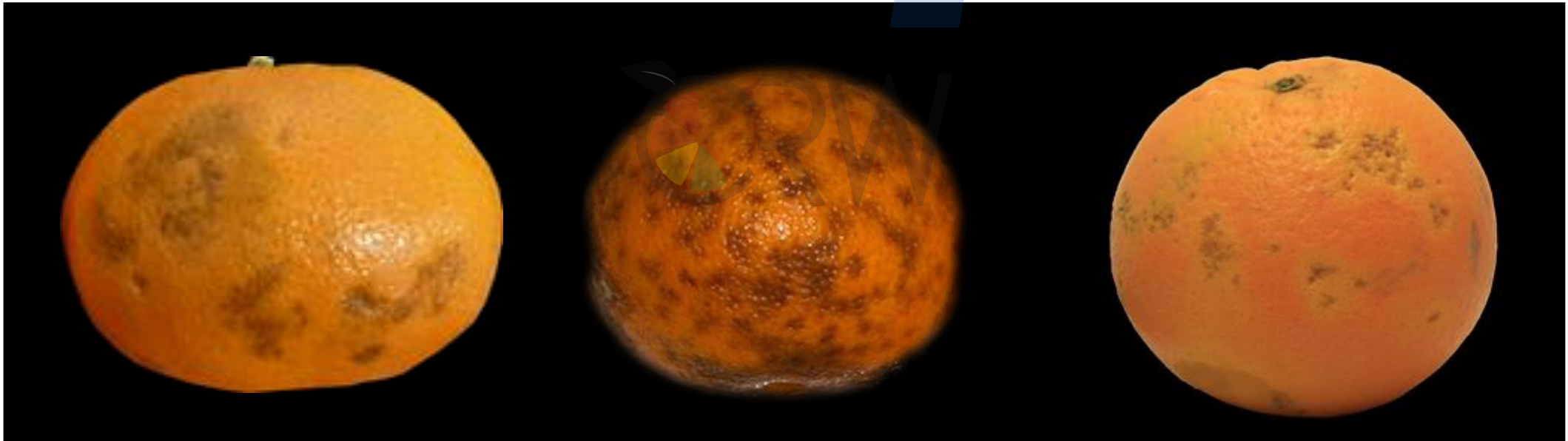


Rind disorders in 2025 season: Rind pitting, breakdown and chilling injury

Paul Cronje and Tarl Berry

CRI Packhouse workshops 2026



- Rind breakdown of of Clemetine
 - Pitting of Late Mandarin
 - Chilling injury of Valencia

These disorders have different causal mechanism involved and ask for specific interventions

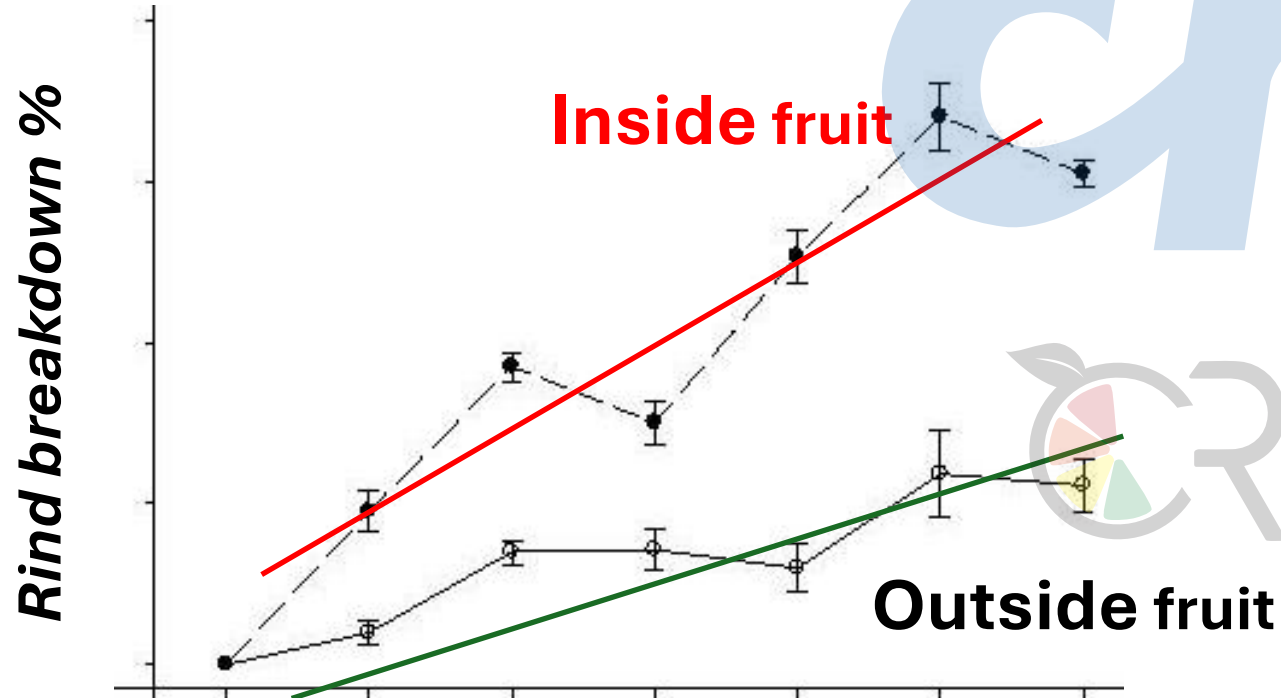
Rind breakdown (RBD) of Clementine mandarins

- Develop during export
- Random collapse of oil glands
- Senescence related = progressive
- Full development on arrival = very costly



Reduce RBD risk: Preharvest and packline sorting

- Low rind colour (pale orange) = high risk
- Small fruit = high risk

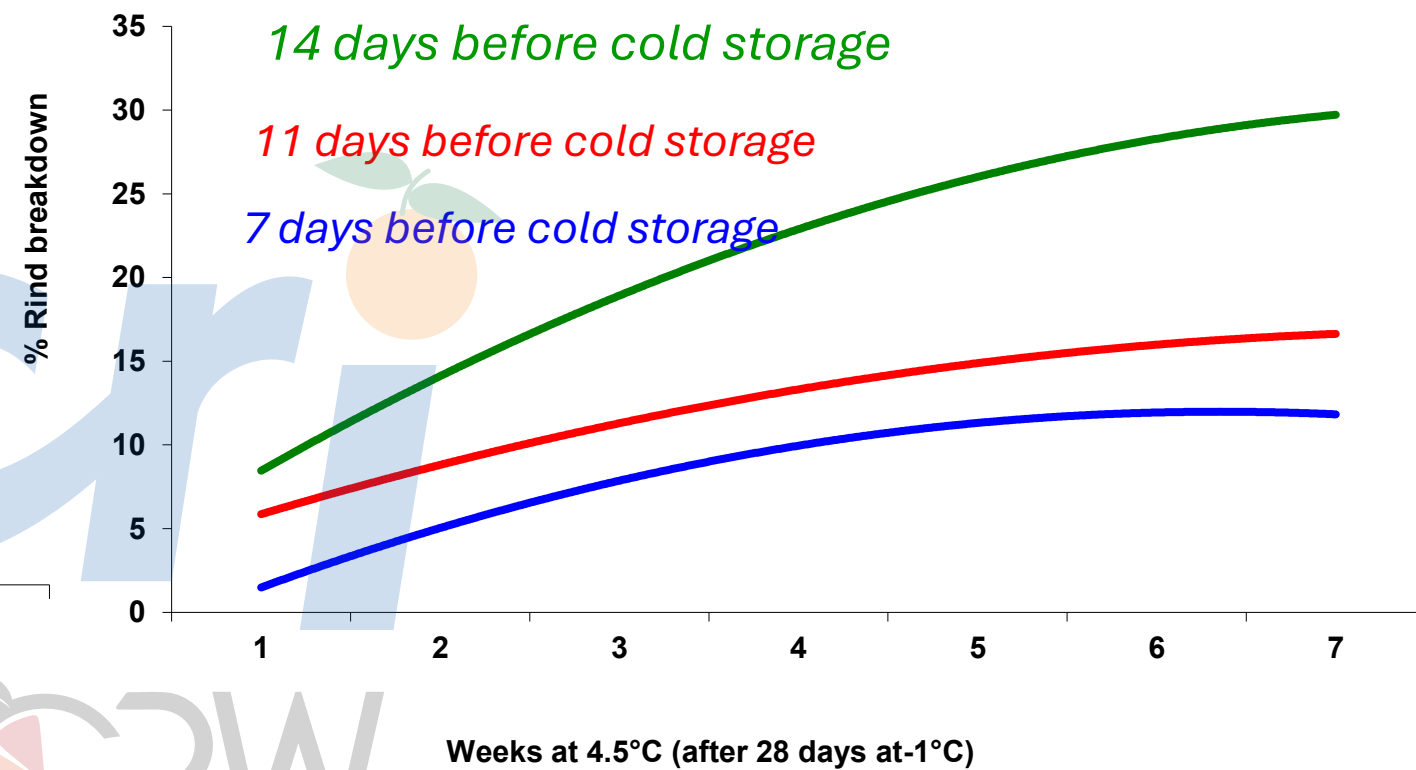
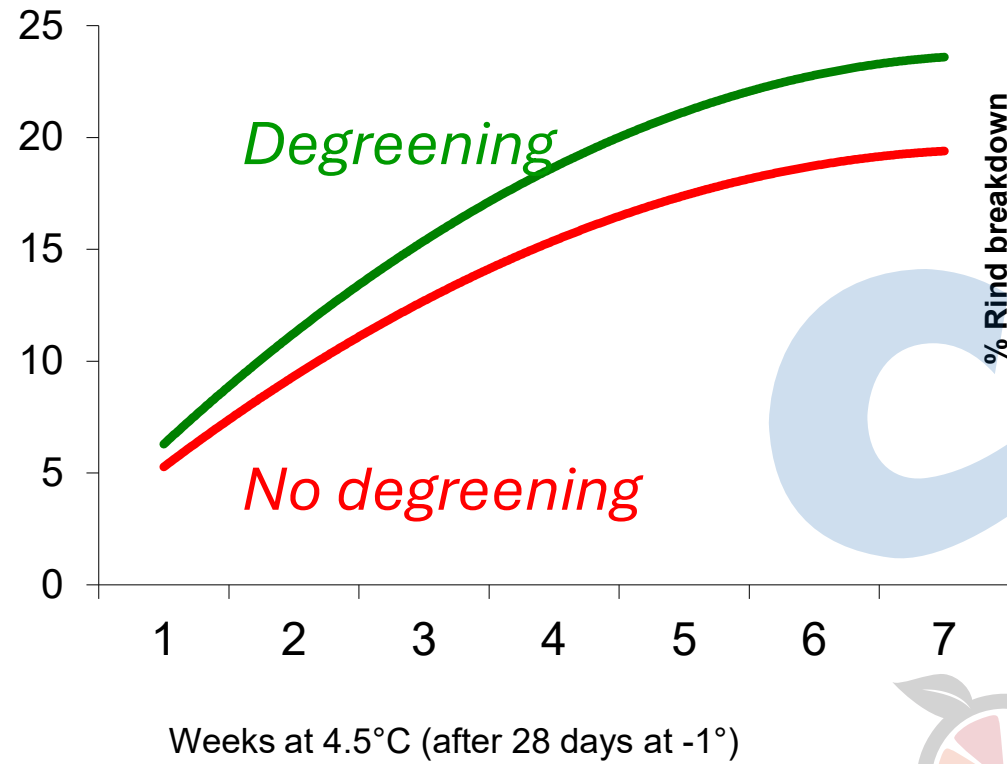


Control options

- Improve light distribution in canopy (Oct-Feb)
- Selective harvest on colour
- Use colour/size sorting and remove small and yellow fruit

Reduce RBD risk: Packhouse and cold chain

Rind breakdown %



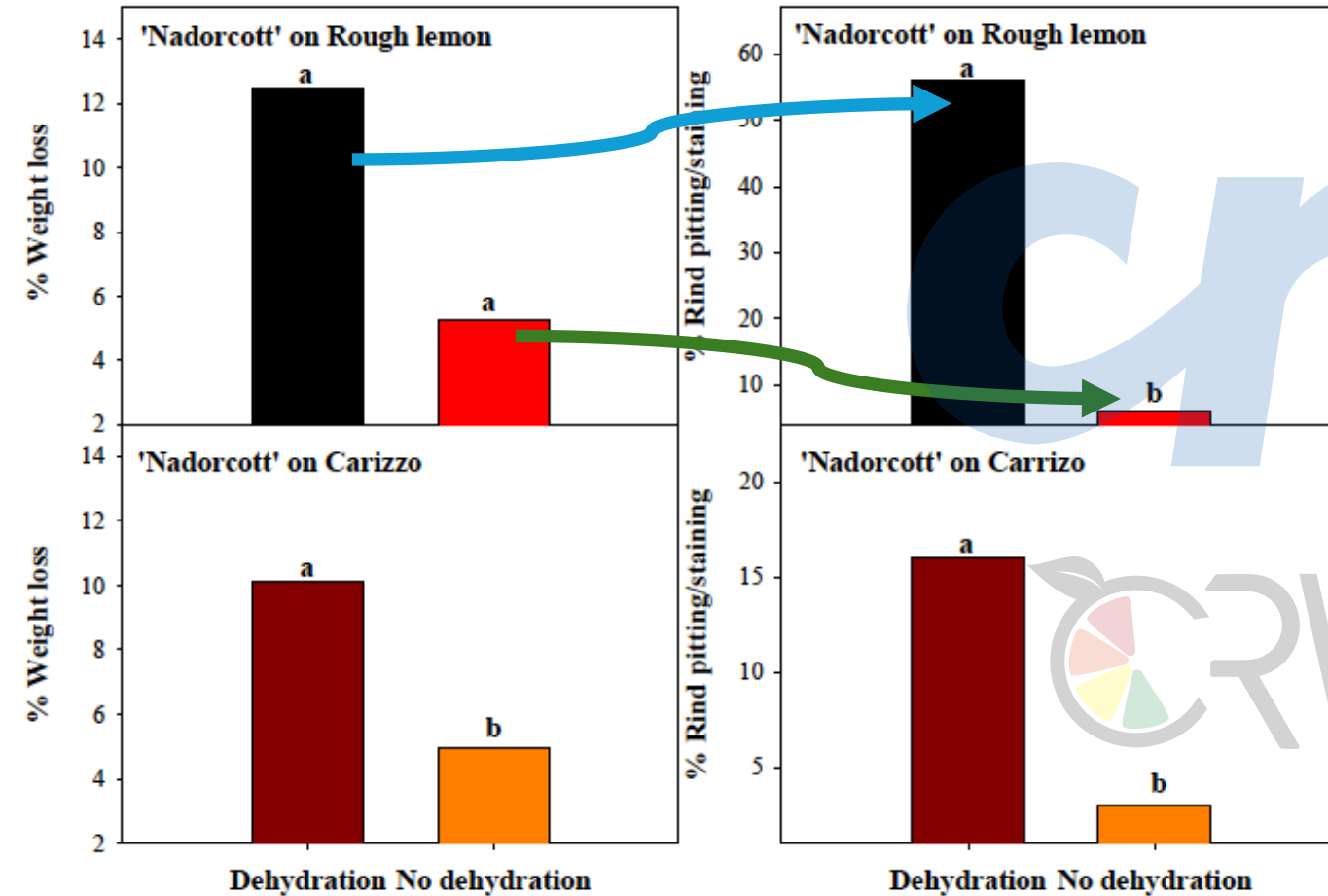
- Reduce or avoid degreening if possible
 - Not cause of RBD but increase incidence
- Ensure fruit are in cold chain ASAP

Rind Pitting of late mandarins (Nadorcott and Tango)

- Different disorder than RDB of mandarin
- Develop **5-10 days after harvest**
- Not related to ethylene/degreening
- Not an oil gland collapse but large flavedo
- **Main factor is rapid loss of rind moisture**



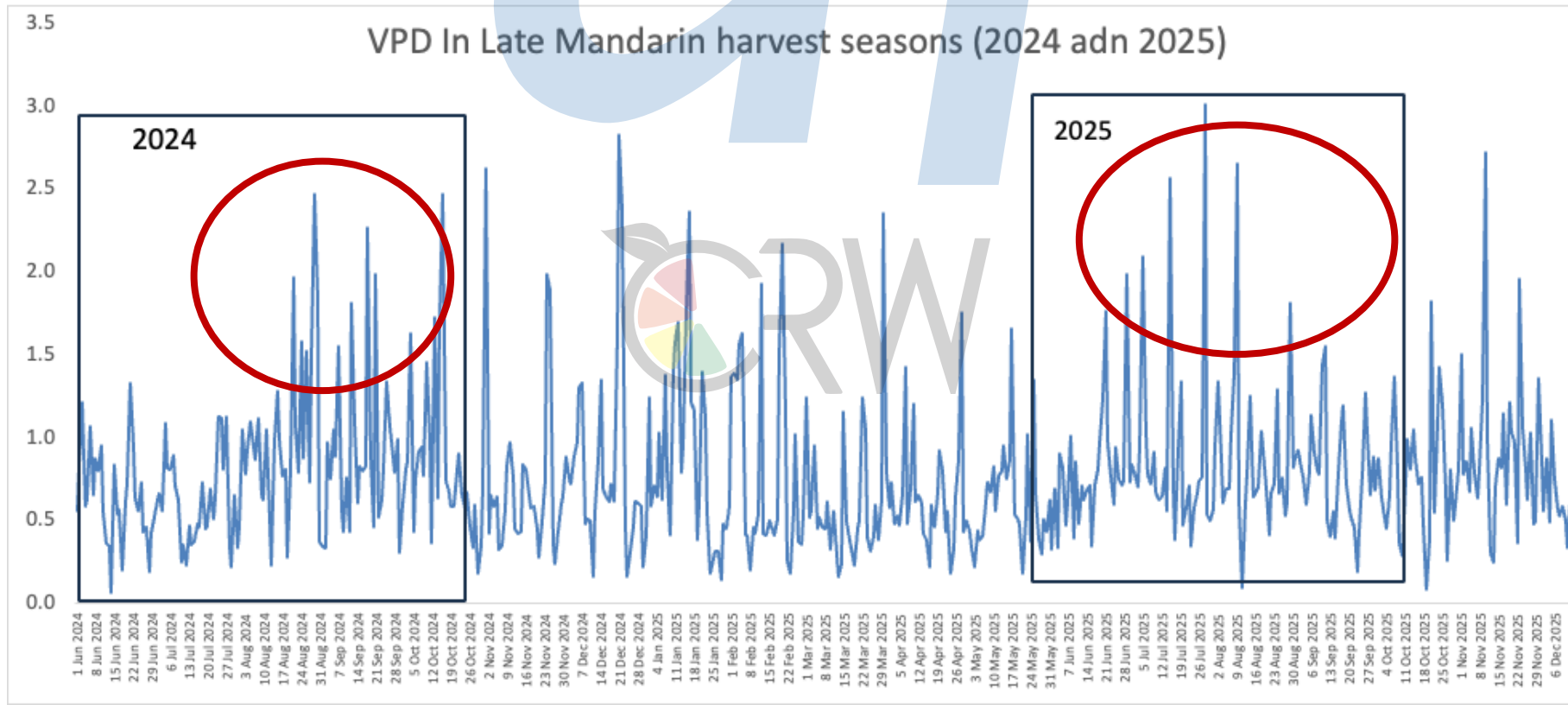
Rind pitting of Late mandarin



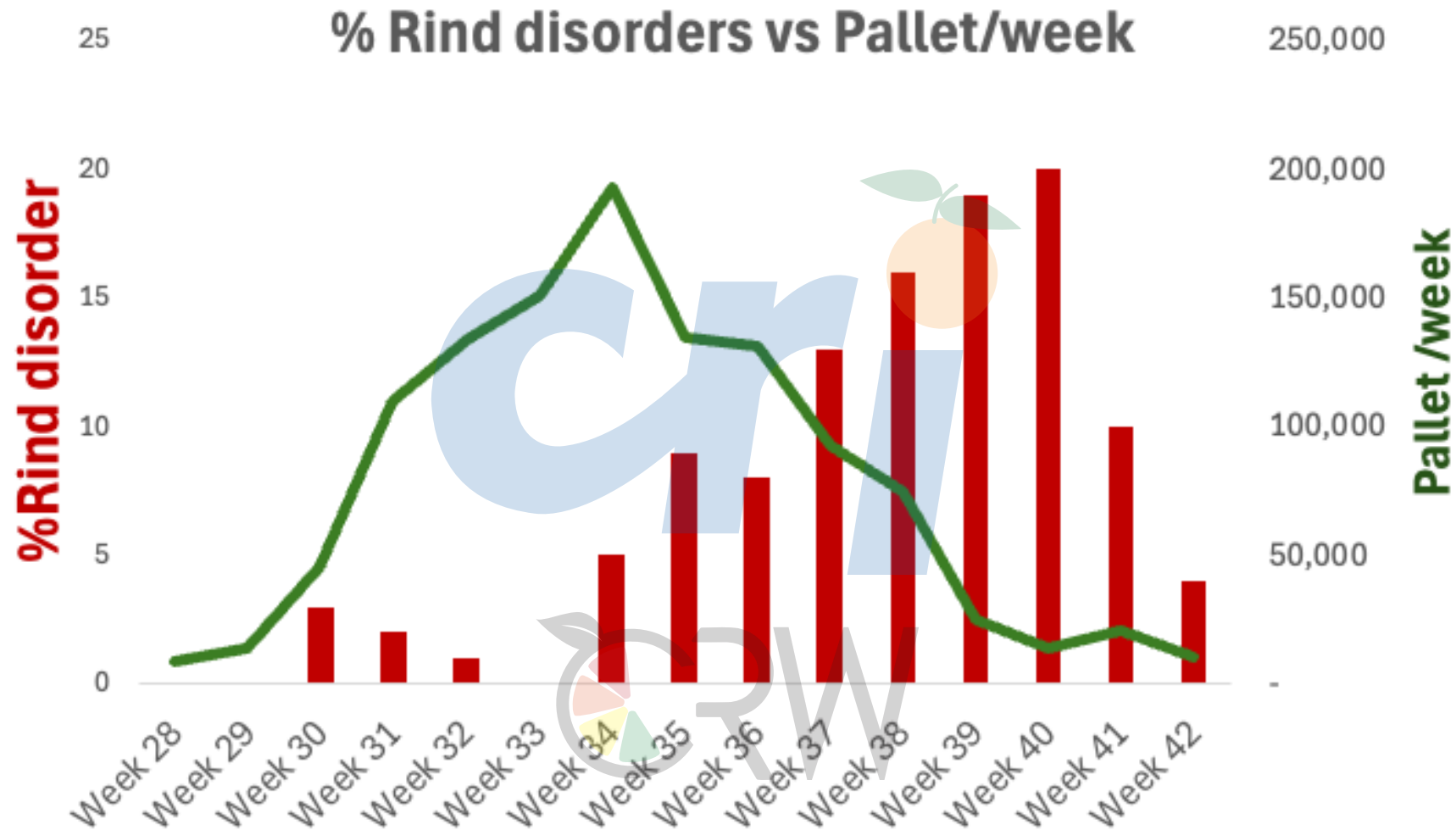
- Flavedo breakdown initiate after postharvest loss of moisture = weight loss
- Risk increase later in season (maturity and climate)
- High risk if water stress in weeks prior to harvest
 - Not oleo sensitive do not apply water stress as for Clementine

Rind pitting of Late mandarin

- **Problematic harvest conditions:** high temperature + low RH = high Vapour Pressure Deficit (VPD)
- High heat stress events add significant risk to pitting
 - 2025 higher VPD during harvest as 2025
- Monitor and react to heat stress (Identify the peaks in stress)



Rind pitting: Time of harvest in season is critical



- Harvest maturity (***how old is the fruit rind ?***) key component in managing sensitivity
- Ensure you know the risk of harvesting later

Recommendations to reduce risk of pitting in Late mandarin

- Do not harvest trees under water stress
 - Do not apply “oleo” stress
 - Monitor temperature and RH – farm and packhouse
- Rootstock and yield influence fruit susceptibility
- Reduce/prevent water loss after harvest
 - Store at High RH conditions

DO NOT TRY TO DEGREEN LATE MANDARIN FRUIT
-----IT WILL NOT WORK----

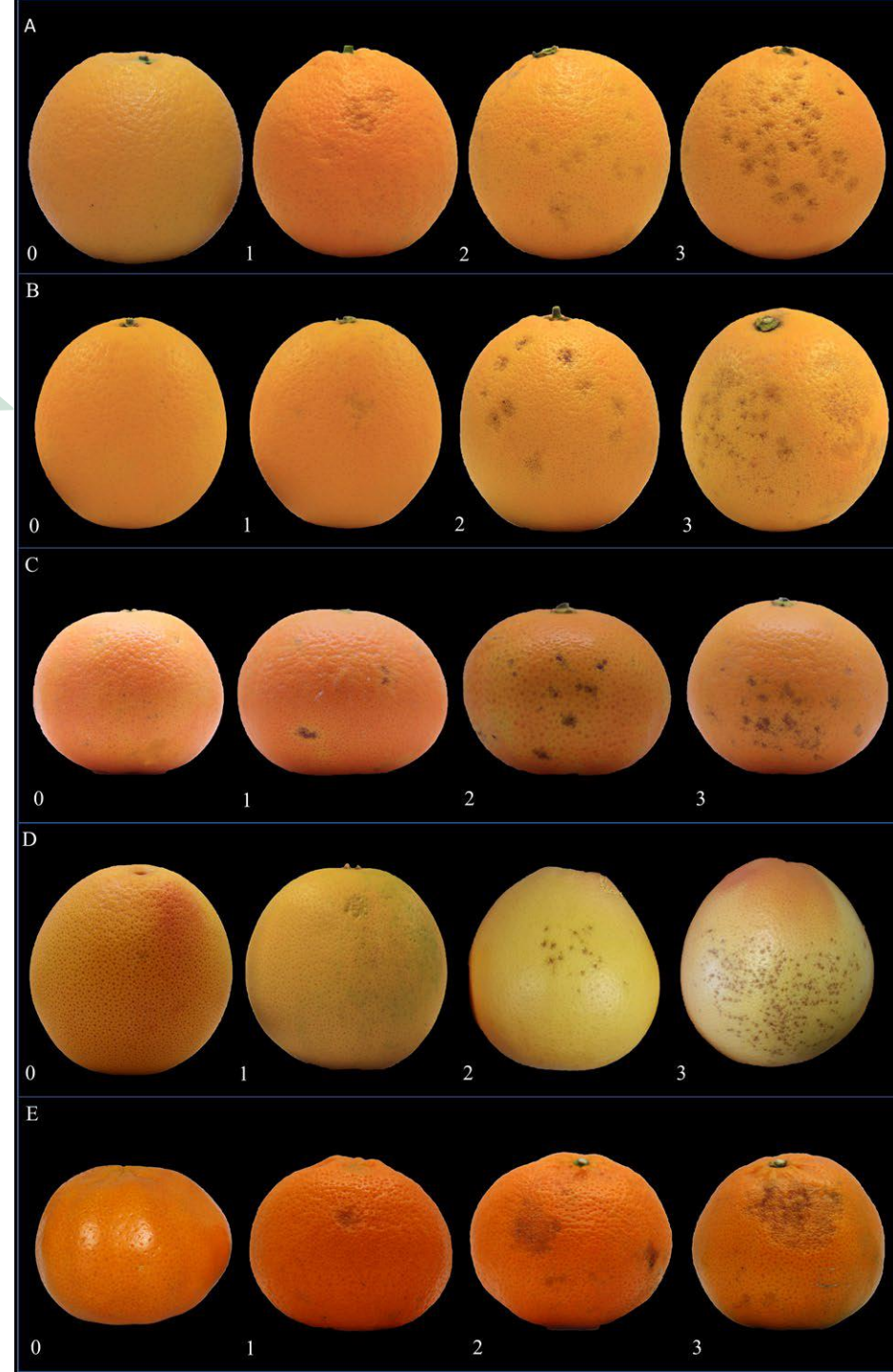
Late mandarin and chemical damage

- Nadorcott and Tango are very sensitive to chemicals after colour break and in packhouse.
 - Including any nutrition, sanitation/decay control and wax
- Apply the minimum products to these cultivars
- Do not apply any new products without tough testing it on your own



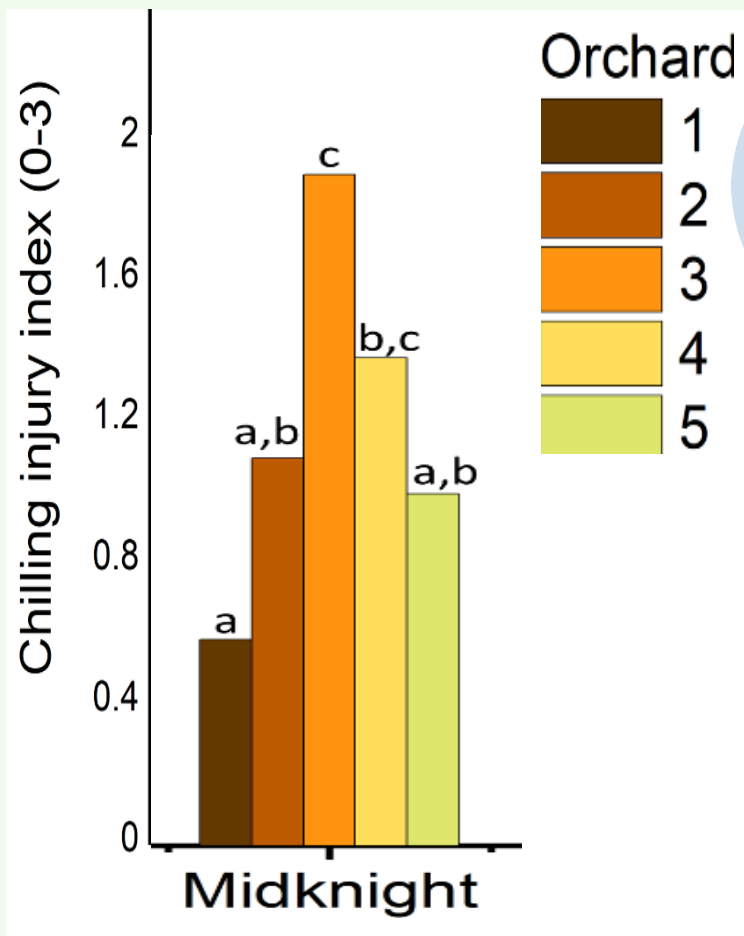
Chilling injury of citrus fruit

- Function of Temperature * Time * Cultivar
- All protocols $<4^{\circ}\text{C}$ shipment have risk of chilling injury
- Only option for us is to reduce incidence below commercially relevant levels
- *NO silver bullet for CI reduction*

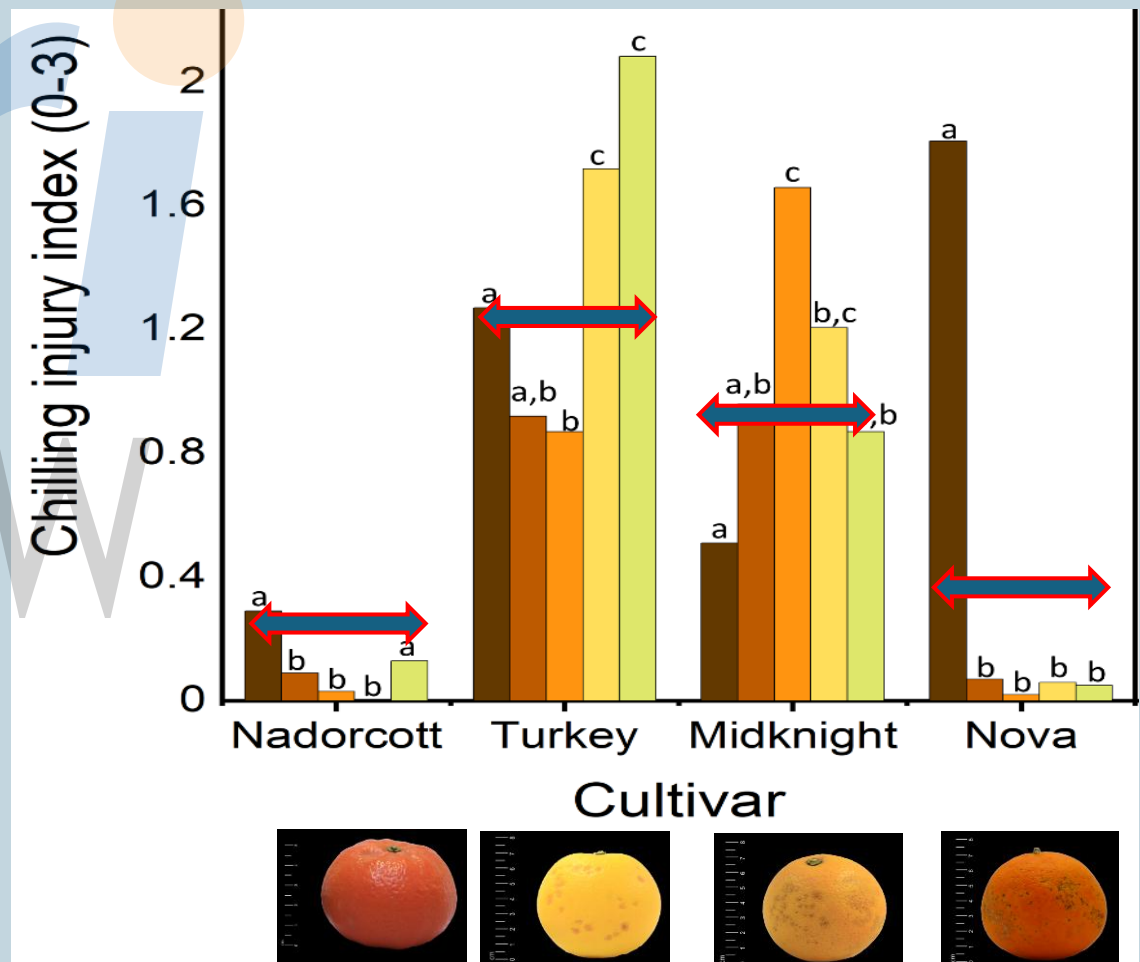


Chilling injury risk management: Identify and mitigate variation

Orchards vary in susceptibility



All cultivars are susceptible to CI but some are more susceptible than others



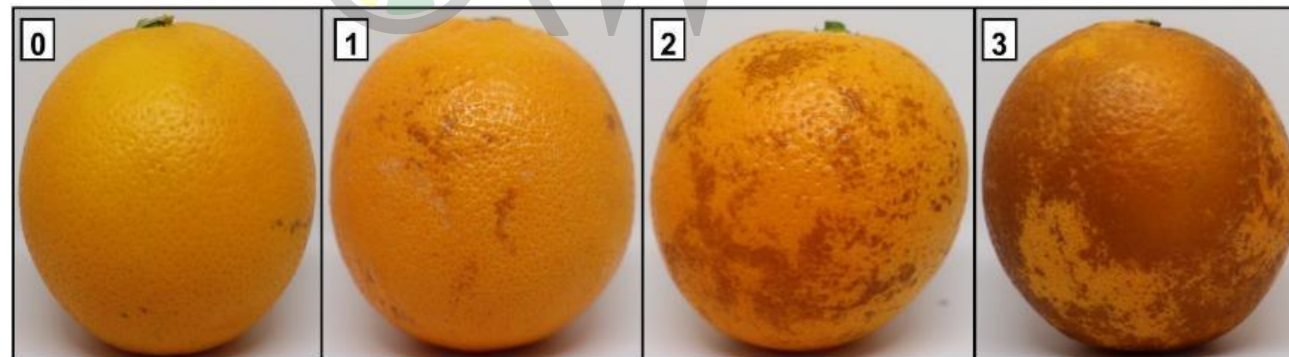
Packhouse action can reduce Chilling injury risk

- **Maturity indexing**

- Early and late in picking window have higher risk

- **Sorting technology**

- Colour: pink and orange = low CI
 - Size: small = higher CI



Wax application: the major option to reduce chilling injury risk

- Wax application (>18%)
 - No difference between different wax products of same solid content
 - Application control critical

1. Mix of wax and fungicides

2. Application: uniform and adequate volume + brush quality and speed

3. Monitor of process

- TBZ in bath and/or wax – still only proven active to reduce CI risk
 - Higher temperature more effective

General recommendations

- At this stage the new natural/vegan waxes and coatings do not add risk to chilling injury
- It is important to test the new wax/coating products in your packhouse
- Application can be more complex
 - Volume and drying

DO NOT apply any chemical product you have not tested to Tango/Nadorcott