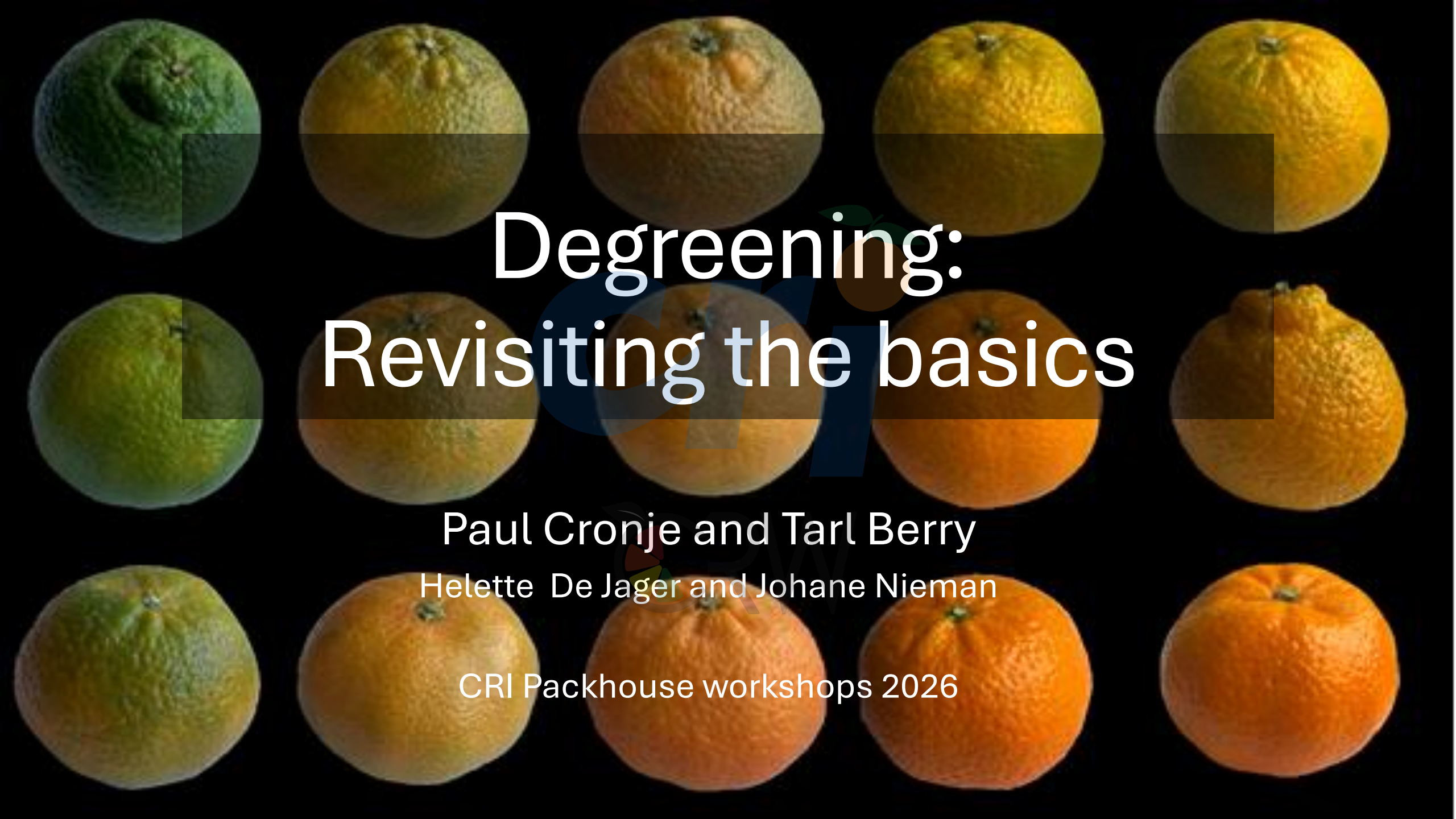


The background of the slide features a 3x5 grid of oranges. The oranges in the first column are green, the second column is yellow-green, the third column is yellow, the fourth column is orange-yellow, and the fifth column is bright orange. This visual progression represents the ripening process of the fruit.

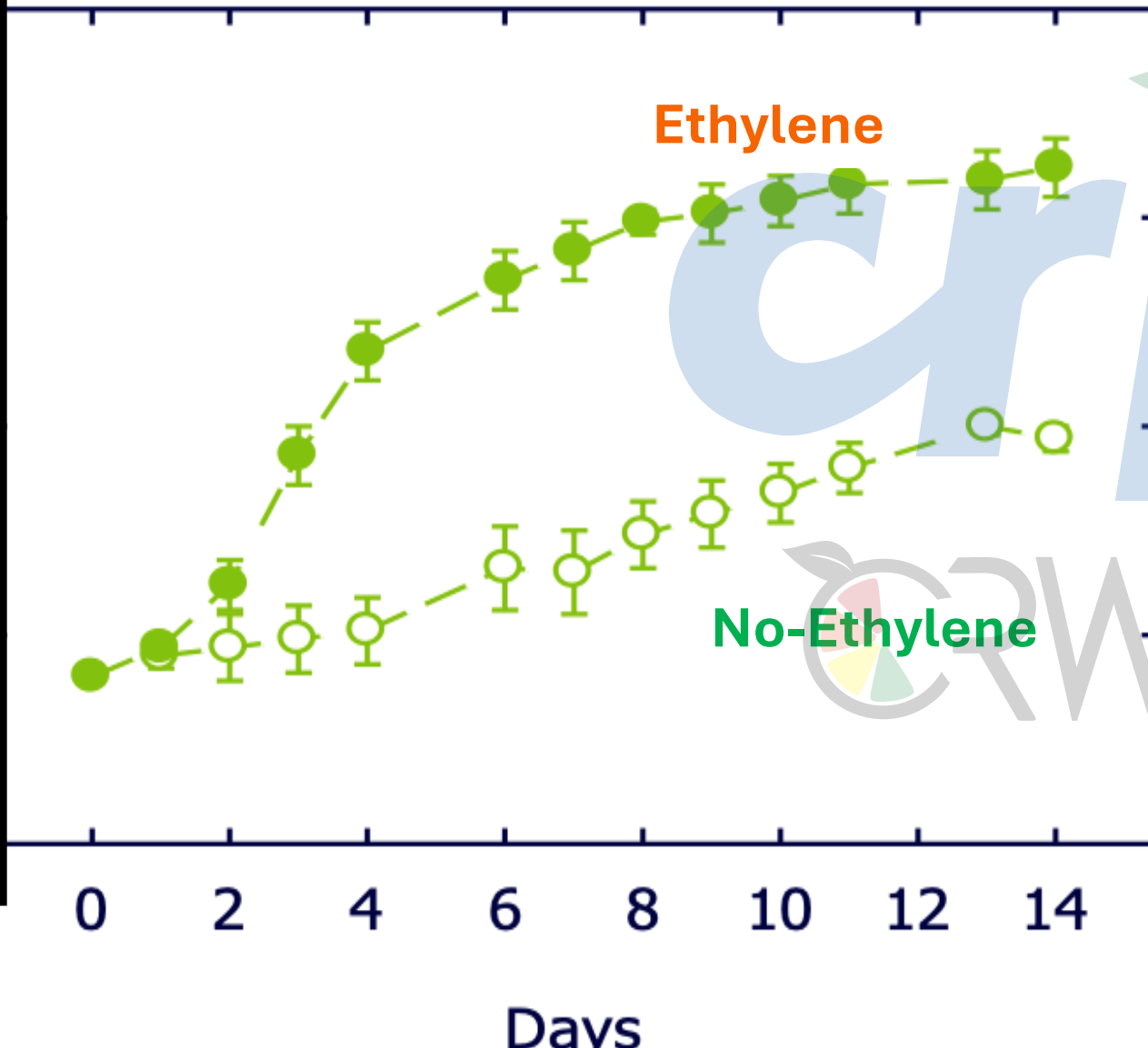
Degreening: Revisiting the basics

Paul Cronje and Tarl Berry

Helette De Jager and Johane Nieman

CRI Packhouse workshops 2026

Normal colour development of citrus can be enhanced by postharvest ethylene application



- 3 ppm Ethylene
- 18-25°C
- RH 94-96%
- 72h



Degreening challenges

Negative impact of degreening

- Pale yellow or partially green fruit
- Calyx abscission
- Increased physiological defects
- Increased decay
- Distinct marks or patches of different colours.

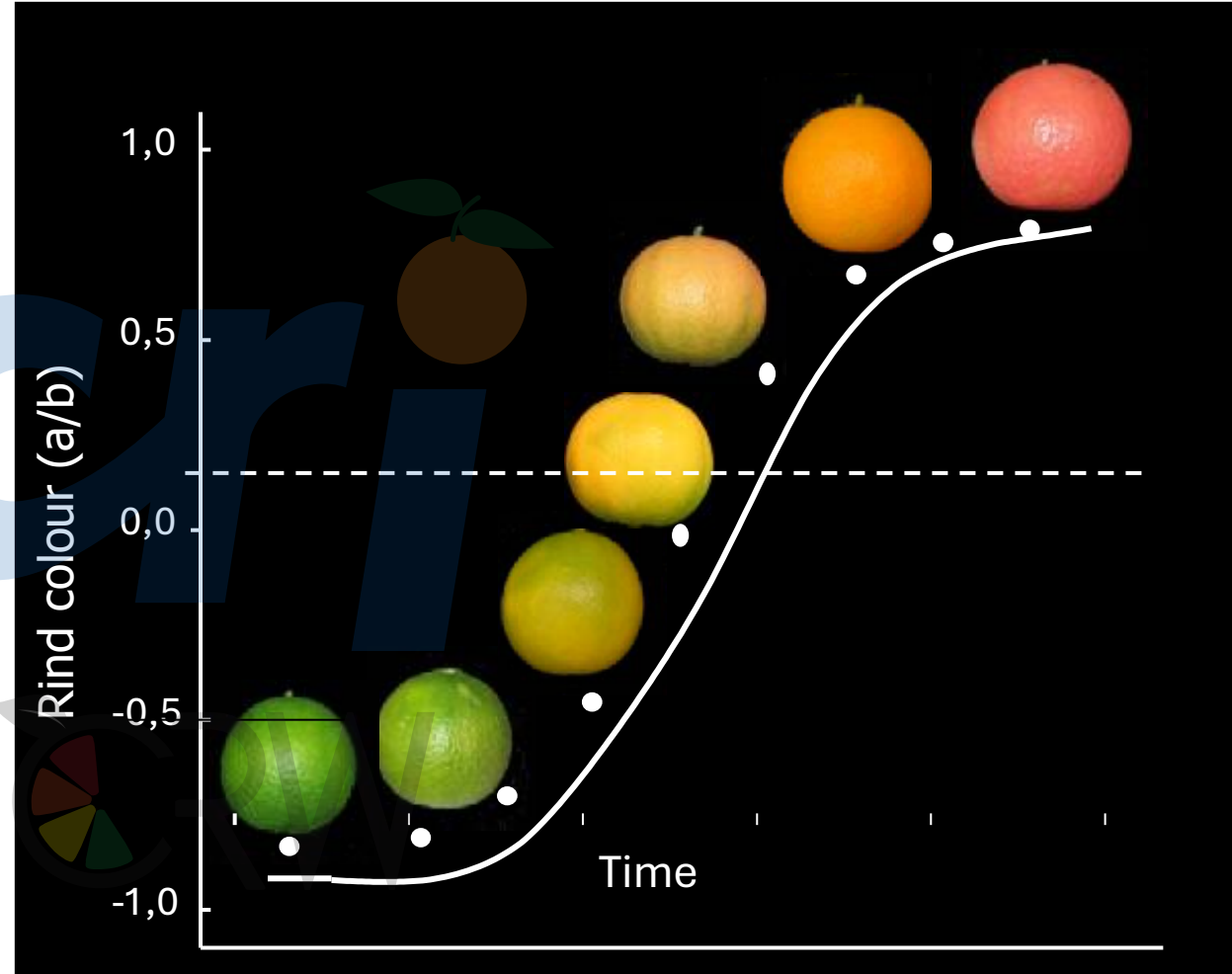
Contributing factors to effective degreening

- Cultivar
- Maturity
- Preharvest growing conditions
- Chemical drench
- Effective use of ethylene



Degreening control points

- Fruit
- Ethylene room
- Temperature
- RH



Successful degreening = *increased value of product*,
require integration of all these components

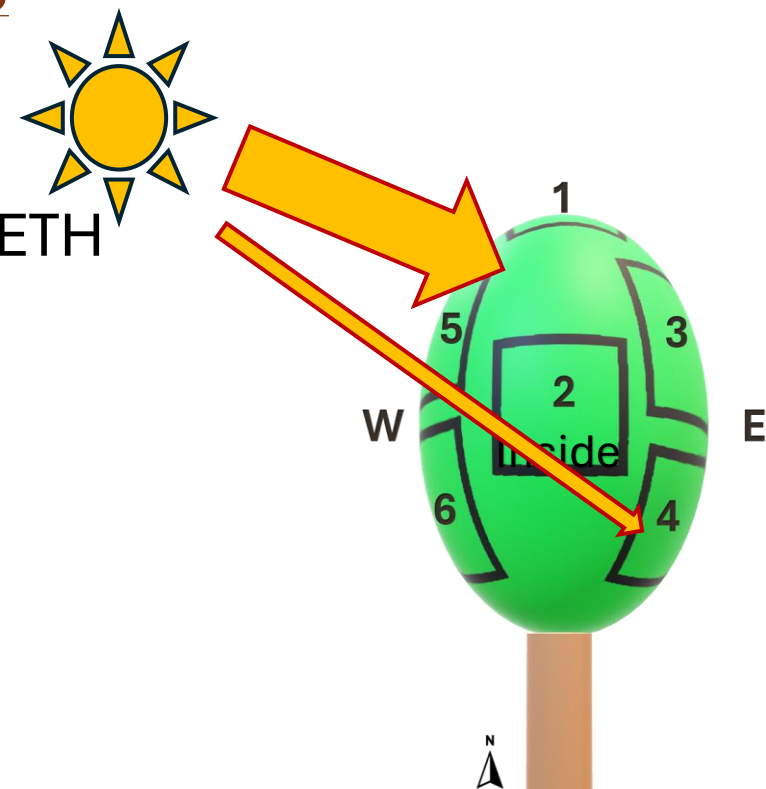
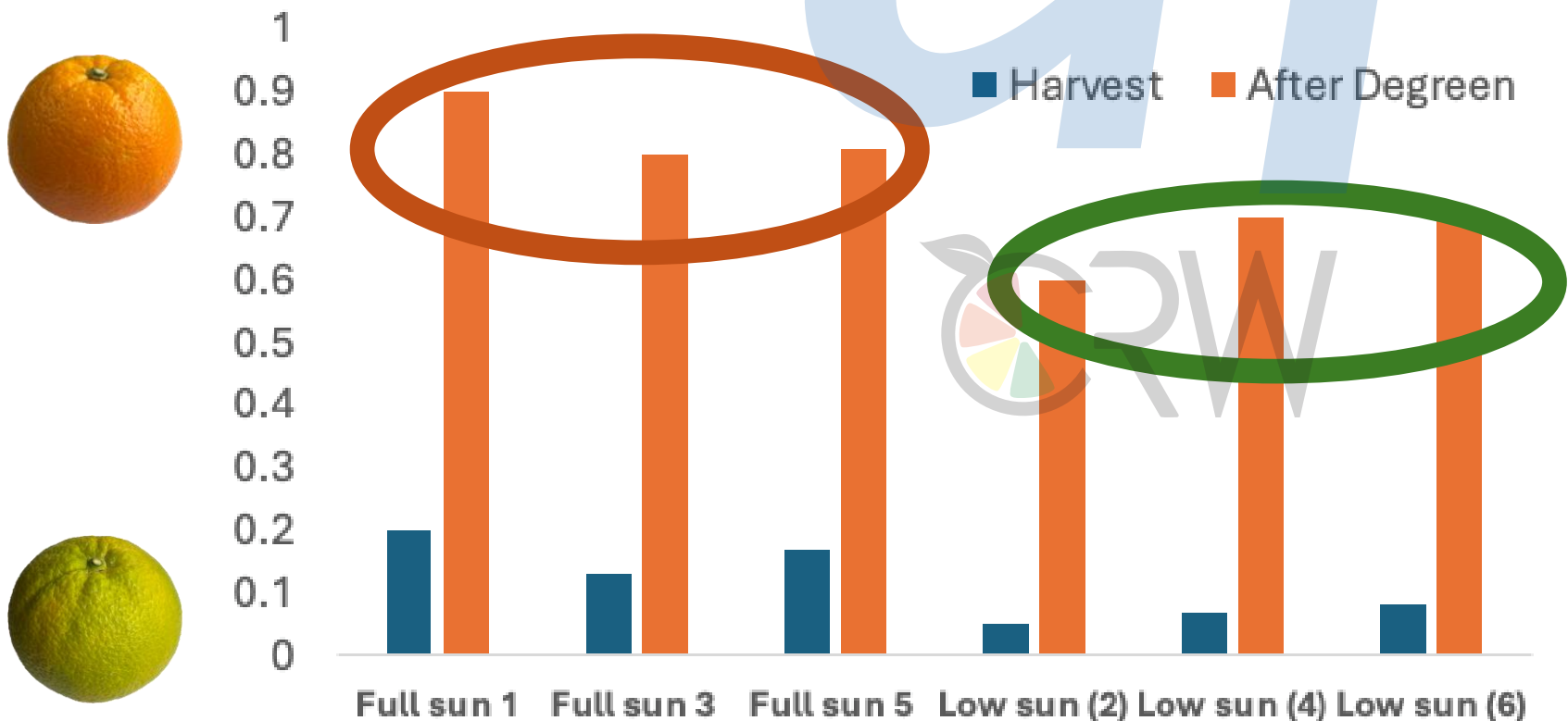
Critical control points during degreening

- **Cultivar**

- Respond differently to ethylene and environmental conditions during degreening
- **LATE MANDARINS (NADROCOTT/TANGO) CAN NOT BE DEGREEND**

- **Fruit maturity i.e. rind colour**

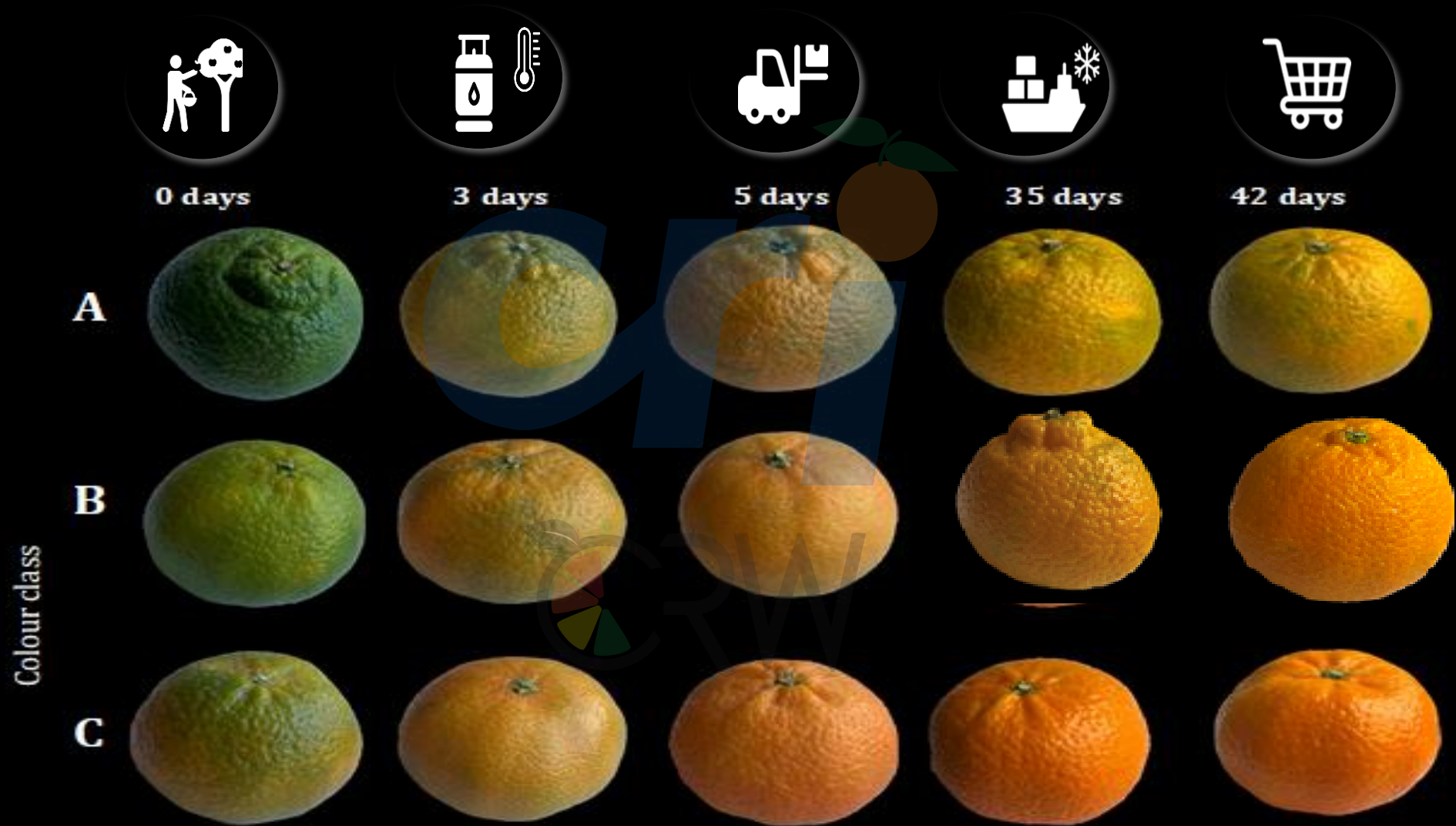
- Preharvest aspects do impact rind colour and response to ETH



Sun fruit = Good
Shade fruit = Bad
*** not Star Ruby!!**

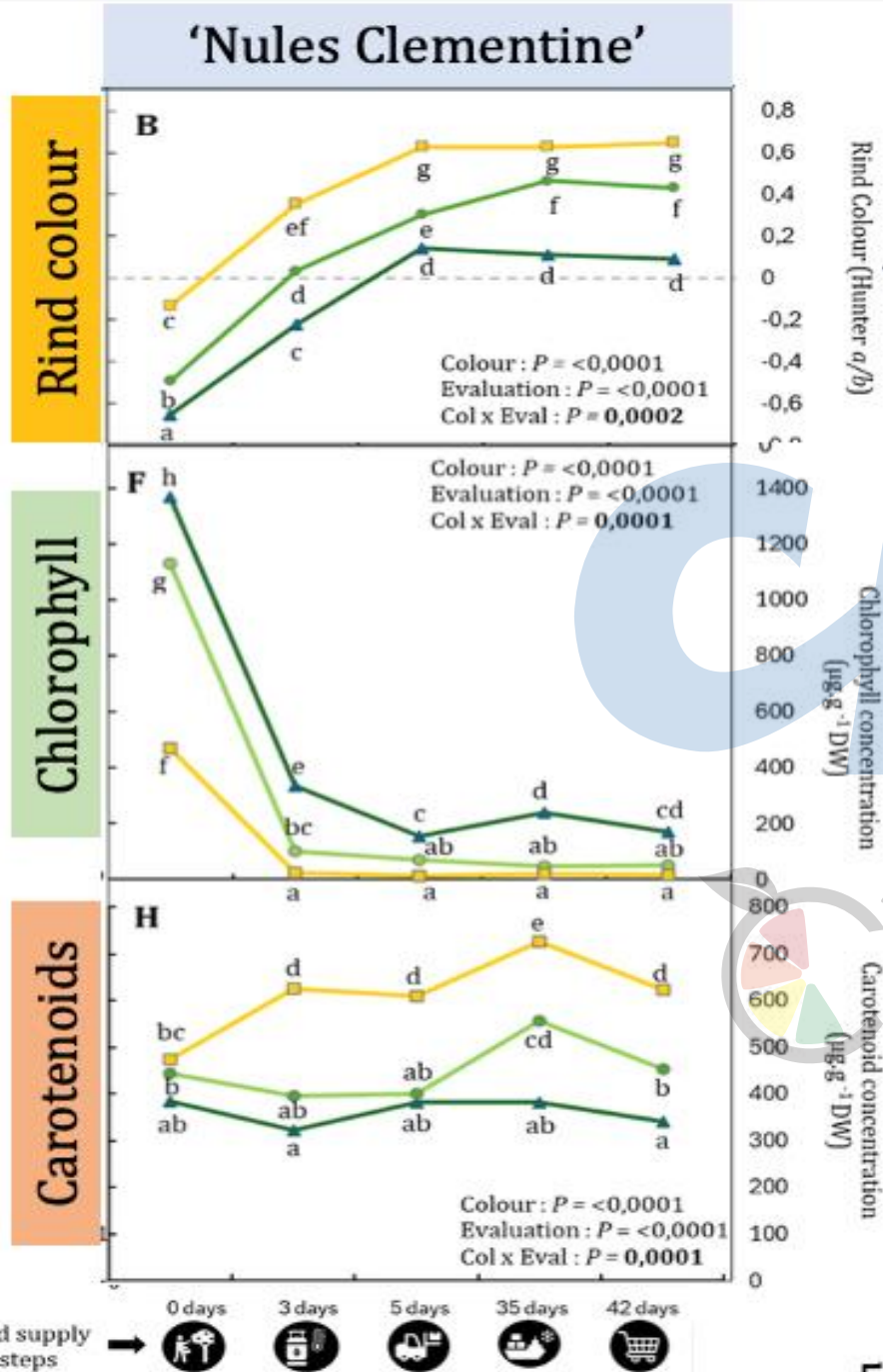
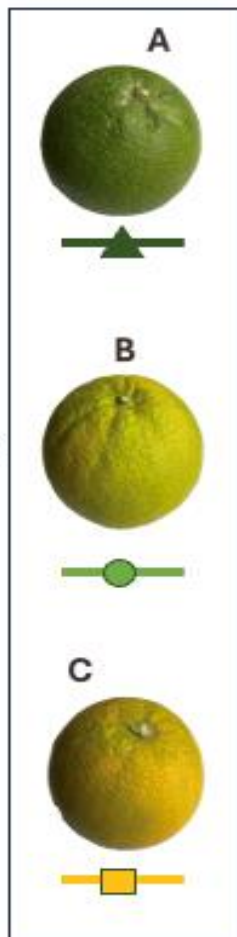
Colour at harvest is the main influence on degreening efficacy:
The impact still visible in the market

Rind colour/maturity at
harvest



Simulated supply chain

Rind maturity at harvest

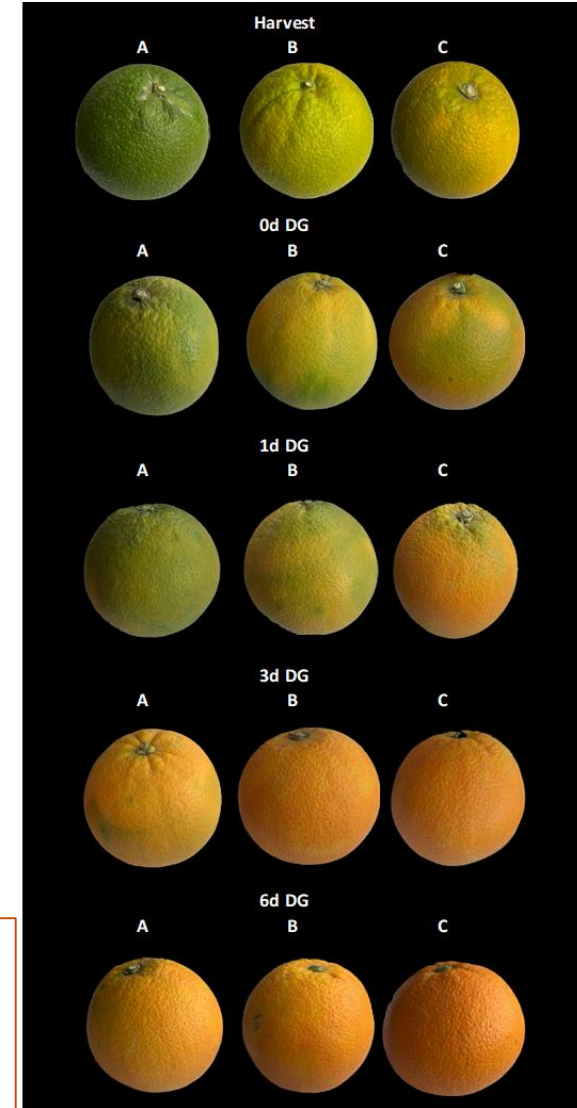
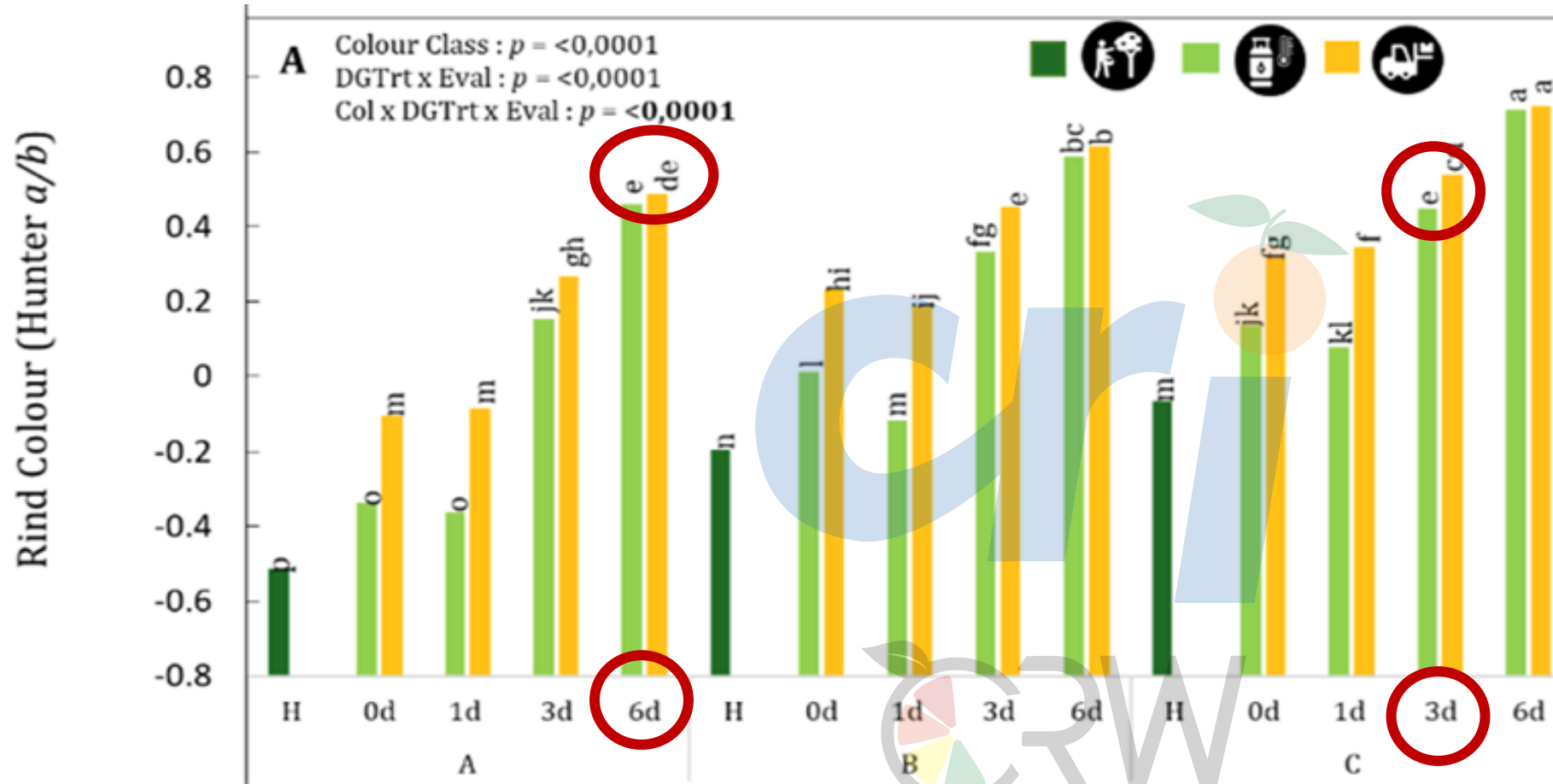


Too early harvested fruit: pigments composition never caught up with better coloured fruit

Additional negative impact of too early harvest: Class A retained green patches

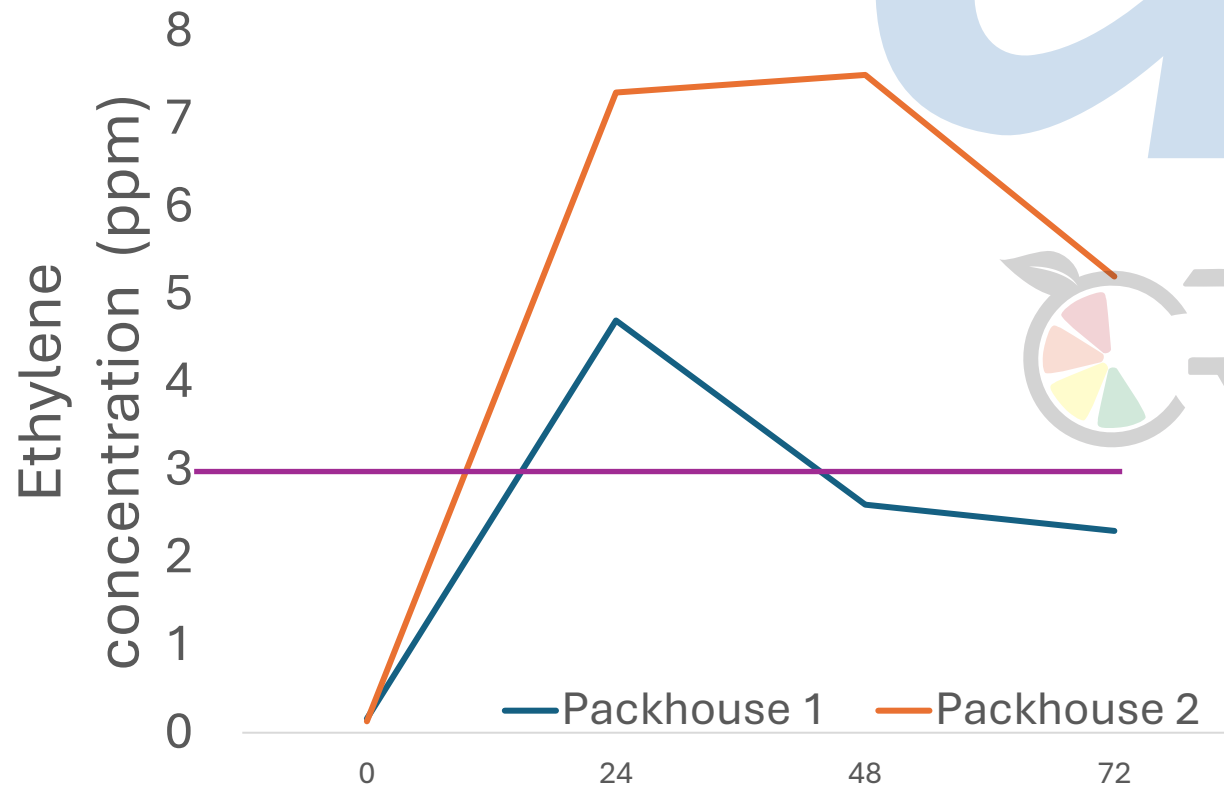
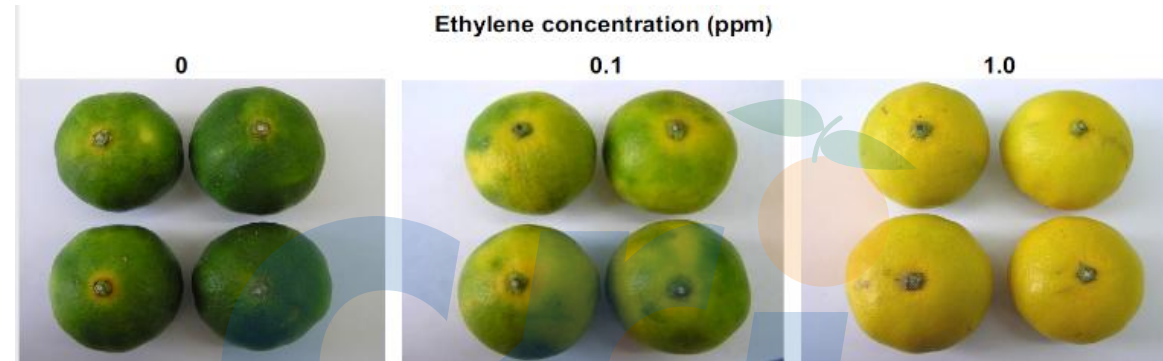


Duration of degreening



- DG for 1 day meaningless.
- Very green fruit for 6 days DG = Orange-green fruit for 3 days DG.
- Longer duration do help but cost money/time and quality
- Still not the same vivid orange colour

Ethylene concentration: aim to reach target concentration from the start



- Two different Ethelen concentrations
- Both reach required coloration
- Important to reach 3 ppm as soon as possible

Temperature control

- High temperature needed to enable biochemical processes
- Cold fruit will take longer to start process
 - Satsuma 18-22°C
 - Mandarin 19 -22°C
 - Navel 21-23°C
 - Valencia 23-24°C
 - Grapefruit lemons 24-25°C

Relative humidity

- Ideally 94 %, **not below** 90% as it will result in high moisture loss

Air circulation and replacement

- **CO₂ compete with Ethylene**: key and lock concept
- Flush regularly, low as possible
- High will reduce CO₂ effectiveness = longer time = reduce quality



Comon degreening defects

Defect	Cause	Remedial Action	Photo
1. Green Fruit	- Fruit picked at T8; before colour break - [Ethylene] no correct - ↑CO₂ - Wet fruit in degreening	- Selective picking - Monitor degreening chamber and fruit after 24hrs colour change should be visible	
2. Yellow fruit	- Inside fruit - Harvested > 32°C (Rapid colour change, prevent orange carotenoid pigment build-up)	- Selective picking - ↓ Field heat in harvested fruit - After drench stand in shaded, well ventilated area. - Choose correct temp.	
3. Variable fruit colour	No selective picking/colour sorting	- Selective picking to narrow colour range. - Colour sorting in packhouse.	

Defect	Cause	Remedial Action	Photo (Degreening booklet)
4. Oleocellosis	- Rough handling of turgid fruit, fruit with sensitive rinds - Degreening makes damage that is already present easier to see, it does NOT make damage worse.	- Only pick when conditions is favourable. - Be aware of sudden weather changes and trees with late vegetative flush. - Indigo-carmin test to see for picking injuries.	
5. Green spotting	Rind oil from adjacent damaged fruit transfer to fruit.	Same as for Oleo	
6. Injuries after degreening (No green halo around injury)	Incorrect handling of fruit after degreening : i.e. tipping of crates, packline.	- Check packline for possible injury points. - Allow fruit to stand for 6-8 hrs before tipping on line.	

Defect	Cause	Remedial Action	Photo (Degreening booklet)
7. Defects affecting the button.	Sepals: ↑ Field heat ↑Temp & ↓RH in degreening chamber	Stop harvesting when to hot. Control of degreening chamber	
	Brown buttons: Insufficient 2,4-D in pre-degreening drench (poor coverage / low concentration).		
	Missing buttons: - Worsened by orchard stresses. (↑Temp, RH, Water stress) - ↓RH, ↑Ethylene in degreening chamber	- Check [2,4-D] - Do not triple stack crates	

Defect	Cause	Remedial Action	Photo (Degreening booklet)
8. Defects from Degreening chamber	Zebra Skin: ↓RH	- Minimize orchard stresses (Temp, RH) Drench thoroughly - Optimize degreening chamber - Optimize fungicides and 2,4-D in packhouse.	
	Green rings (point of contact between wet fruit): Wet fruit from drench loaded into chamber - Formation of dew-point temperature in chamber	Load only dry fruit.	
	Wilting: Excessive wilting at harvest	Fruit must not be excessively wilted at harvest	

Take house message

- Degreening is a valuable tool to improve fruit quality and value
 - It is not an easy fix for inadequate colour
- Do not underestimate the long-term negative effect on quality of ineffective degreening practises
- **REMEMBER: NADORCOTT and TANGO can NOT BE DEGREENED**