Are the fruit on your trees really ready to pick?

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Background

- Poor Outturn
  - Flesh Browning, discolouration, mealy, rubbery, shrivel
- Harvest maturity
  - Cultivar? Maturity?
  - Firmness and Sweetness results from several cultivars
- Fruit development
  - firmness, SSC results several cultivars
- Storage trial results

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Poor Outturn

Flavour Pearl nectarine 3w + 2d

Majestic Pearl nectarine 1w + 2d

Flesh browning: flesh is browned/discoloured

Off colour: flesh isn't brown but is off colour

Polar Princess Peach 2w + 2d

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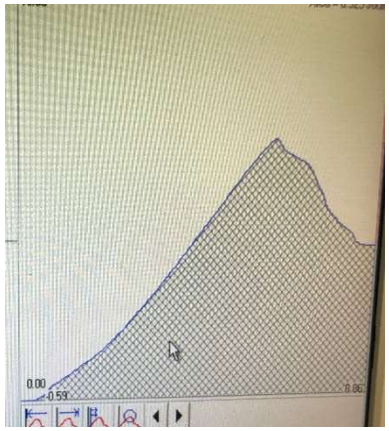
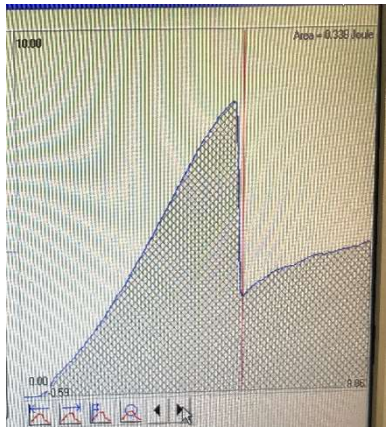
Poor Outturn

Mealiness:
dry, wooly, juiceless

September Bright nectarine
2w + 2d

Rubberiness:
fruit is very firm, often juiceless





- Mostly internal and textural
- Poor/dull skin colour

- No aroma or poor flavour
- Off odours

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Outturn – Maturity

Immature fruit are more likely to express:

- Flesh browning
  visible on return to ambient temperatures
- Rubbery flesh
  noticeable after long term storage (more than 2 weeks)
- Flesh dryness
- Discoloured flesh
- Dehydration – rubberiness, sometimes shrivelled skin
- Possibly mealiness

Mature fruit are more likely to express:

- Mealiness
- Flesh browning
- Shrivel

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Harvest maturity

Harvest factors:

- Colour
- Size
- Firmness
- Sweetness

Factors measure harvest readiness, not maturity.

Fruit is harvest ready, but not ready to harvest

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Physiological Maturity

Maturity needs to be a measure of whether the fruit can be harvested and progress through ontogeny – reach is full organoleptic potential.

Physiological maturity: measuring the actual development stage of the fruit; using factors that help understand the physiological stages within the fruit.

CO_2 production - not sensitive enough; Ethylene production is better measure.

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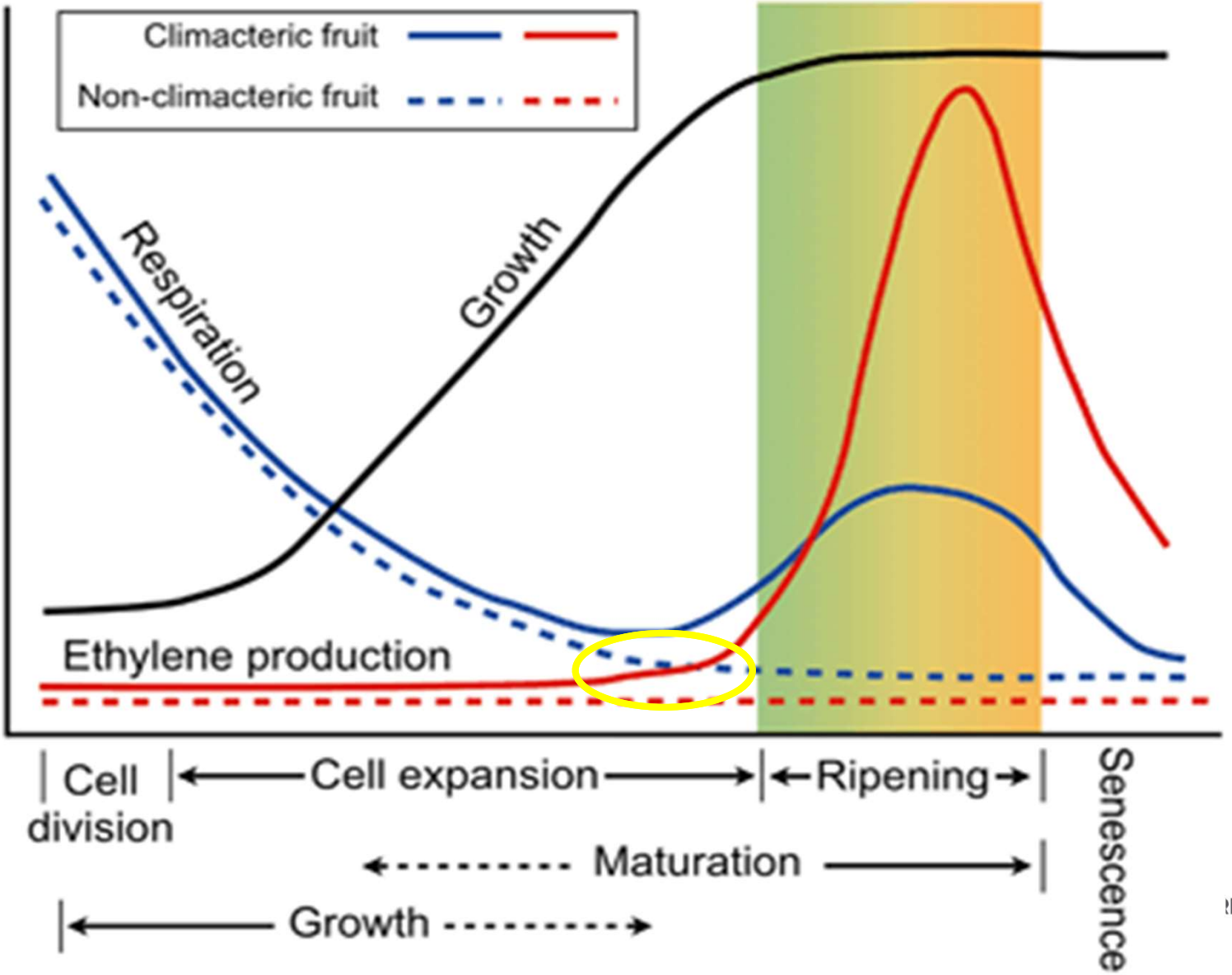
Fruit development



Costa G., Ramina A. (2014) Temperate Fruit Species. In: Dixon G., Aldous D. (eds) Horticulture: Plants for People and Places, Volume 1. Springer, Dordrecht. https://doi.org/10.1007/978-94-017-8578-5_4

DA meter IAD maturity classes: Database

Preliminary results on I_{AD} Maturity classes for selected Stonefruit

Cultivar	Seasonality	Immature (no ethylene, not to be harvested)	Harvest Ready (on-set climacteric, suitable for export and domestic)	Mature (climacteric peak, suitable for domestic)
Golden May	Apricot - Mid	> 1.20	1.19 - 0.60	< 0.59
Angeleno	Plum - Late	> 1.30	1.29 - 1.0	< 0.99
Rose Bright	Nectarine - Early	> 1.0	1.0 - 0.40	< 0.40
Snow Flame 23	Peach - Early	> 0.9	0.90 - 0.30	< 0.3
Snow Flame 25	Peach - Mid	> 1.0	1.0 - 0.60	< 0.6
Summer Bright	Nectarine - Mid	> 0.70	0.69 - 0.30	< 0.29
Fire Sweet	Nectarine - Mid	> 1.0	0.99 - 0.50	< 0.49
Summer Flare 26	Nectarine - Mid	> 1.0	0.99 - 0.60	< 0.59
Summer Flare 34	Nectarine - Mid	> 1.20	1.19 - 0.60	< 0.59
August Fire	Nectarine - Late	> 1.0	0.99 - 0.50	< 0.49
Autumn Bright	Nectarine - Late	> 1.0	1.0 - 0.60	< 0.60
August Bright	Nectarine - Late	> 0.90	0.90 - 0.40	< 0.40
September Red	Nectarine - Late	> 1.10	1.09 - 0.60	< 0.59
September Bright	Nectarine - Late	> 1.20	1.20 - 0.50	< 0.50
August Flame	Peach - Late	> 1.30	1.30 - 0.70	< 0.70
September Sun	Peach - Late	> 1.20	1.20 - 0.80	< 0.80
Ice Princess	Peach - Mid	> 1.30	1.30 - 0.50	< 0.50
O'Henry	Peach - Early	> 0.90	0.90 - 0.60	< 0.60
	Peach - Late	> 1.20	1.20 - 0.70	< 0.70
Red Haven	Peach - Mid	> 1.60	1.60 - 0.60	< 0.60

http://www.hin.com.au/networks/profitable-stonefruit-research/stonefruit-maturity-and-fruit-quality/da-meter-iad-maturity-classes-database

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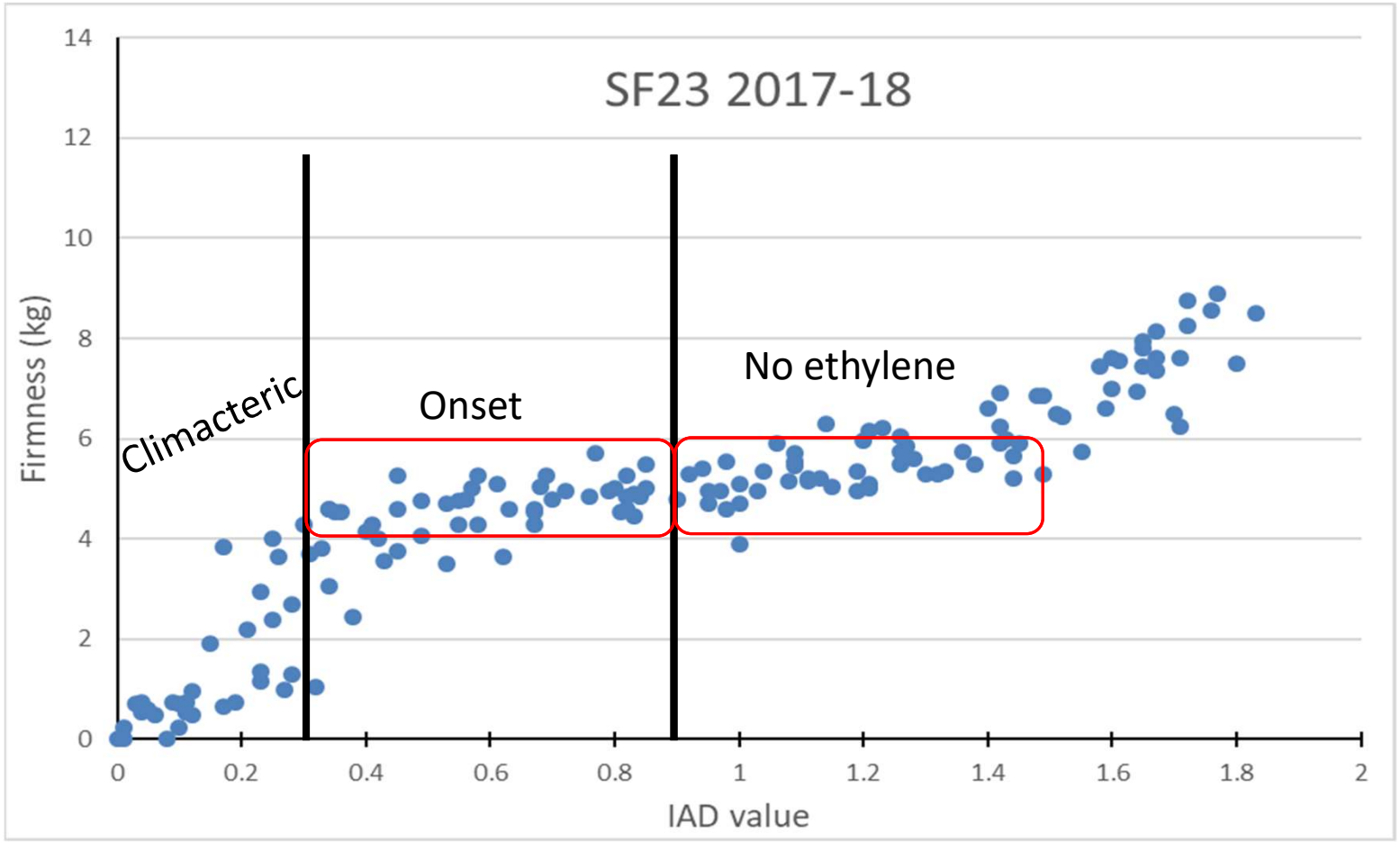
Firmness – Snow Flame 23



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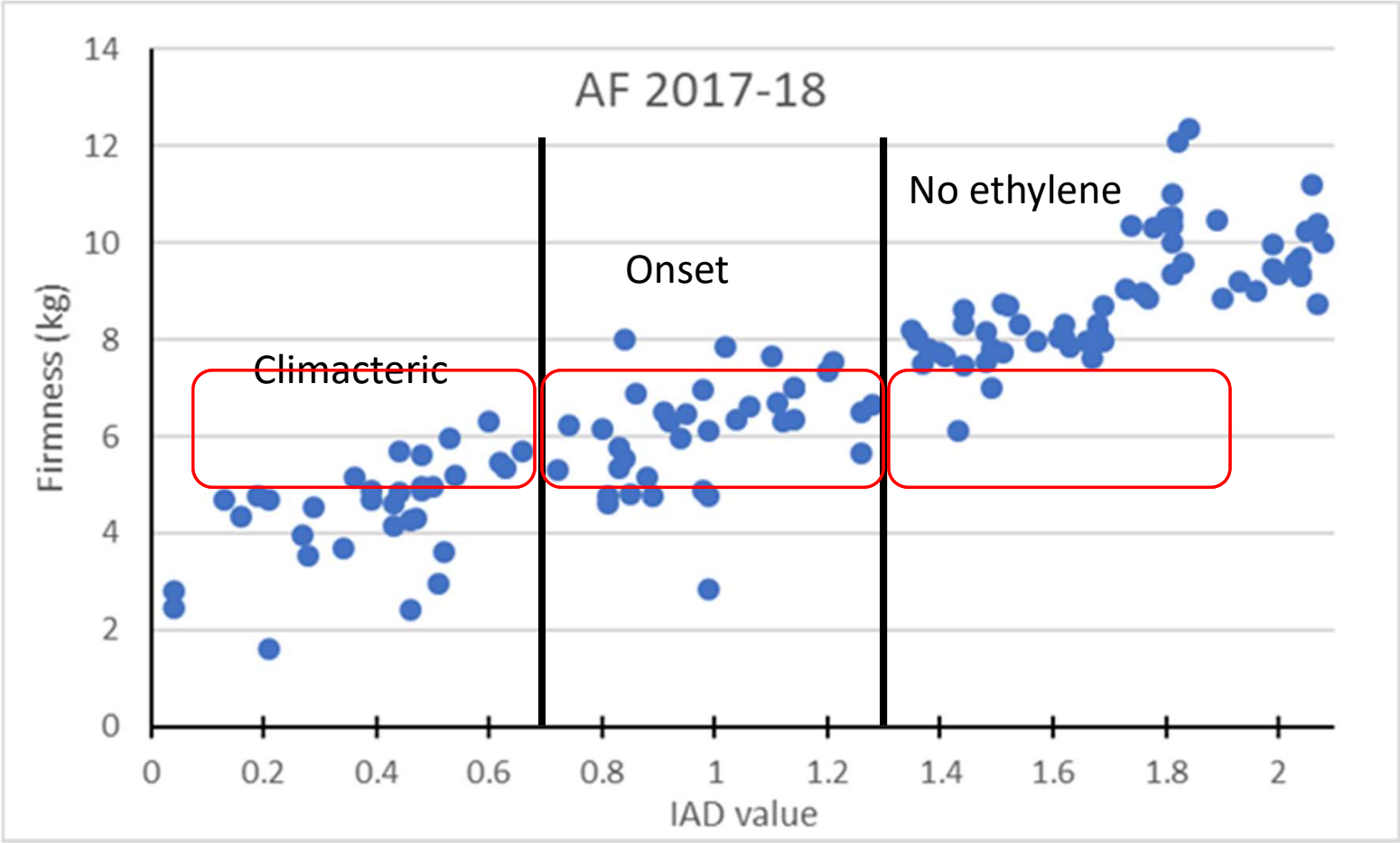
Firmness – August Flame



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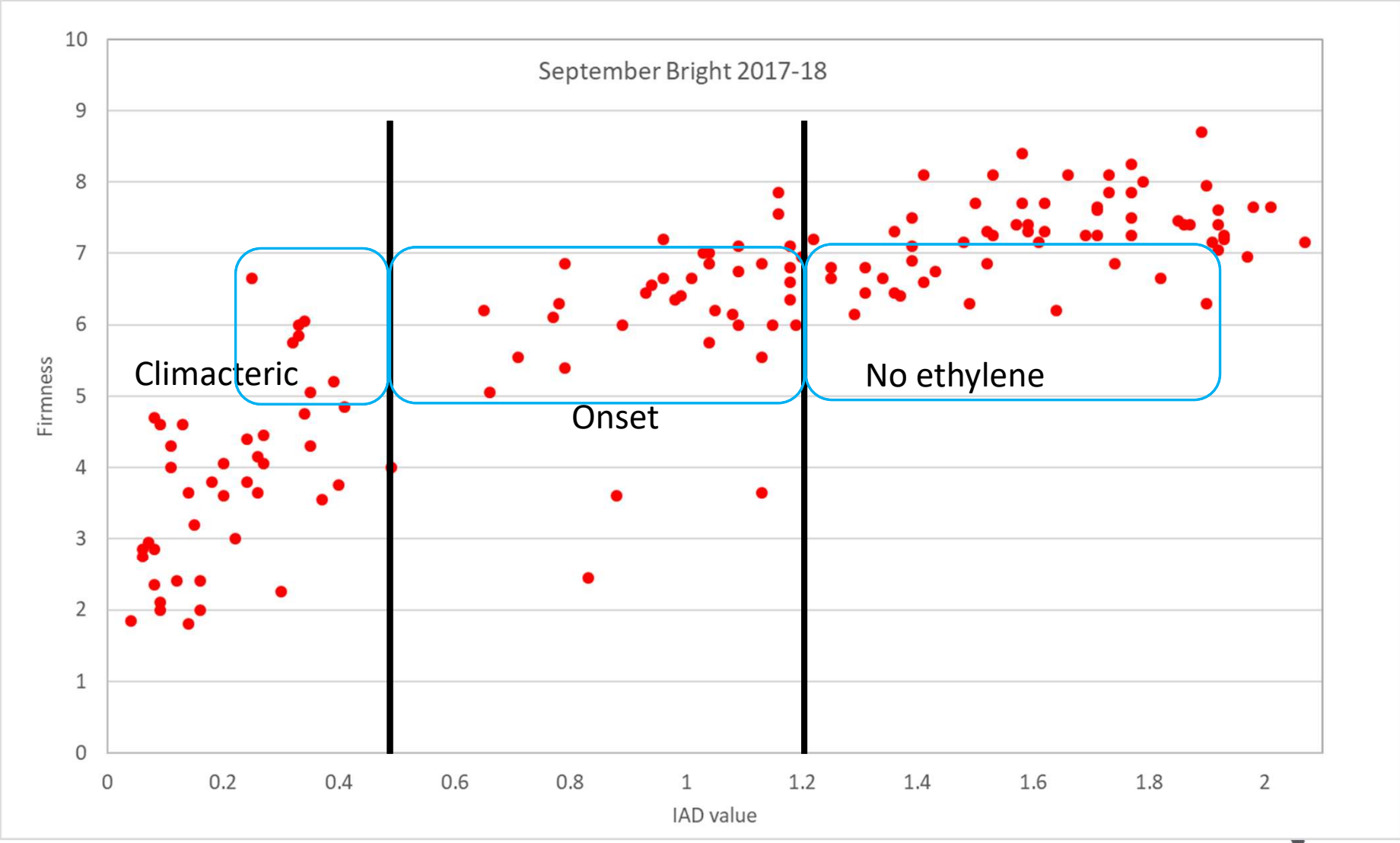
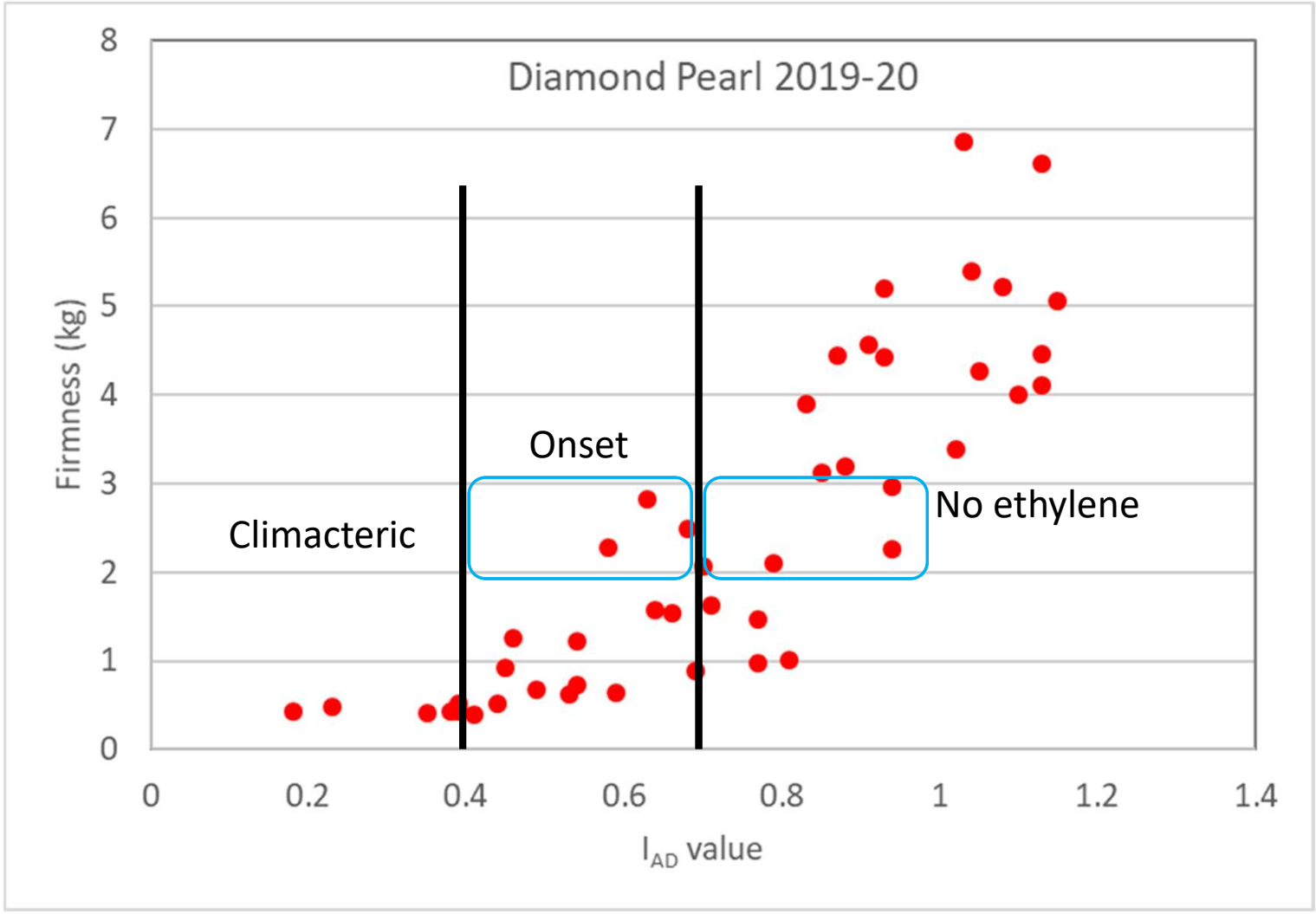
Firmness – September Bright



Firmness – Diamond Pearl



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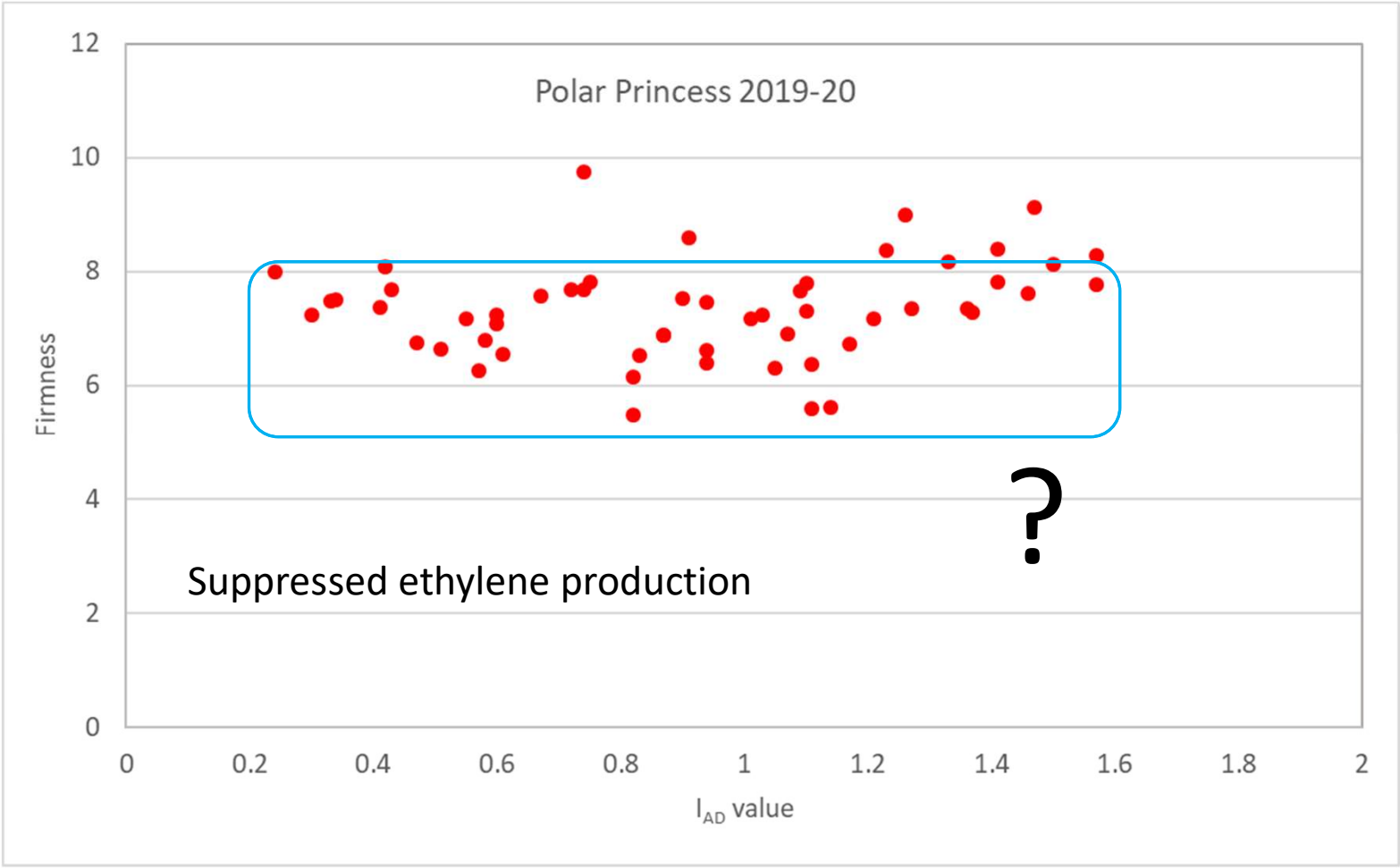
Firmness – Polar Princess



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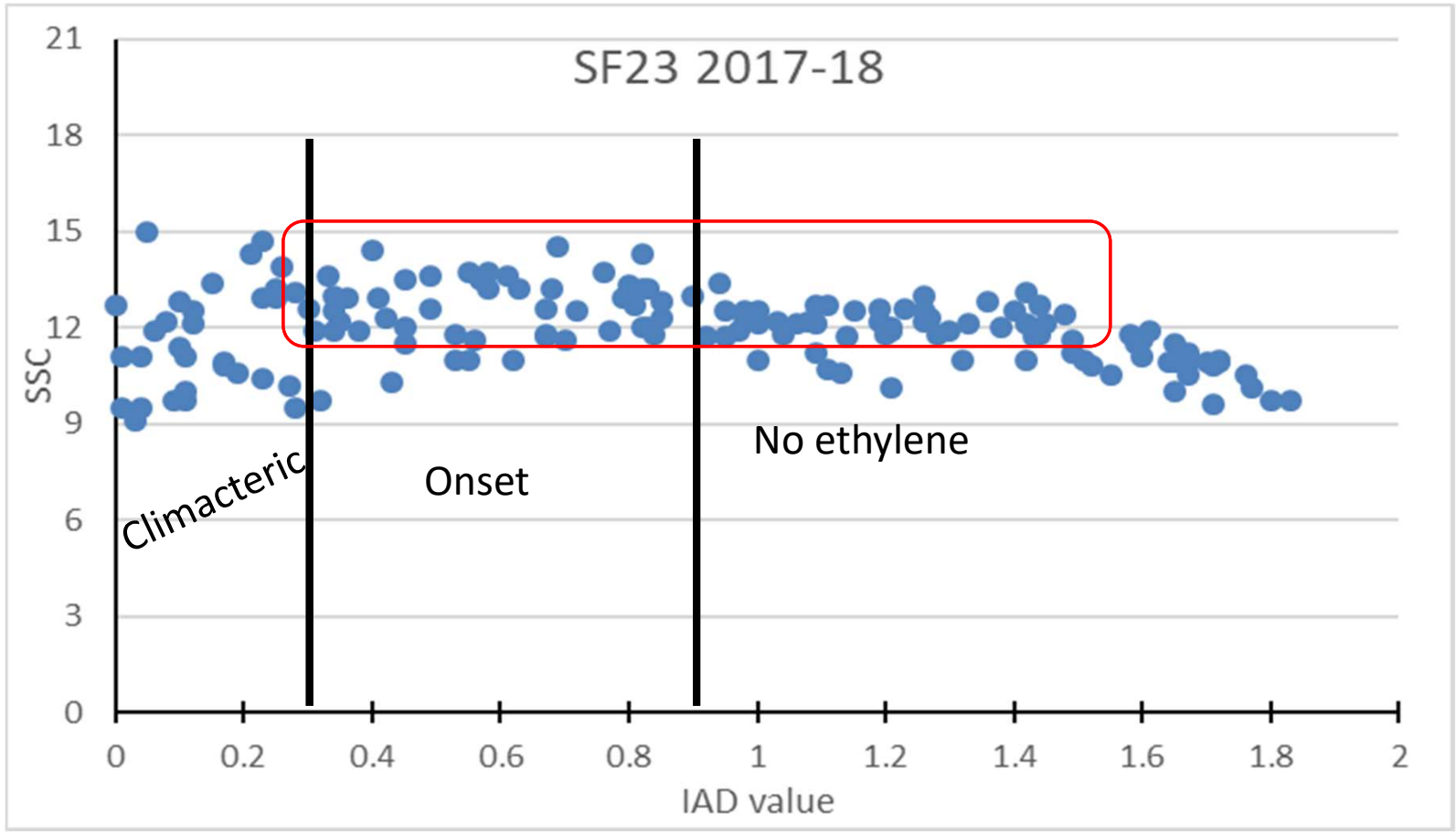
Sweetness – Snow Flame 23



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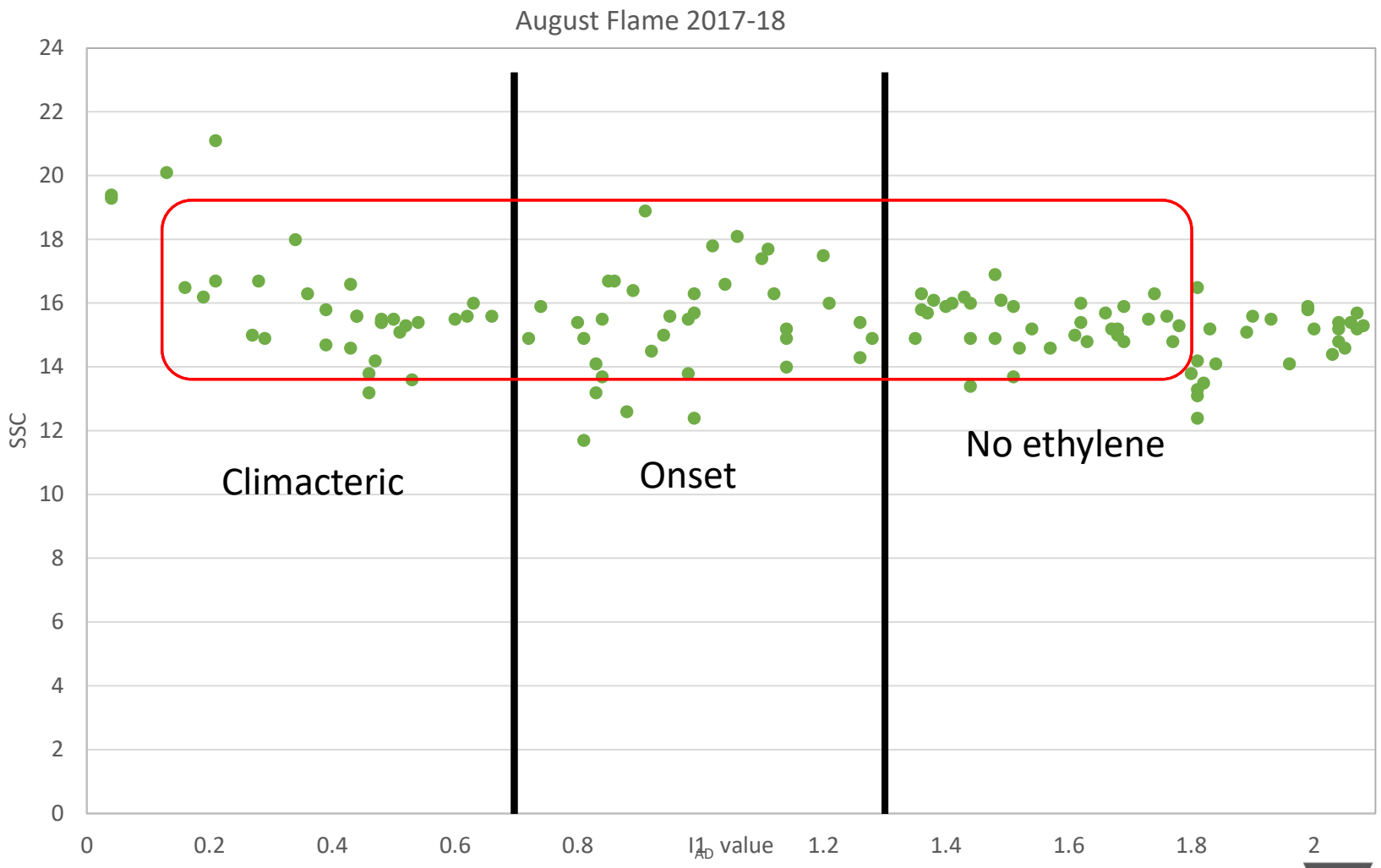
Sweetness – August Flame



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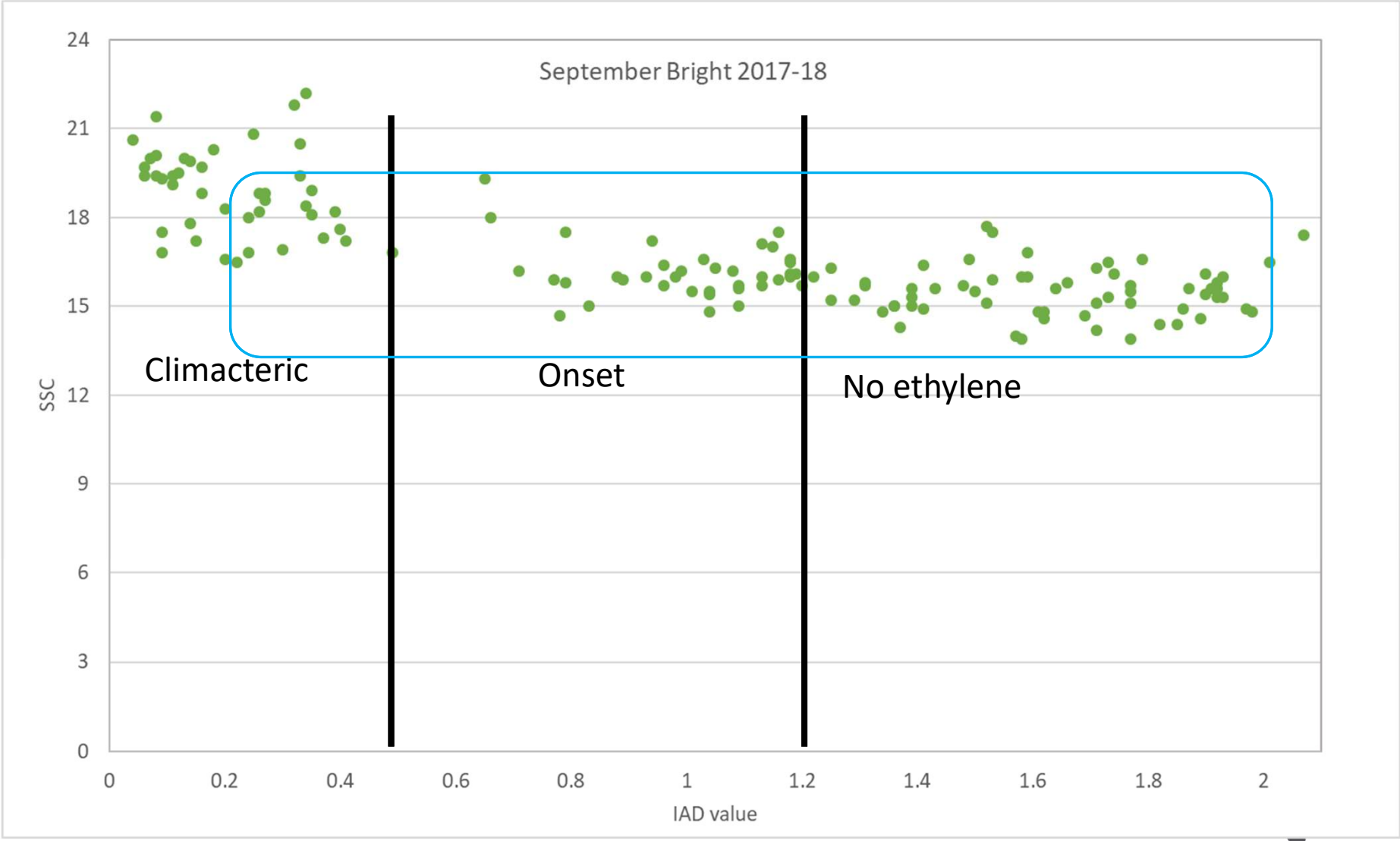
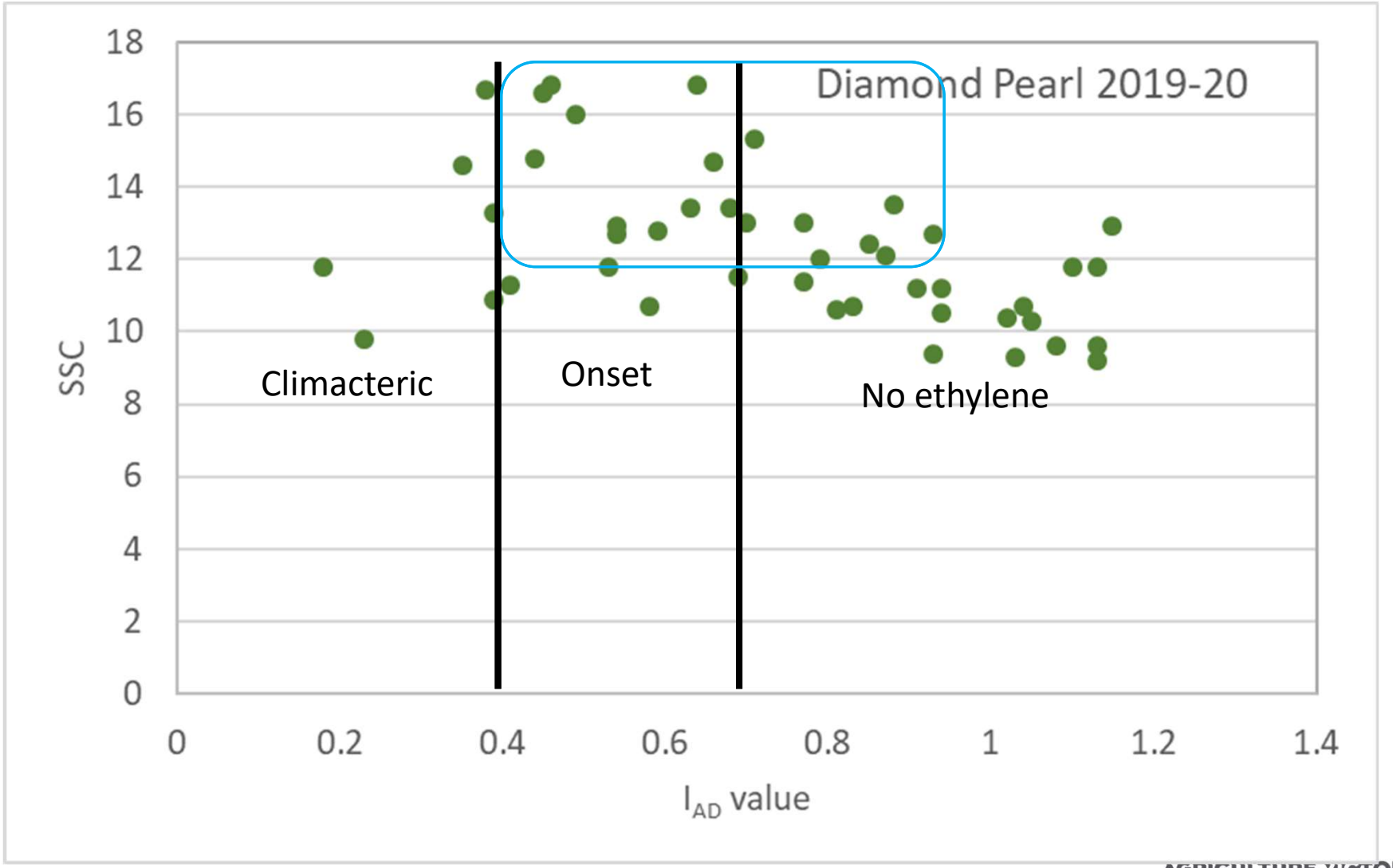
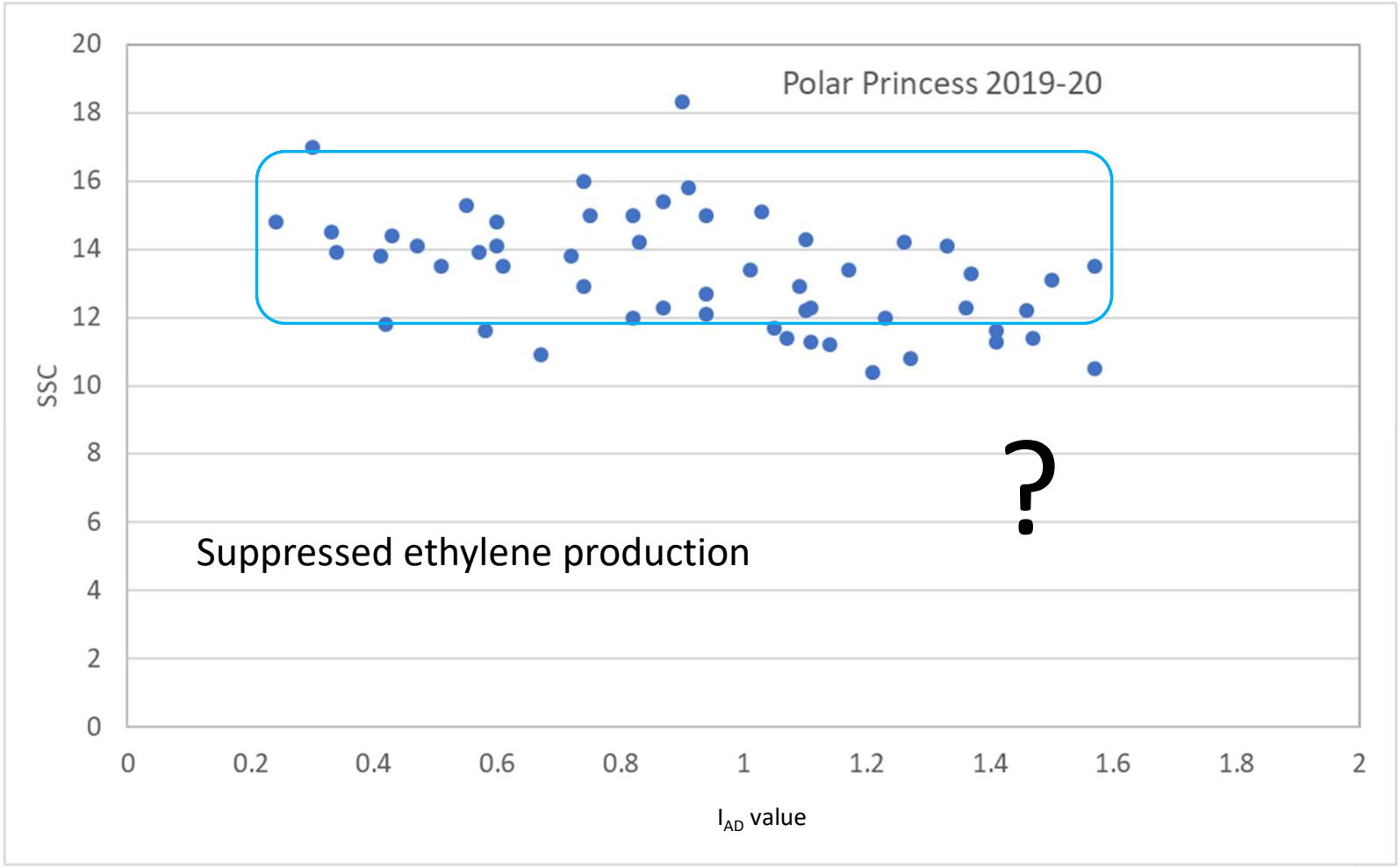
Sweetness – September Bright



Sweetness – Diamond Pearl



Sweetness – Polar Princess



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Maturity: DA range/Firmness range

Crossover in harvest firmness between No ethylene and Onset ethylene production

Cultivar	Firmness	DA range	DA values
Snow Flame 23	9.1 – 3.9	No ethylene	≥ 1.0
	5.9 – 1.0	Onset	0.90 – 0.30
Diamond Pearl	7.0 – 0.9	No ethylene	≥ 0.80
	3.0 – 0.5	Onset	0.70 – 0.40
September Bright	8.9 – 6.0	No ethylene	≥ 1.30
	7.9 – 2.5	Onset	1.20 – 0.50
August Flame	12.2 – 6.0	No ethylene	≥ 1.40
	7.8 – 3.0	Onset	1.30 – 0.70
Polar Princess	9.9 – 5.8	?	1.8 – 0.2

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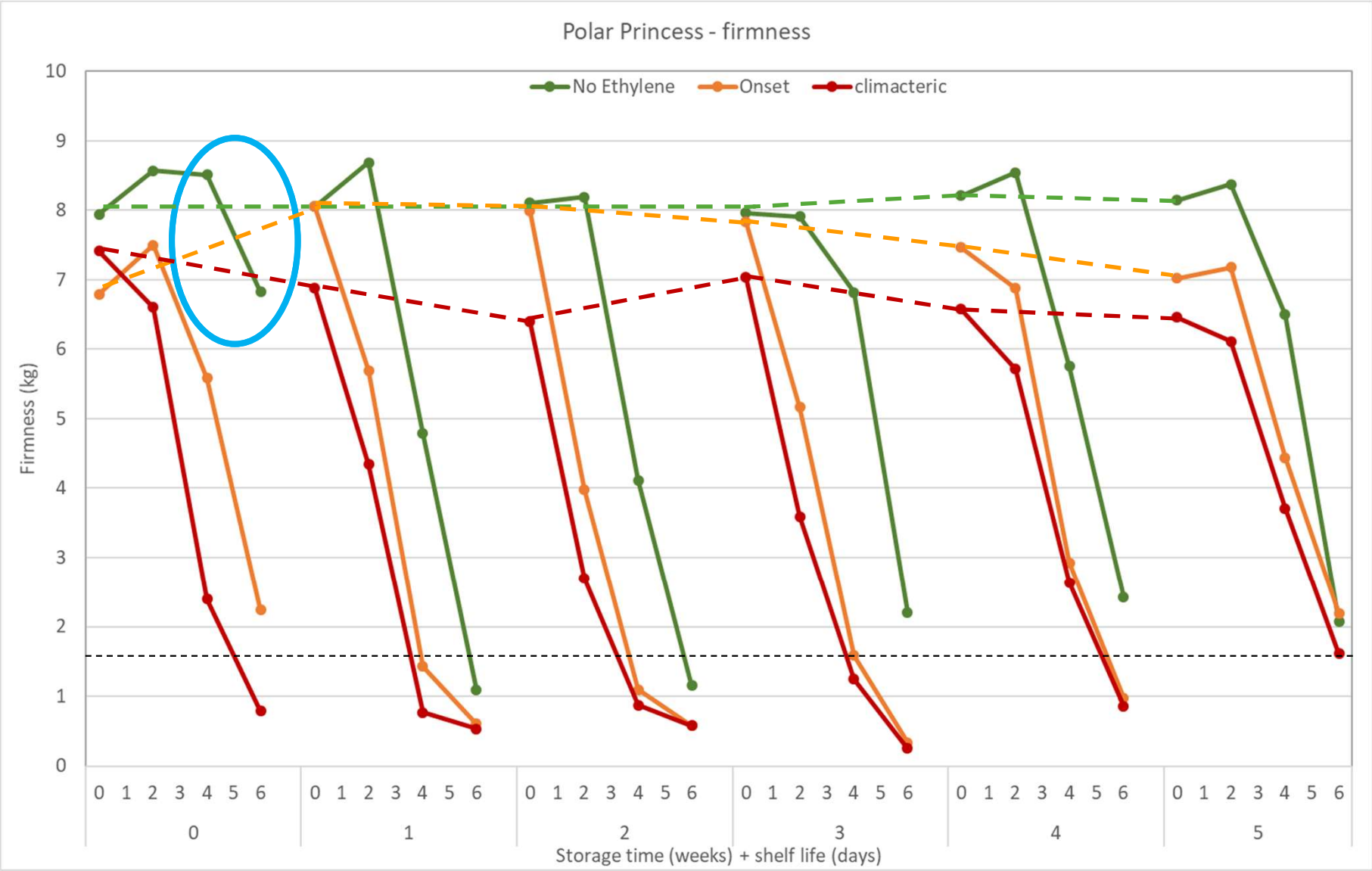
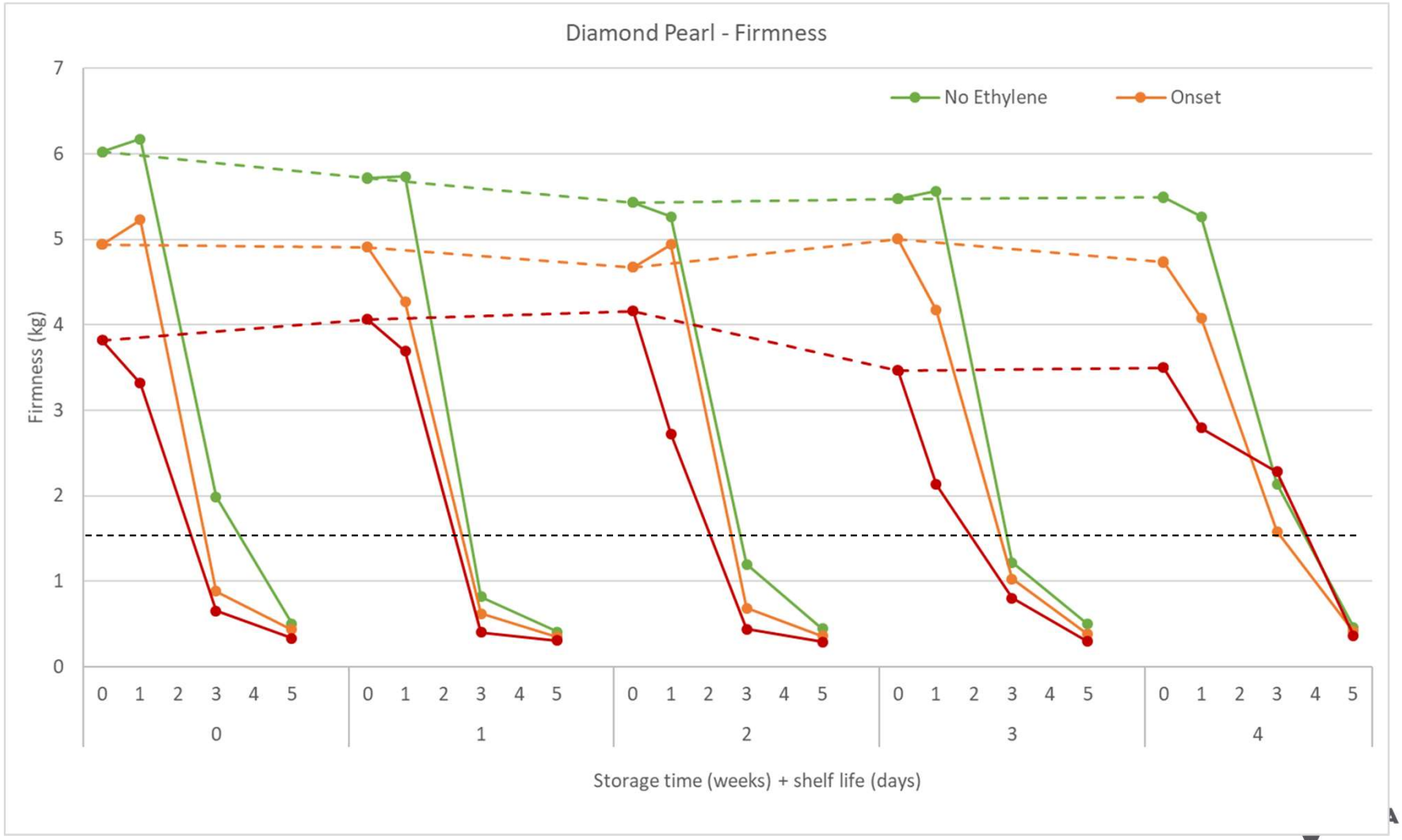
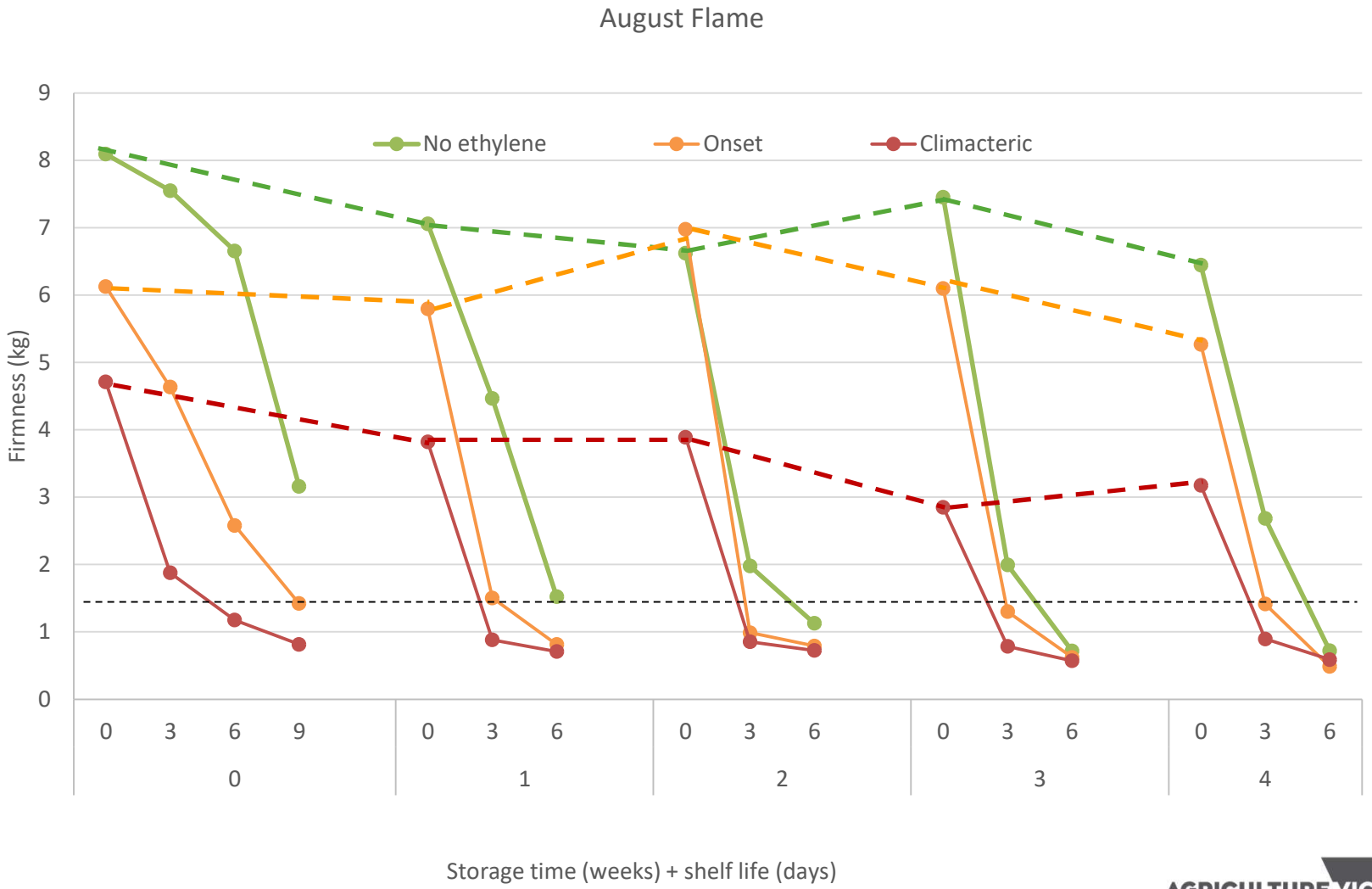
Firmness – long term storage and shelf life



Firmness – long term storage and shelf life



Firmness – long term storage and shelf life



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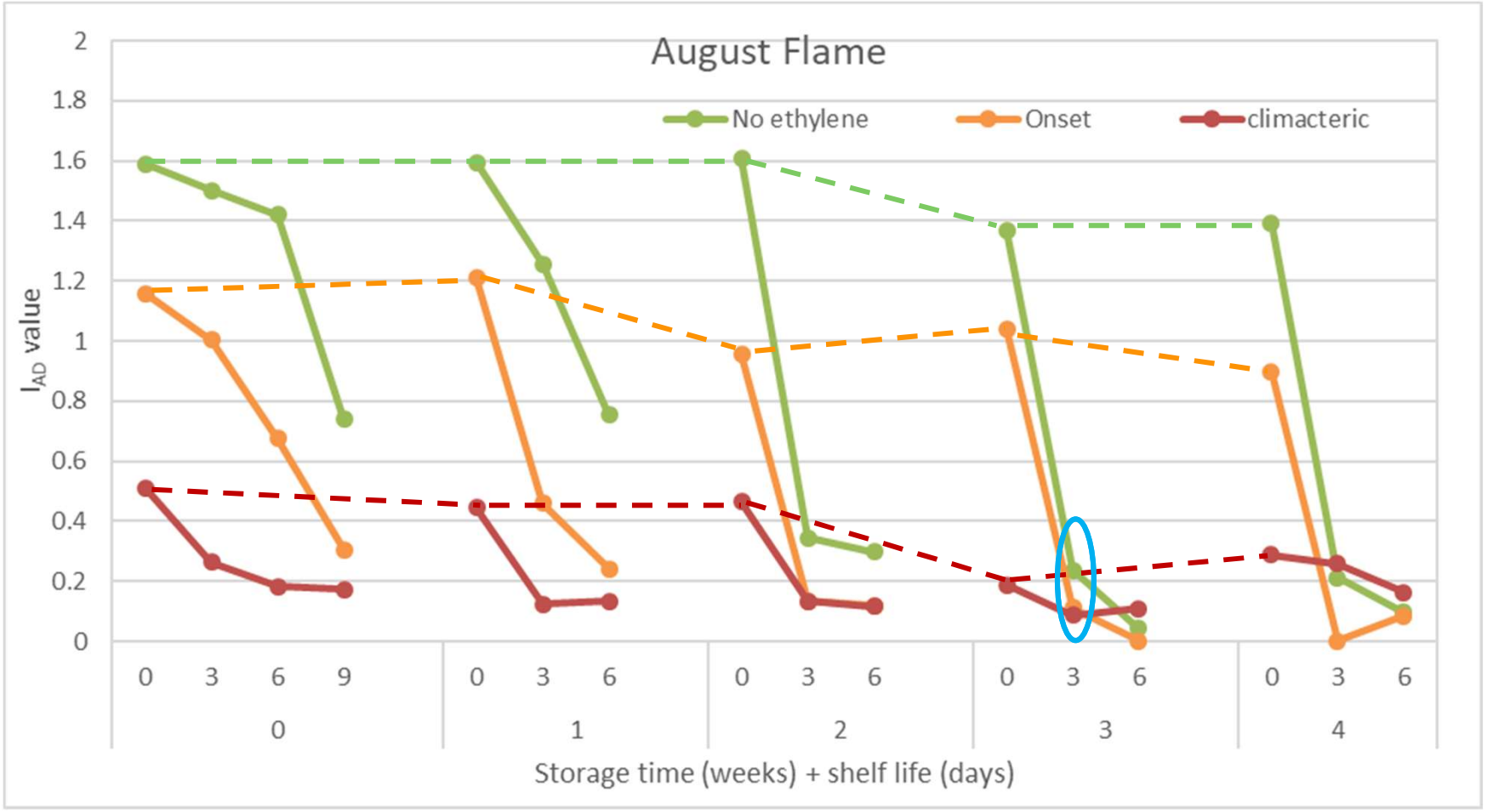
I_{AD} – long term storage and shelf life



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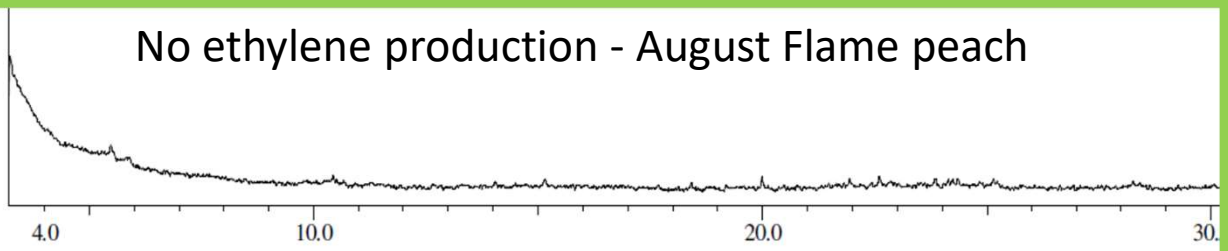
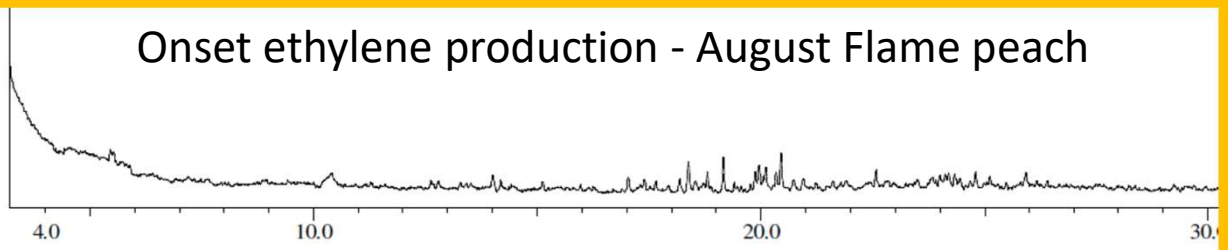
Physiological maturity - VOCs

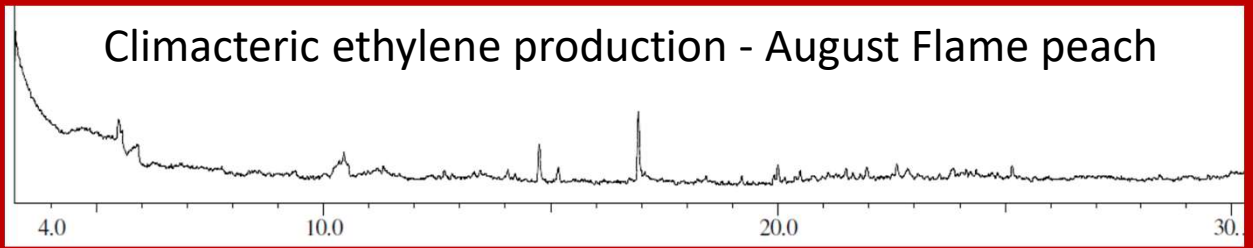
No ethylene production - August Flame peach



Onset ethylene production - August Flame peach

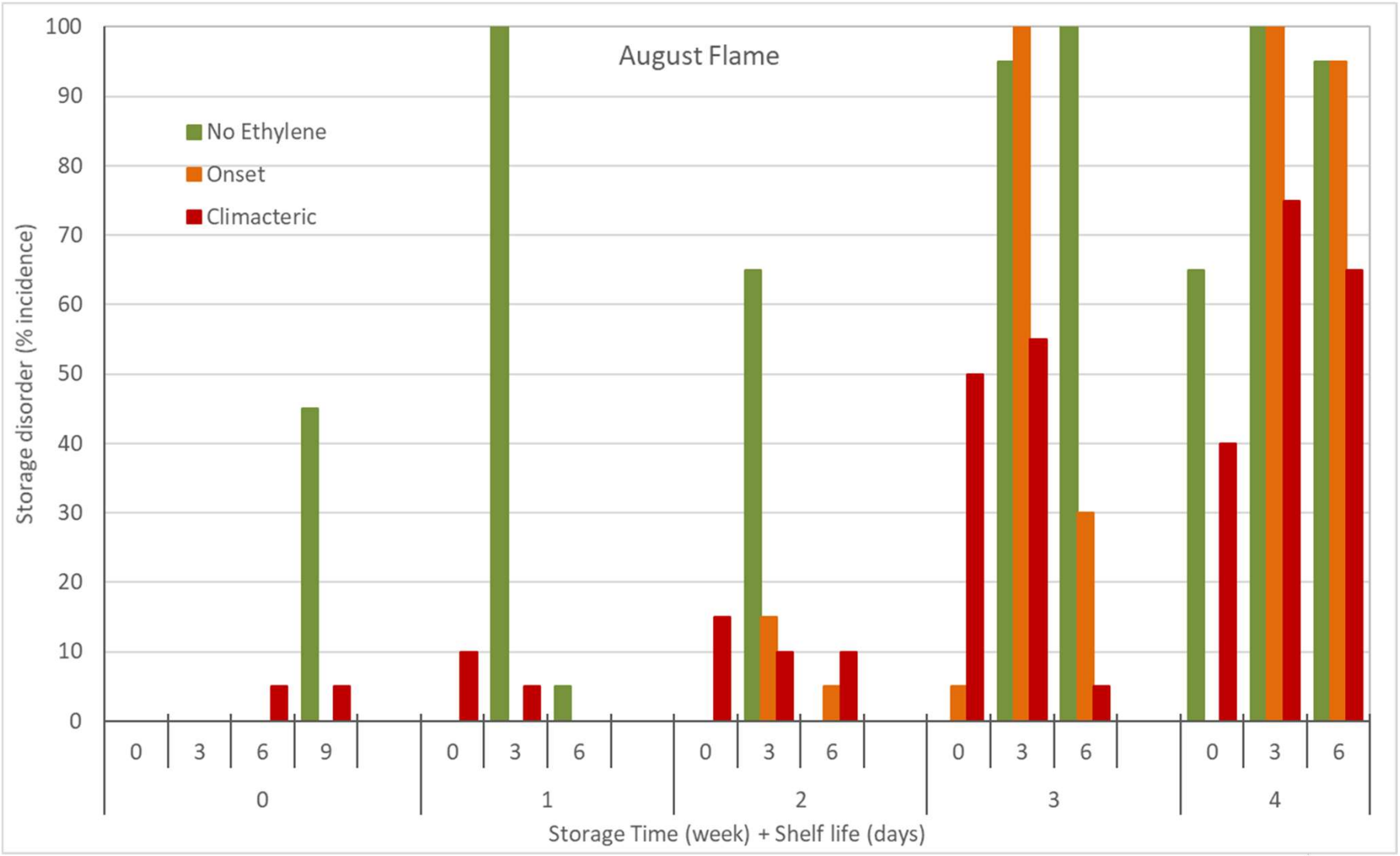


Climacteric ethylene production - August Flame peach



(3 weeks 2 °C + 3 days shelf life)

Disorders during long term storage and shelf life



What we know so far

- Fruit with the **same** size, appearance, SSC, or Firmness **may not be** at the same physiological development stage

- Fruit that is **not physiologically ready** at harvest are more likely to result in disorders after short and long term storage
  - browning, mealy, rubbery, shrivelled
  - these fruit will soften, but not ripen
  - cannot *restart* adequately

- **Ontogeny** – fruit should be harvested at a stage where it is still capable of reaching it's full organoleptic potential. Taste, smell, texture

Make sure the fruit is not just harvest ready,
but is ready to harvest

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Where to from here?

- Measure physiological maturity - ethylene production

- Correlate ethylene production with in field instruments:
  - I_{AD} (DA meter; database of results on HIN)
  - App for downloading DA values will be available next couple months

  - Fluorescence meter – Reubens Technology, preliminary testing shows promise, further testing coming season/s

- Delayed cooling
  - Further studies to link physiological maturity with delayed cooling (stepwise cooling/preconditioning)

- Other future possibilities:
  - NIR in grading system – still under investigation (Spain, IRTA)

  - Cultivar – breeding - appropriate varieties for storage

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Thank you

Questions?

Contact: Christine.Frisina@agriculture.vic.gov.au

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www.hin.com.au/profitable-stonefruit-research

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