Asian Markets: Serviced Supply Chains

Stone fruit cultivar performance during cool storage and predicting quality during export

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Stone fruit webinar series

Stone fruit cultivar performance during cool storage and predicting quality during export
John Lopresti, Agriculture Victoria

19th August 2020

Using real-time data loggers and dashboards
Glenn Hale, Agriculture Victoria

26th August 2020

Delayed cooling after harvest reduces storage disorders in white nectarine and peach
John Lopresti, Agriculture Victoria

2nd September 2020

Are the fruit on your trees really ready to pick?
Christine Frisina, Agriculture Victoria

9th September 2020

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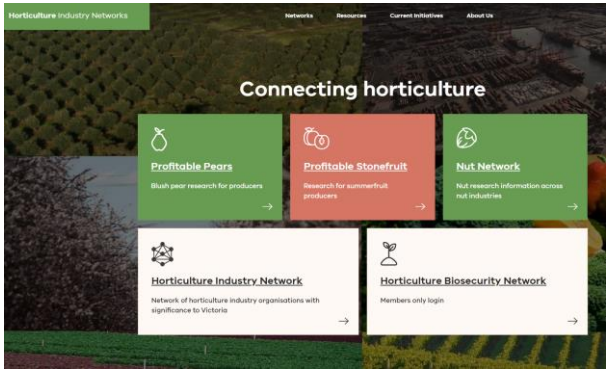
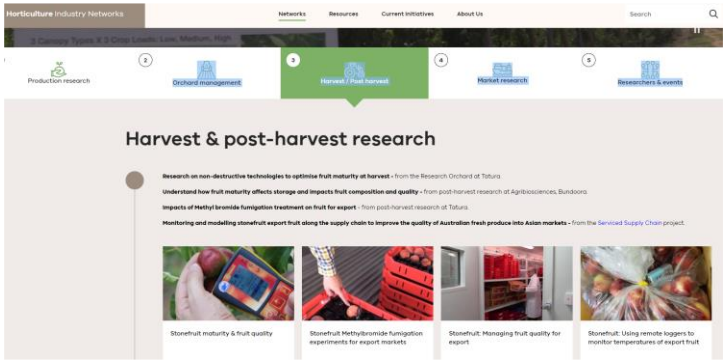
Serviced supply chains – Stone fruit

- Cultivar performance and potential for storage disorders
- Optimum harvest maturity (ripeness)
- Use of real-time temperature logging
- Impacts of temperature management during export
- Fruit shelf life prediction
- Postharvest treatments to reduce storage disorders





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Briefly covering today…..

1. Cultivar performance
    - Recent cultivars i.e., white-fleshed
    - Potential for storage disorders i.e., storage duration
2. Impacts of temperature management during export
    - Air freight commercial simulation
    - Sea freight commercial simulation
    - Predicting fruit softening using temperature & storage duration
3. Stone fruit shelf life prediction
    - Effect of different temperatures on rate of fruit softening
    - Demonstration of a shelf life prediction tool

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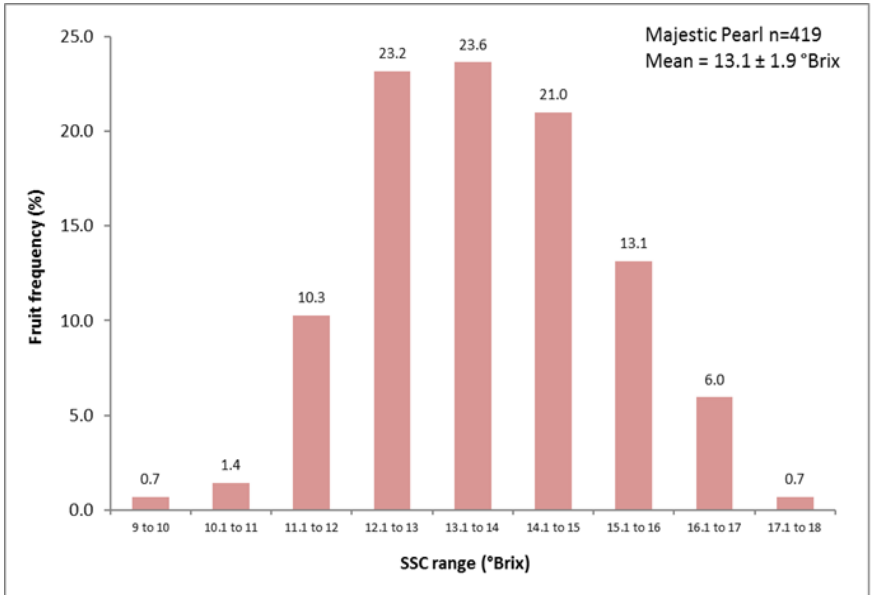
Harvest & storage performance issues

- Variety
  - Behave differently in storage
  - Some susceptible to storage disorders
  - Little information about new varieties

- Distant export markets
  - i.e, sea freight duration > 4 weeks
  - Importer storage > 1 week



- Harvest maturity & variability

- Limited temperature monitoring
  - Particularly before and after export

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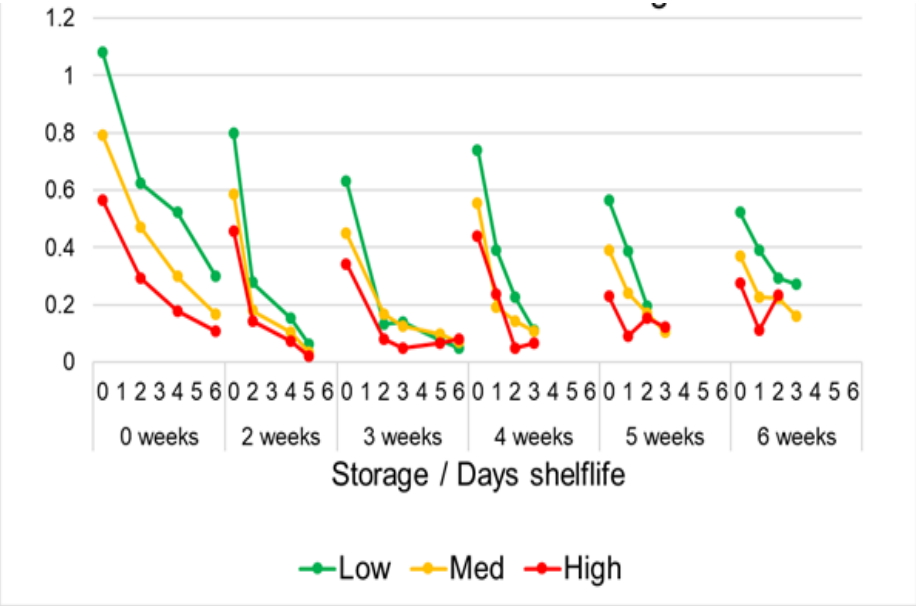
Harvest maturity

Fruit maturity classes and constant temperature storage at 2°C



DA meter to measure fruit maturity

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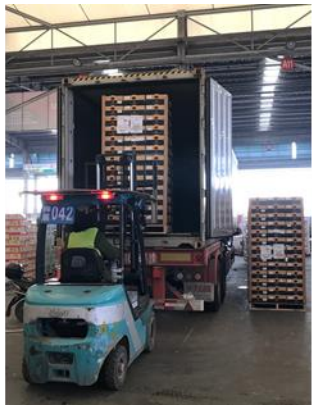
Export temperature monitoring

- Air freight
  - Variable temperatures over short export period
  - Effect of short and high temperature spikes?
- Sea freight
  - Good temperature management
  - BUT among majority of consignments sea freight leg >27 days and up to 35 days!!
- Temperature logging difficult to implement after arrival at importer



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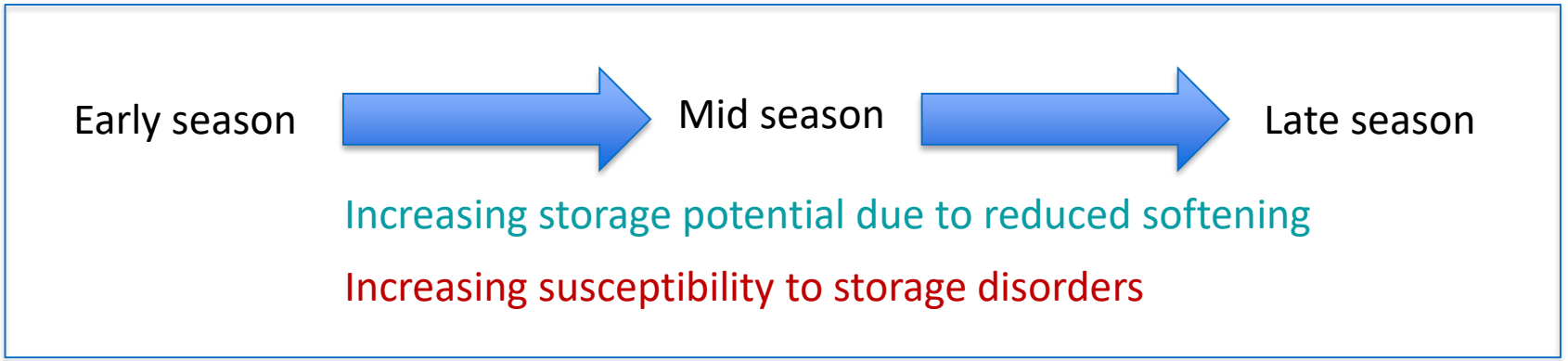
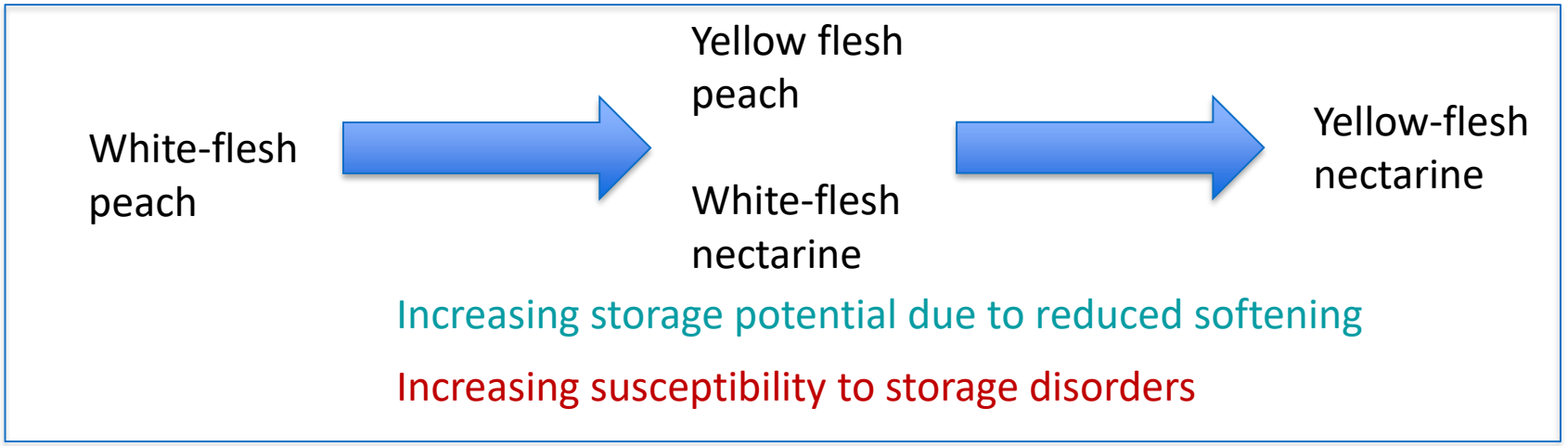
General behavior of fruit type and variety





Tree age, orchard climate……??
Melting versus Non-melting

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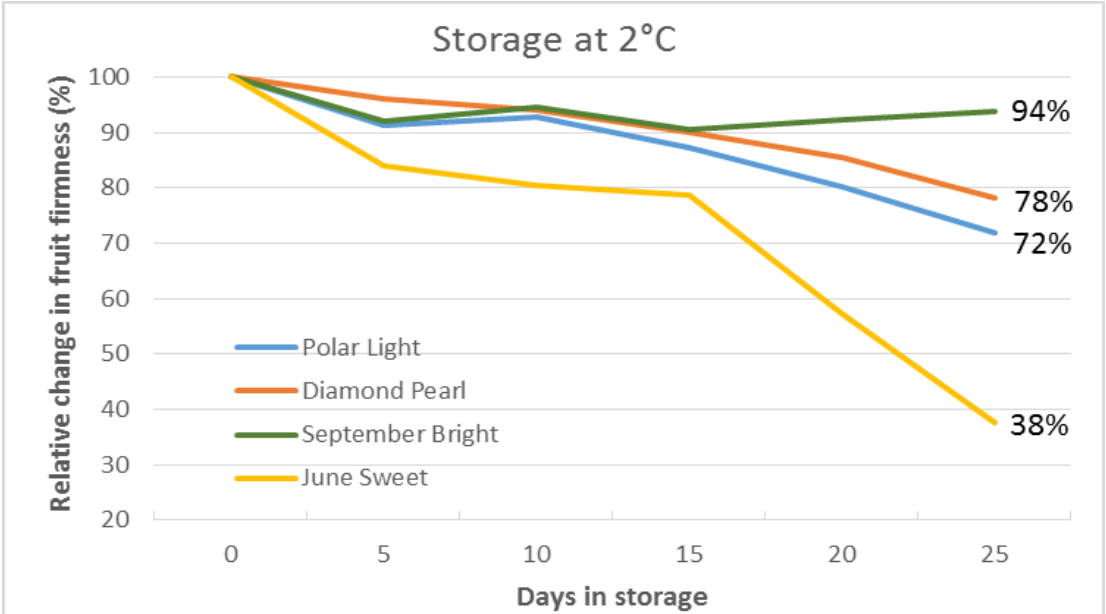
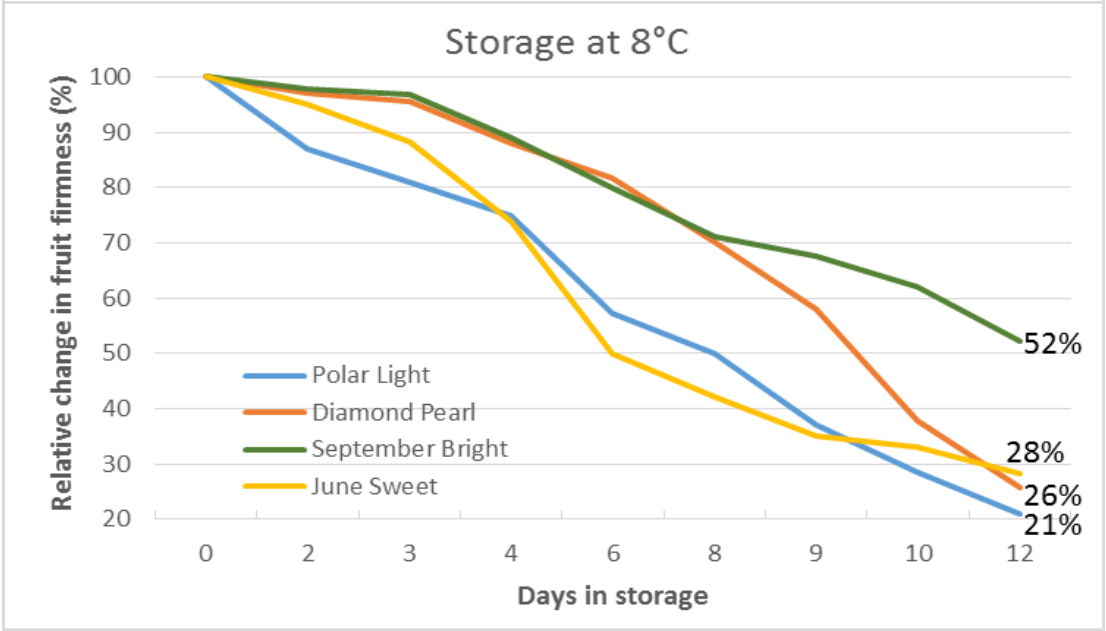
Storage behavior of selected varieties

Effect of fruit type and seasonality

‘Commercial maturity’

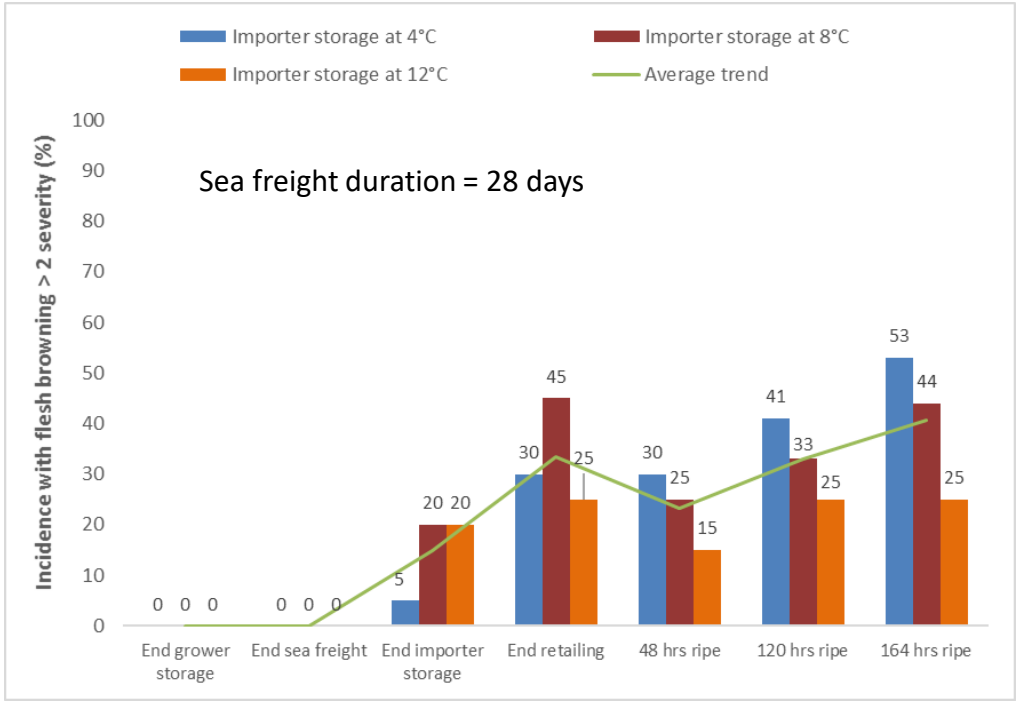
Type	Variety	Harvest firmness (kgf)
Very early yellow nectarine	June Sweet	5.9
Early white nectarine	Polar Light	5.1
Early white nectarine	Diamond Pearl	6.5
Mid yellow nectarine	September Bright	6.4

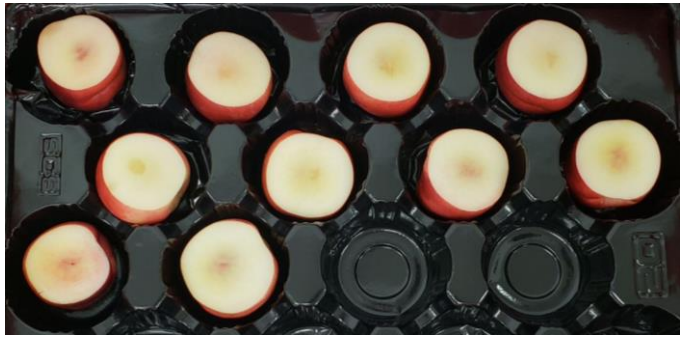




Cultivar storage potential - disorders

Sea freight export simulation……





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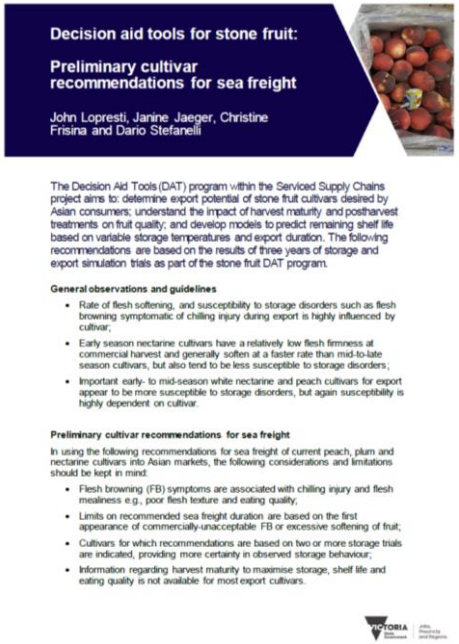
Outcomes – Cultivar storage potential

Peach, plum and nectarine cultivar recommendations for sea freight

Type	Cultivar	Sea freight FB risk	Max. storage duration at 2°C	Limiting factors for storage	Maximum harvest maturity (I_{AD} value)
White nectarine	White Knight	Low	2 weeks	Fruit softening	na
	Polar Light	Low	2 weeks	Fruit softening	na
	Diamond Pearl*	Moderate/ High	3 weeks	Chilling injury	na
	Flavour Pearl*	Low	4 weeks		na
	Majestic Pearl*	High	3 weeks	Chilling injury	na
White peach	Polar Princess*	High	2 to 3 weeks	Chilling injury	na
	Autumn Snow	Moderate	3 weeks	Chilling injury	na
	Polar Queen	High	2 to 3 weeks	Chilling injury	na
	Sierra Princess*	Moderate/ High	3 weeks	Chilling injury	na
	Snow Fall*	Moderate/ High	3 weeks	Chilling injury	na
Plum	Sunshine*	Low/ Moderate	4 weeks	Softening/ Shrivel	na
	Red Phoenix	Low	4 to 5 weeks	Shrivel	na
	Autumn Honey*	Low	4 to 5 weeks		na
Yellow nectarine	Sol Candy	Low	4 weeks	Fruit softening	na
	September Bright*	High	3 weeks	Chilling injury	1.20
	June Sweet*	Low	3 to 4 weeks		na

FB = Flesh browning sympotms associated with chilling injury and flesh mealiness
Maximum storage duration based on first appearance of FB or excessive softening of fruit during storage
*Recommendations based on two or more storage trials with remaining recommendations based on a single trial
Maximum harvest maturity above which proper ripening is unlikely
na = not available



Decision aid tools for stone fruit:

Preliminary cultivar recommendations for sea freight

John Lopresti, Janine Jaeger, Christine Frisina and Dario Stefanelli

The Decision Aid Tools (DAT) program within the Serviced Supply Chains project aims to: determine export potential of stone fruit cultivars desired by Asian consumers; understand the impact of harvest maturity and postharvest treatments on fruit quality; and develop models to predict remaining shelf life based on variable storage temperatures and export duration. The following recommendations are based on the results of three years of storage and export simulation trials as part of the stone fruit DAT program.

General observations and guidelines

- Rate of flesh softening, and susceptibility to storage disorders such as flesh browning symptomatic of chilling injury during export is highly influenced by cultivar;
- Early season nectarine cultivars have a relatively low flesh firmness at commercial harvest and generally soften at a faster rate than mid-to-late season cultivars, but also tend to be less susceptible to storage disorders;
- Important early- to mid-season white nectarine and peach cultivars for export appear to be more susceptible to storage disorders, but again susceptibility is highly dependent on cultivar.

Preliminary cultivar recommendations for sea freight

In using the following recommendations for sea freight of current peach, plum and nectarine cultivars into Asian markets, the following considerations and limitations should be kept in mind:

- Flesh browning (FB) symptoms are associated with chilling injury and flesh mealiness e.g., poor flesh texture and eating quality;
- Limits on recommended sea freight duration are based on the first appearance of commercially-unacceptable FB or excessive softening of fruit;
- Cultivars for which recommendations are based on two or more storage trials are indicated, providing more certainty in observed storage behaviour;
- Information regarding harvest maturity to maximise storage, shelf life and eating quality is not available for most export cultivars.

Horticulture Industry Networks

http://hin.com.au/current-initiatives/serviced-supply-chain

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Beyond SSC project…..

- Benchmark latest and new cultivars against best performing varieties
  - Cool storage and ripening trials
  - By type and seasonality
- Optimum harvest maturity based on fruit physiology
- Postharvest treatments
  - Optimum cooling practices after harvest
  - MA liners
  - Impact of fumigation on fruit quality
- Temperature monitoring
  - Harvest onwards not just export stage

Impact of temperature management and storage duration

- Assumption is that we already know what these are
  - Do we…. particularly for current export varieties?
  - May have a general idea but specifically?

- What is the actual impact of 'poor' temperature management?
  - E.g., 3 days at 8°C during export, or 12 hours at 16°C
- What is the impact of high air freight temperature on fruit quality?
- How long can a grower or importer cool store a variety?
- Immediate or delayed cooling after harvest?
  - Impact on fruit softening
  - Impact on cool storage disorders

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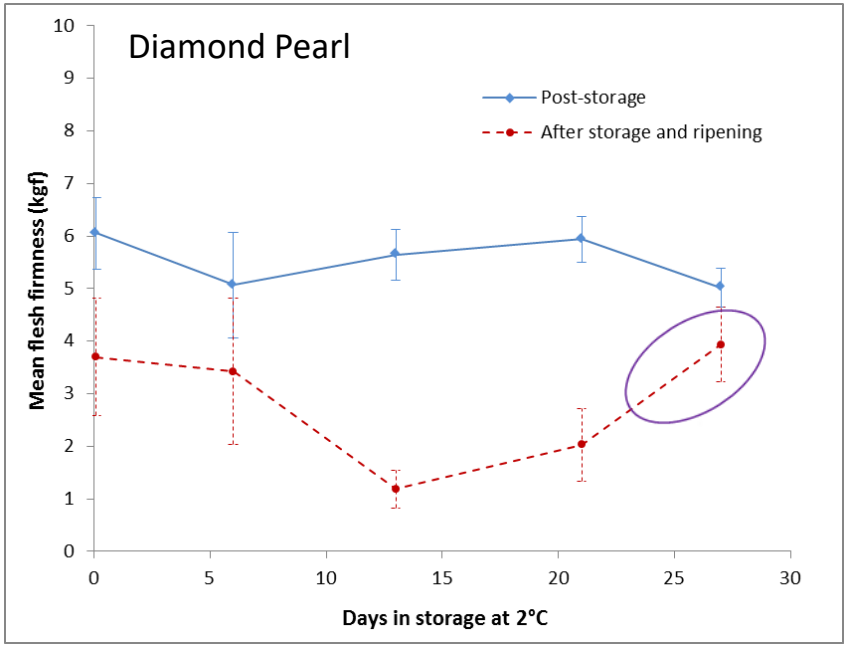
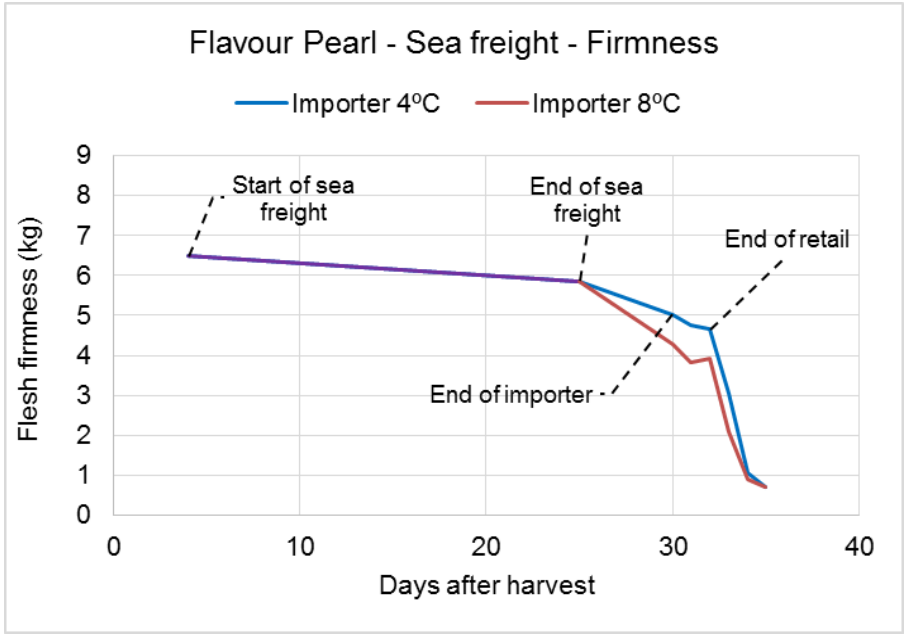
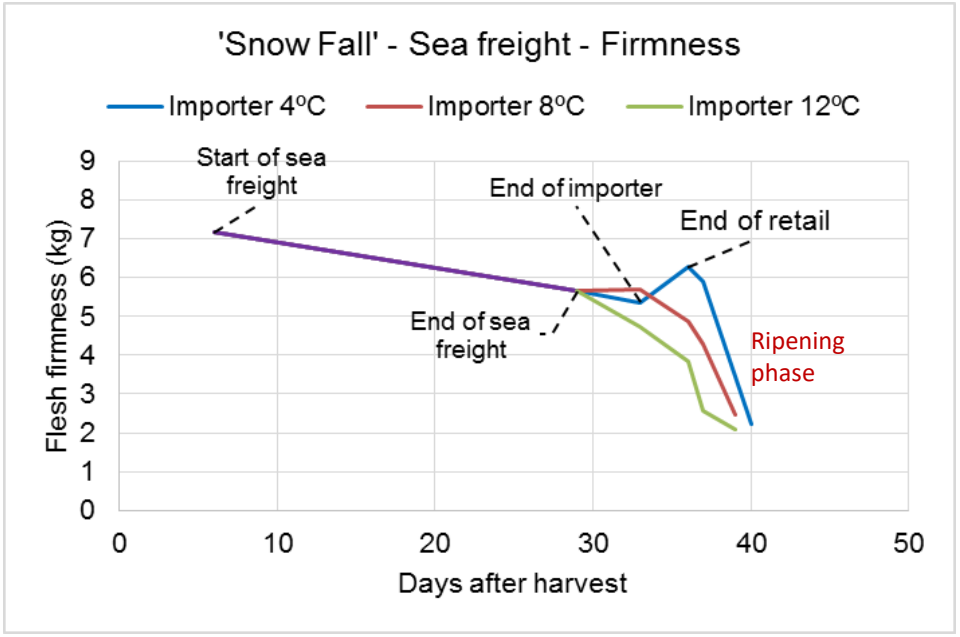
Commercial export simulation

- Air freight and Sea freight
- Seven dedicated cool rooms at AgVic AgriBio Centre in Melbourne
- Constant temperature storage & ripening
- Can simulate different export temperature scenarios and durations
- Generally use fruit packed for export and dispatched to freight forwarder



Commercial export simulation – Sea freight





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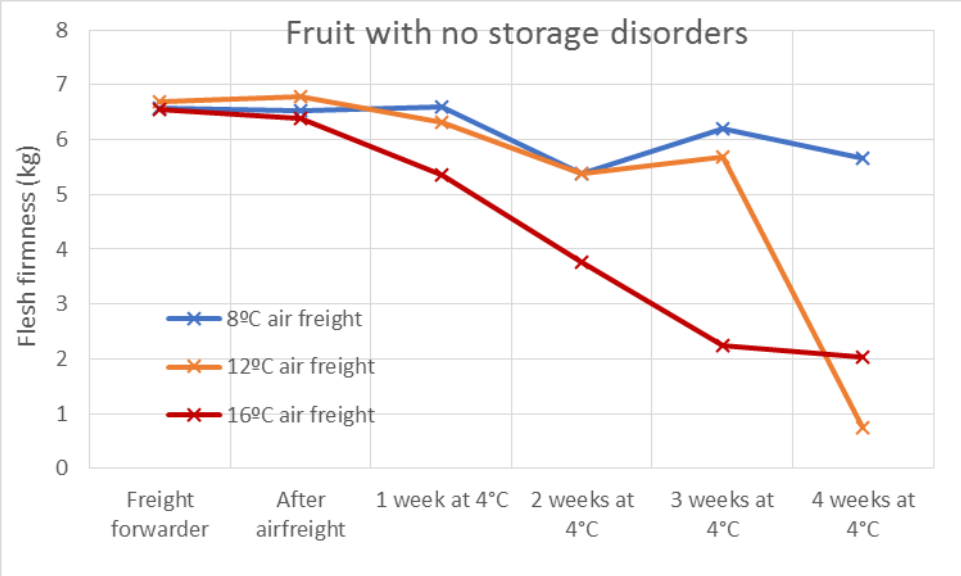
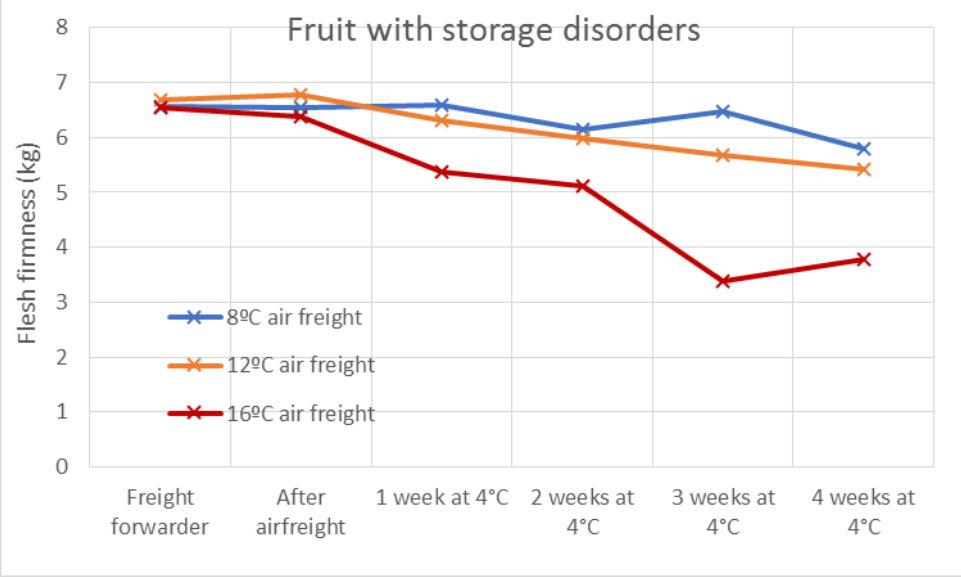
Commercial export simulation

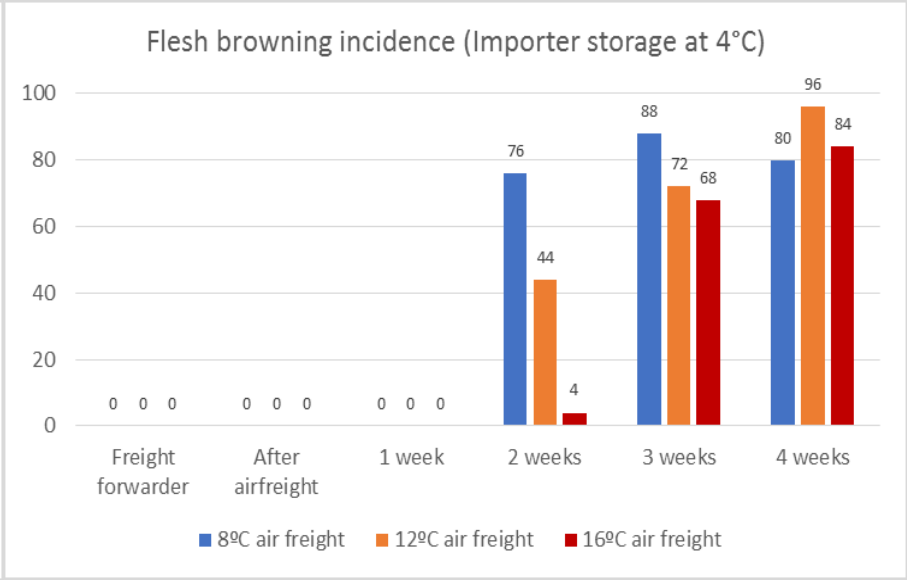


-Air freight

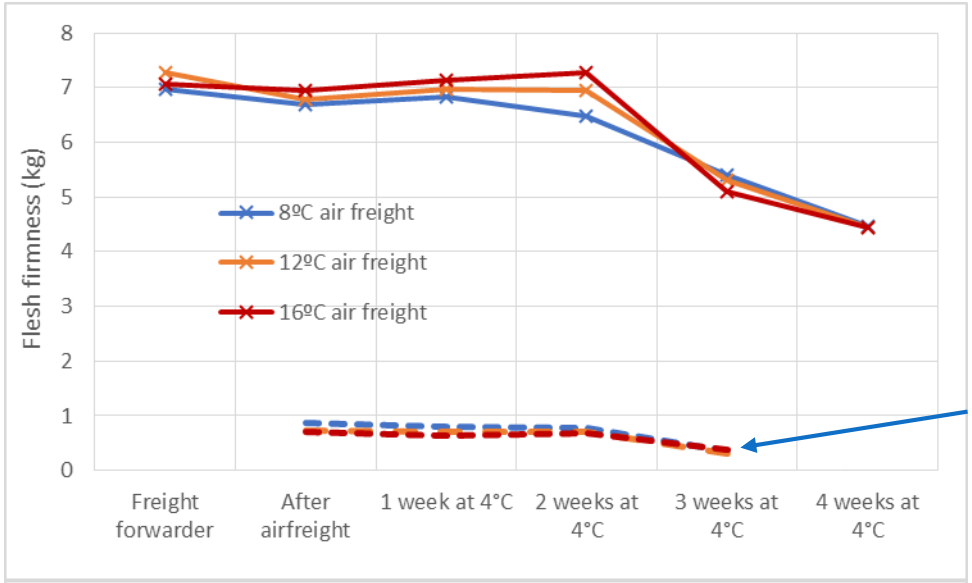
-3 temperatures for 24 hours

-Polar Queen

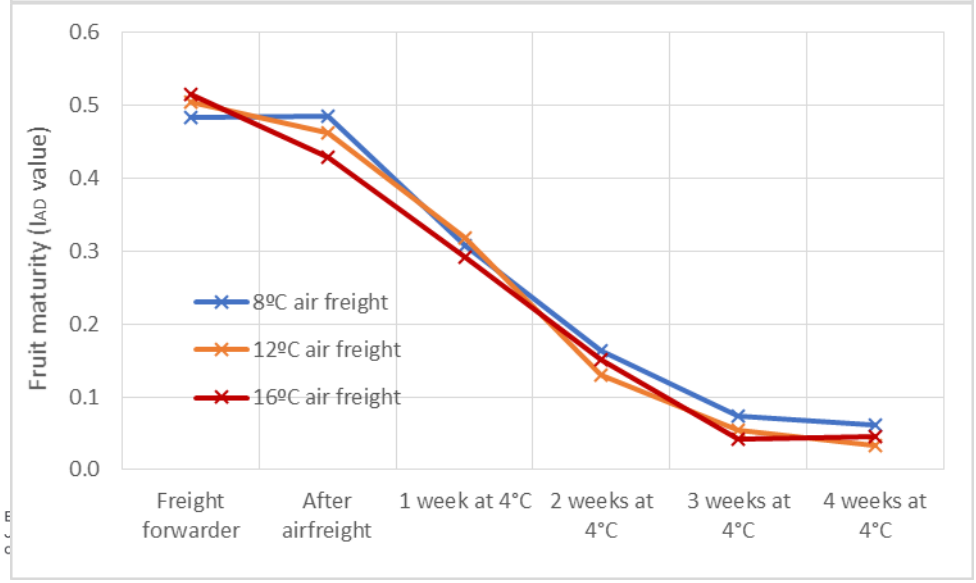




Commercial export simulation



4 days at 18°C



-Air freight

-3 temperatures for 24 hours

-Flavour Pearl

-Very robust variety!

-Maturity drops during cool storage with little change in firmness

-But ripens very quickly at marketing temperatures

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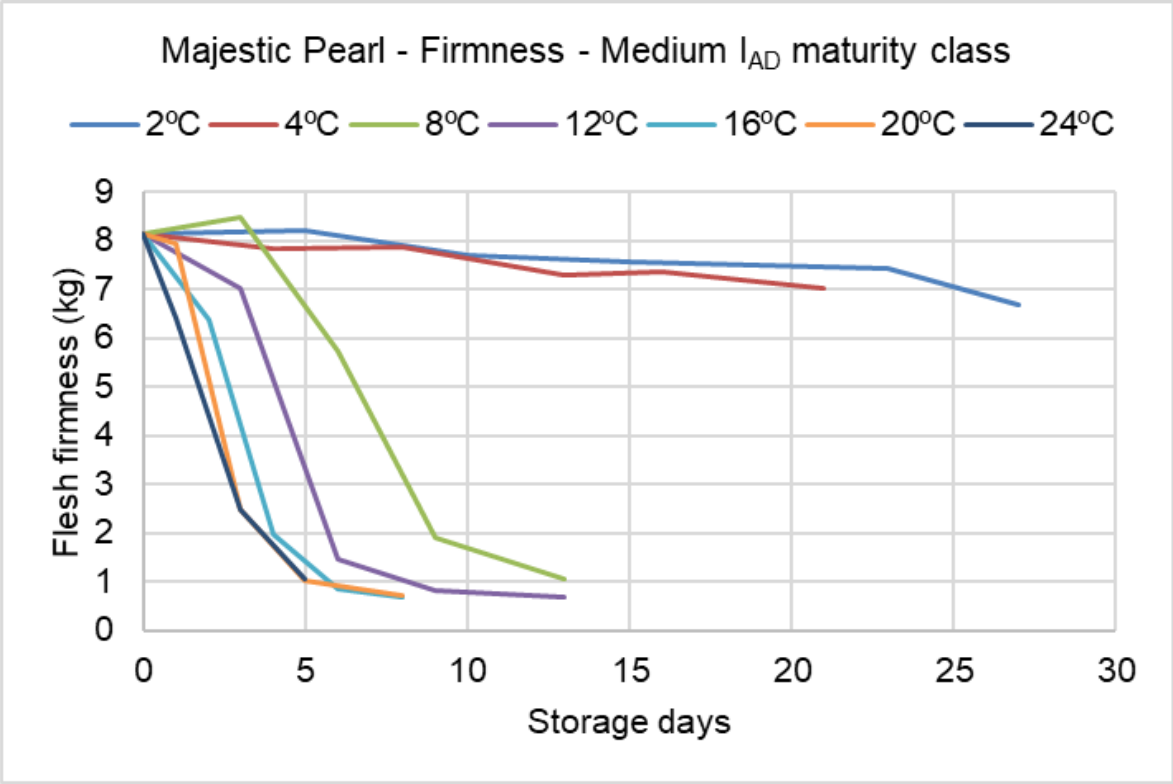
Effect of temperature and storage period

Approx. 12 varieties studied so far….



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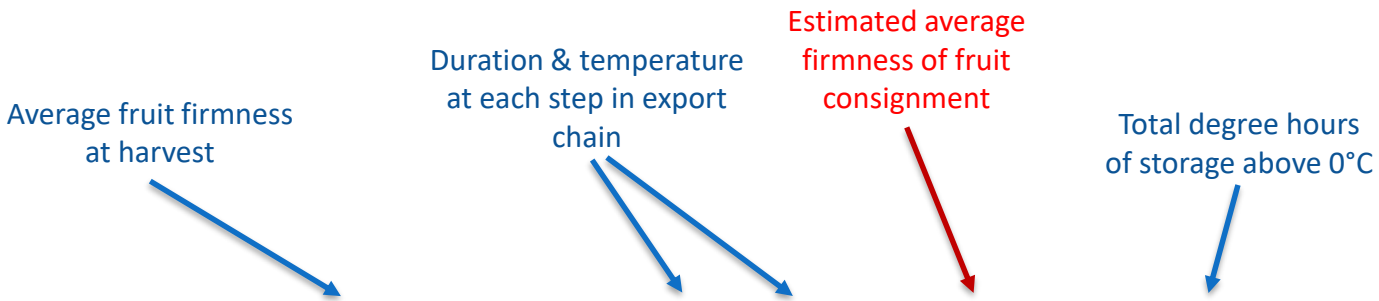
Impact of temperature and storage duration on fruit softening – Majestic Pearl



8.2	Export scenario			
Stage	**Stage days**	**Stage Temp (°C)**	**Average firmness (kg)**	**Cumulative Dh > 0°C**
Harvest to freight forwarder		3	**8.2**	0
Sea or Air Freight		2	**8.2**	0
Importer storage		3	**8.2**	0
Distribution & Retailing		8	**8.2**	0
Consumer		18	**8.2**	0

Assumes maximum 4 to 5 weeks from harvest to consumer

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Estimating remaining shelf life after export

Importer or retailer can set minimum firmness at which point fruit needs to be sold

Desired minimum firmness (kgf)			
4.0	Storage life - Importer		
Stage	Stage days	Stage Temp (°C)	Remaining storage period (Days)
Harvest to freight forwarder		3	Continue
Sea or Air freight		2	
Importer		3	23.6

Desired minimum firmness (kgf)			
2.5	Storage life - Retailer		
Stage	Stage days	Stage Temp (°C)	Remaining storage period (Days)
Harvest to freight forwarder		3	Continue
Sea or Air freight		2	
Importer		3	Continue
Retailer		8	11.6

Mobile App being developed with simple user interface

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Summary – Temperature, duration and quality

- Good temperature management still critical
  - But temperature impacts on quality depend on variety and storage time
  - E.g., short bursts of a warmer temperature beneficial.. Delayed cooling?
- Simulation trials provide insights about storage potential of varieties
  - Under commercial/ export conditions
  - More monitoring required during importer storage and retail
- 'Real' impact on quality due to temperature and storage time can be understood using shelf life models
  - Next step - robust models for multiple varieties
  - Commercial validation of quality predictions required
  - Industry requires a simple to use 'real-time' mobile app (being developed)

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Questions????

The Serviced Supply Chains project is funded by the Hort Frontiers Asian Markets Fund, part of the Hort Frontiers strategic partnership initiative developed by Hort Innovation with co-investment from:

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