late-season, white flesh, freestone variety. Skin is pale white with a light red blush. Flesh is low acid.	

http://www.hin.com.au

The Profitable Stonefruit program consists of a series of experiments, analysis and trials: **Select picture links below**

About the Field Laboratory

Rootstock experiments

Stonefruit maturity experiments

Canopy experiments

Innovation in Stonefruit

Overseas consumer research

Photos of Tree growth over time

Irrigation experiments

A modern stonefruit research orchard has been established at DEDJTR-Tatura to investigate field management practices conducive to fruit quality outcomes consistent with consumer expectations. Long-term experiments will examine effects of crop load, rootstock and irrigation management and canopy training systems in peach, nectarine, plum and apricot. The agronomic studies will be supplemented by sensory research, consumer preference investigations and incorporate new non-destructive measurement technologies to monitor fruit quality along the supply chain.The field laboratory also provides a resource for future studies on integrated pest and disease management, harvest and post-harvest fruit quality, handling, packaging, storage shipping and retail steps and associated protocols in the supply chain. Furthermore, the laboratory offers a platform for industry engagement where growers can be informed of how production and handling practices can be used to meet consumer needs in local and export markets.

COMING SOON:

Post Harvest Performance

Stonefruit field laboratory plantings, Tatura DEDJTR, 2014

Fruit attributes of crop and cultivar types

Select link here or picture below

Project Leader: Dr. Mark O'Connell

Senior Research Scientist – Group Leader - Horticulture Production Science

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- Meet the Team
- Stonefruit Field Laboratory Advisory Committee
- Videos on Markets - Supermarkets, Asia and International Consumers

Summerfruit AUSTRALIA

Summerfruit Australia Limited (SAL) is the industry voice on a national and international level. It is recognised by government as the peak industry body for growers and works closely with other interested groups, government and supply chain partners to maximise profitability for the industry.

Amid rising stone fruit export opportunities and the ever-present need to satisfy consumer expectations, Dr Mark O'Connell is working to change the way the industry does business, one field trial at a time.

Information on the Agriculture Victoria Website

Orchard management

- Choosing an orchard irrigation system

OUTCOMES

- Reduced crop load improves fruit size and sweetness
- Low irrigation inputs (stage 3) increases sweetness but reduces fruit size

Next users:

Growers, Farm advisors, Service providers, Importers, Market/supply chain specialists, Researchers

Communications:

Advisory committee, HIN, presentations, seminars, conferences, videos, factsheets, protocols, updates, roadshows, field walks/tours

EMERGING OPPORTUNITIES

Meeting Asian consumer preferences

- Increase food value: consumer preference (aroma, flavour & taste)
- Fruit maturity models: supply chain management logistics (tree-to-table): labour, harvest, cold storage, handling, transport, wholesale, retail
- Management systems for Chinese stonefruit varieties: aroma, volatiles, shape

Food security under changing environments

- Increase production: high density, optimise inputs, high water productivity
- Improved spatial & temporal management: fruit position, water, pesticide, fertiliser (precision farming)

Fruit size, tree size, yield and fruit sweetness and leaf conductance (% of control) to irrigation (level x timing) treatments of nectarine 'September Bright' under an Open Tatura canopy system at the Stonefruit Field Laboratory, Tatura, during various fruit growth stages of the 2016/17 season.

Treatment	Fruit size Stage 1 End (%)	Fruit size Stage 2 End (%)	Fruit size Stage 3.1 End (%)	Final fruit weight (%)	Tree size Stage 3.1 Mid (%)	Leaf conductance Stage 3.1 Mid (%)	Yield (%)	Fruit sweetness (%)
Stage 1 _0	88	98	97	87	91	105	88	103
Stage 1 _20	95	99	101	105	92	74	92	100
Stage 1 _40	96	97	97	93	106	87	113	100
Stage 2 _0	98	91	98	105	90	73	88	99
Stage 2 _20	100	95	98	104	87	91	92	98
Stage 2 _40	96	94	98	98	94	76	93	100
Stage 3.1 _0	98	100	83	84	103	10	90	99
Stage 3.1 _20	98	100	97	88	91	25	99	100
Stage 3.1 _40	98	98	91	97	98	23	97	100
Stage 3.2 _0	99	99	99	64	96	64	70	118
Stage 3.2 _20	97	100	97	70	102	56	73	113
Control	100	100	100	100	100	100	100	100