Ripening mangoes on the way from farm to market – in-transit ripening

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Mango transport and ripening

Current recommendations

- For longer than 2-3 days journey, delay ripening until fruit reach the ripener
  - Cool on farm to 13°C
  - Transport at 13°C
- At the market
  - Ripen at 18°C
  - Use ethylene for 1-3 days
  - Keep carbon dioxide below about 2%

In-transit ripening?

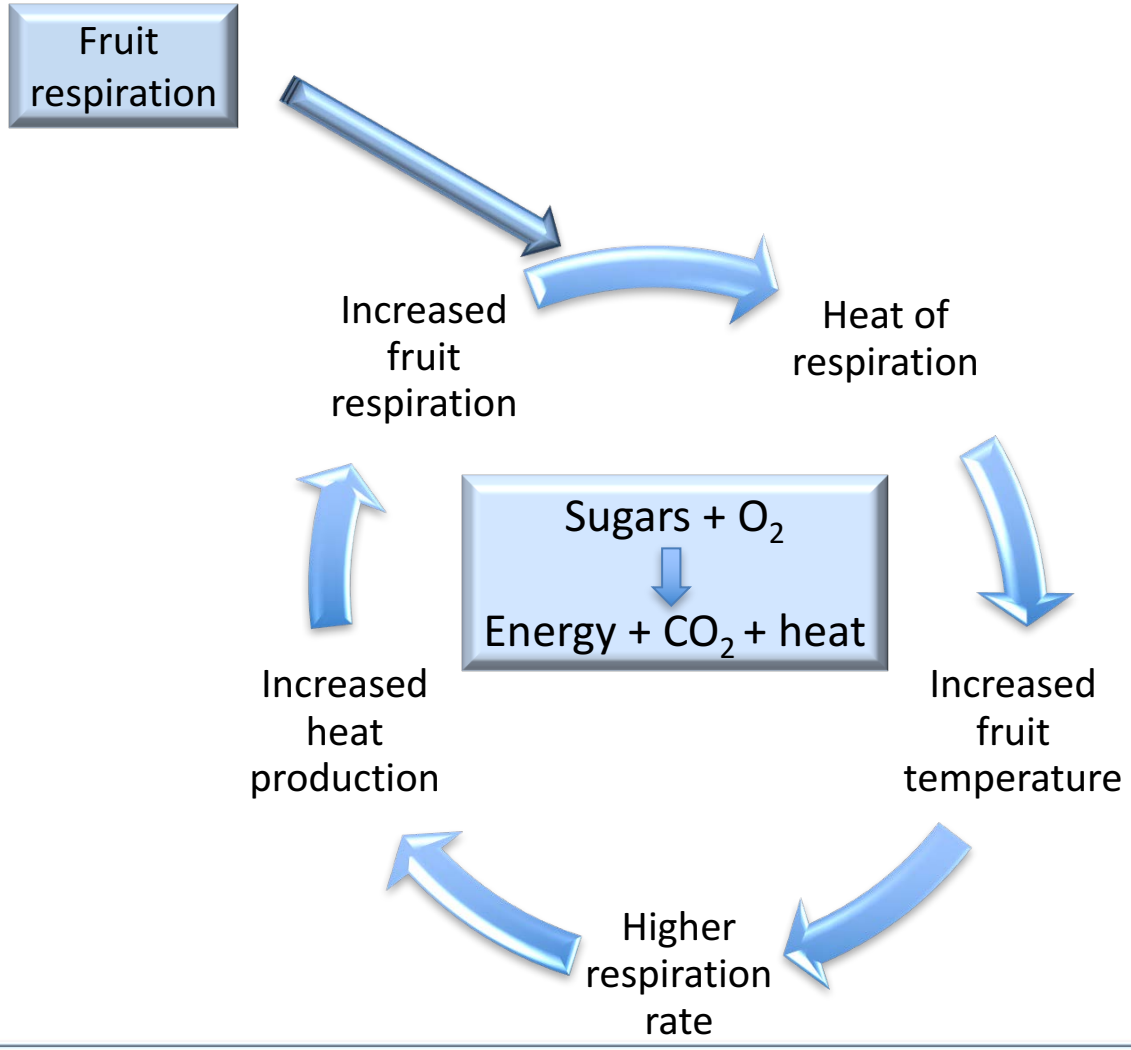
- How would we ripen in-transit?
  - Cool fruit on farm to 16-18°C
  - Transport at 16-18°C
  - Ethylene dosing system
    - 10-100 ppm
      - Higher concentration to overcome potentially poor circulation
      - At least 48 hours above 10 ppm
  - CO_2 absorption system
    - Maintain concentrations below 2-4%

In transit ripening – benefits and risks

- Benefits
  - Less cooling on farm and during transport
    - Energy and infrastructure savings
  - Reduced ripening costs at market
  - Quicker access to high-priced early season markets
- Risks
  - More difficult temperature management
  - Carbon dioxide accumulation
    - Health risk
    - Can affect ripe fruit quality

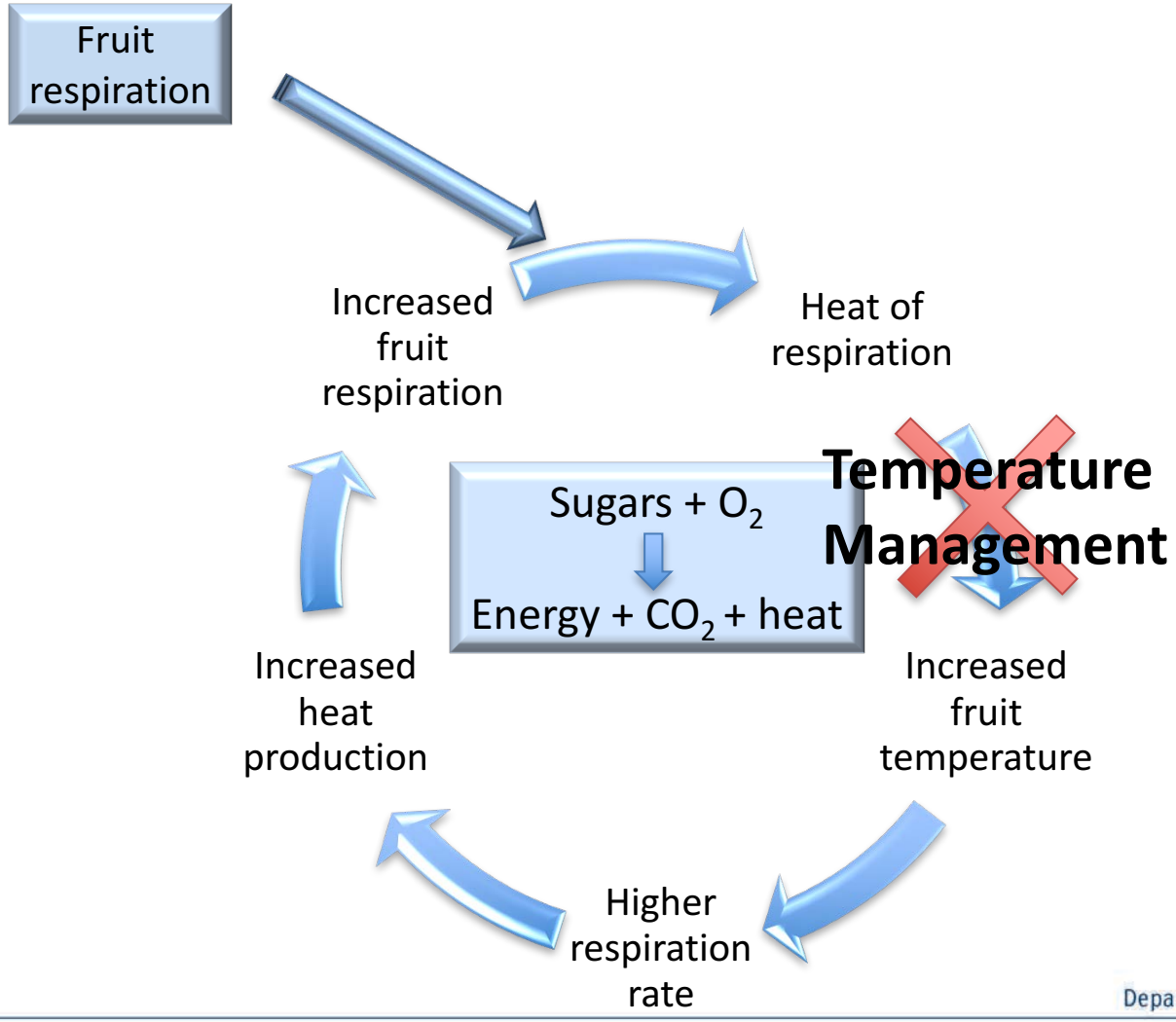
Temperature management

The critical requirement



Temperature management

The critical requirement



Temperature management

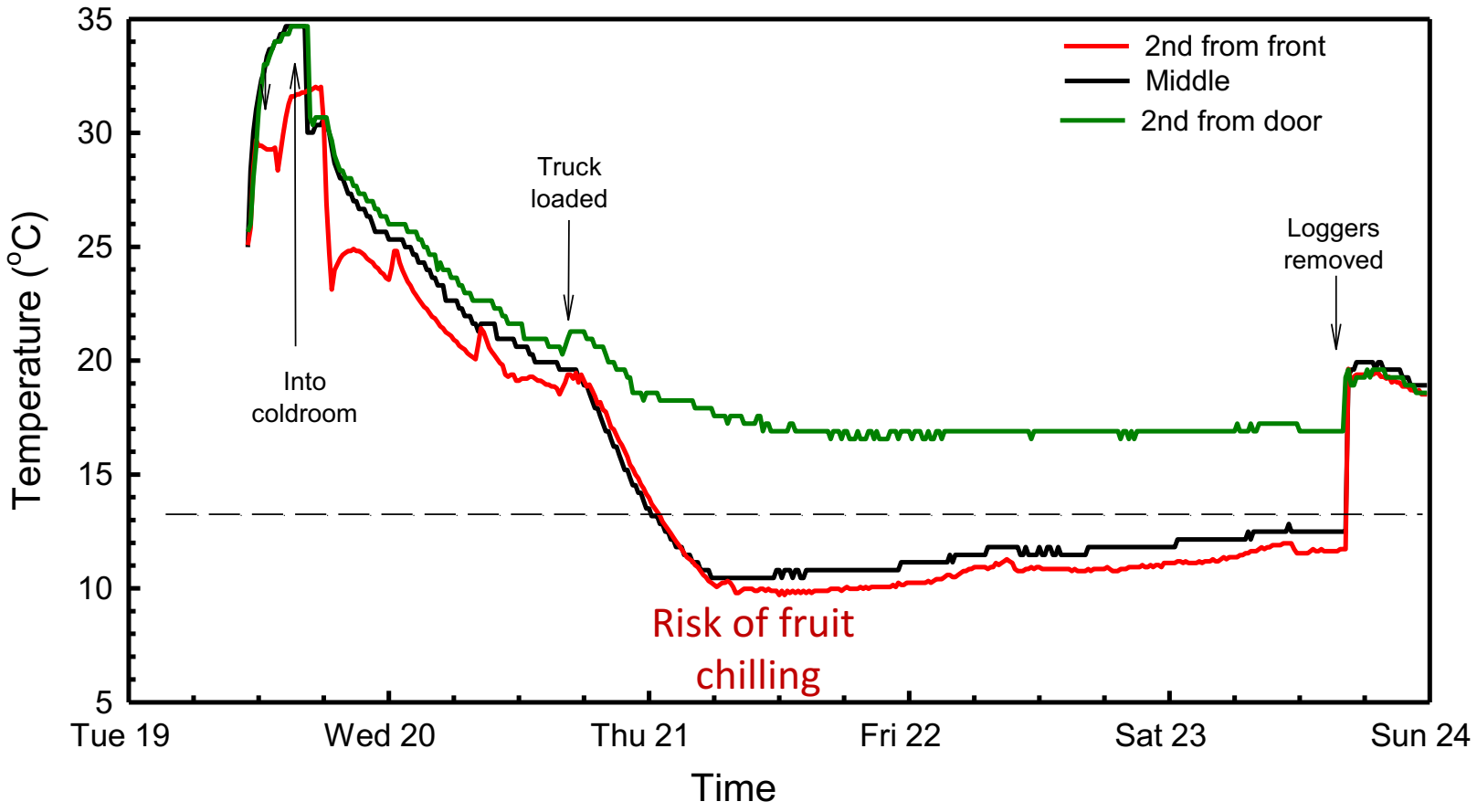
The critical requirement

Key issues

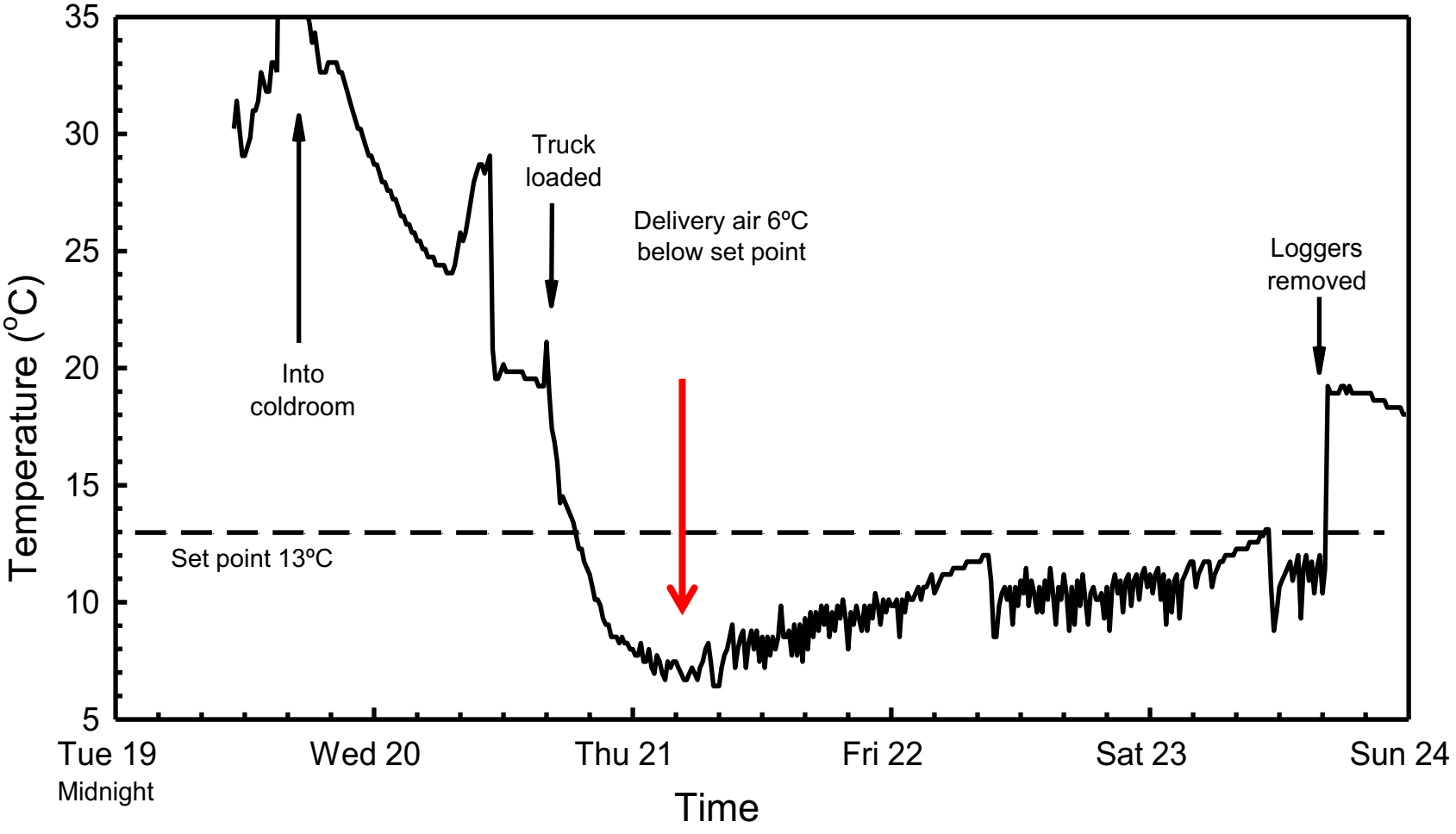
- Temperature of fruit at loading
  - Good pre-cooling
  - Load within 2°C of the container set temperature
- Pallet stowage pattern in the container
  - Reduce air short circuiting
  - “Force” cold air to flow over the fruit
- Refrigeration capacity/air circulation/insulation

Loading warm fruit causes uneven ripening

Truck temperature 13ºC Average fruit temperature at loading 21ºC



Loading warm fruit causes chilling injury



Ethylene management

- Treatment conditions
  - Rapid release to start with
  - Maintain at least 10 ppm for at least 48h
  - Up to 100 ppm should ensure more uniform response
- No pressurised cylinders
  - Safety concern
- We used Ripestuff™
  - Encapsulated ethylene “powder”
  - Placed in specimen jars for slow release

Ripestuff in jars

Ripestuff in the container

Ethylene and CO_2 loggers

In transit ripening

Effective ethylene treatment with Ripestuff™

In transit ripening

Managing carbon dioxide

Hydrated lime
in bags

CO_2 damage

In transit ripening

CO_2 control with hydrated lime

No ethylene or hydrated lime

With ethylene, and hydrated lime

In-transit ripening

Temperature and carbon dioxide

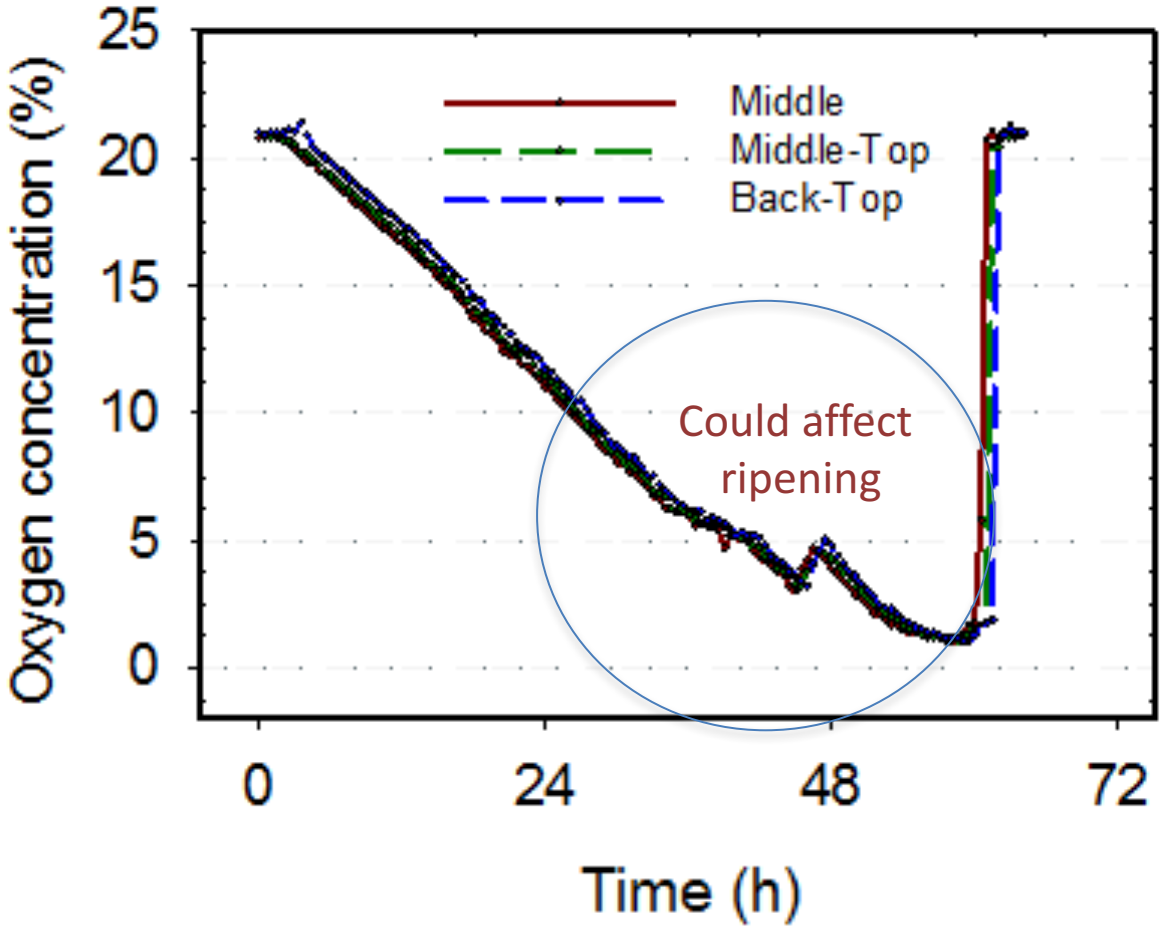
Fruit temp.
on arrival

24°C

17°C

In transit ripening

The other consideration - oxygen



In transit ripening – fruit responses

	% green	Firmness (N)	Days to ripe
At arrival			
Control		26[a]	
Ripestuff		19[b]	
At ripe			
Control	13[c]		12.1[a]
Ripestuff	4[d]		9.2[b]
Ethylene at arr.	0[d]		8.8[b]

Ripestuff-treated fruit:

- Started to ripen on arrival
- Ripened at the same time as fruit treated with ethylene on arrival
- No negative quality affects

In-transit ripening

Where to from here

- Temperature control
  - Improved commercial practices
- Carbon dioxide control
  - More cost effective efficient systems
- Oxygen control
  - Systems for controlled import of air
- Ethylene control
  - Easier application systems

Thanks

DAF, UQ, HIA, Piñata Farms, One Harvest