

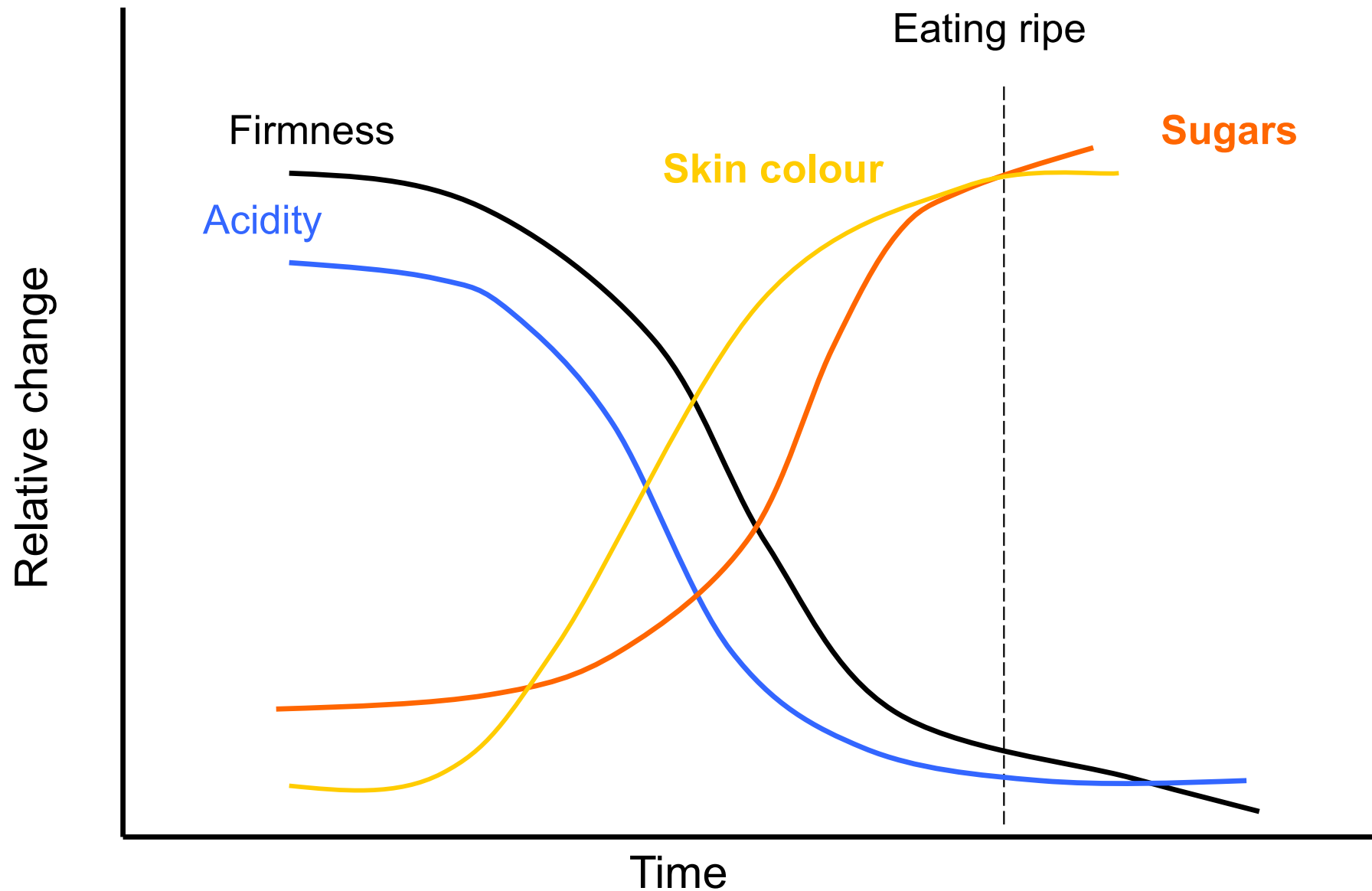
Handling and ripening mangoes in export markets



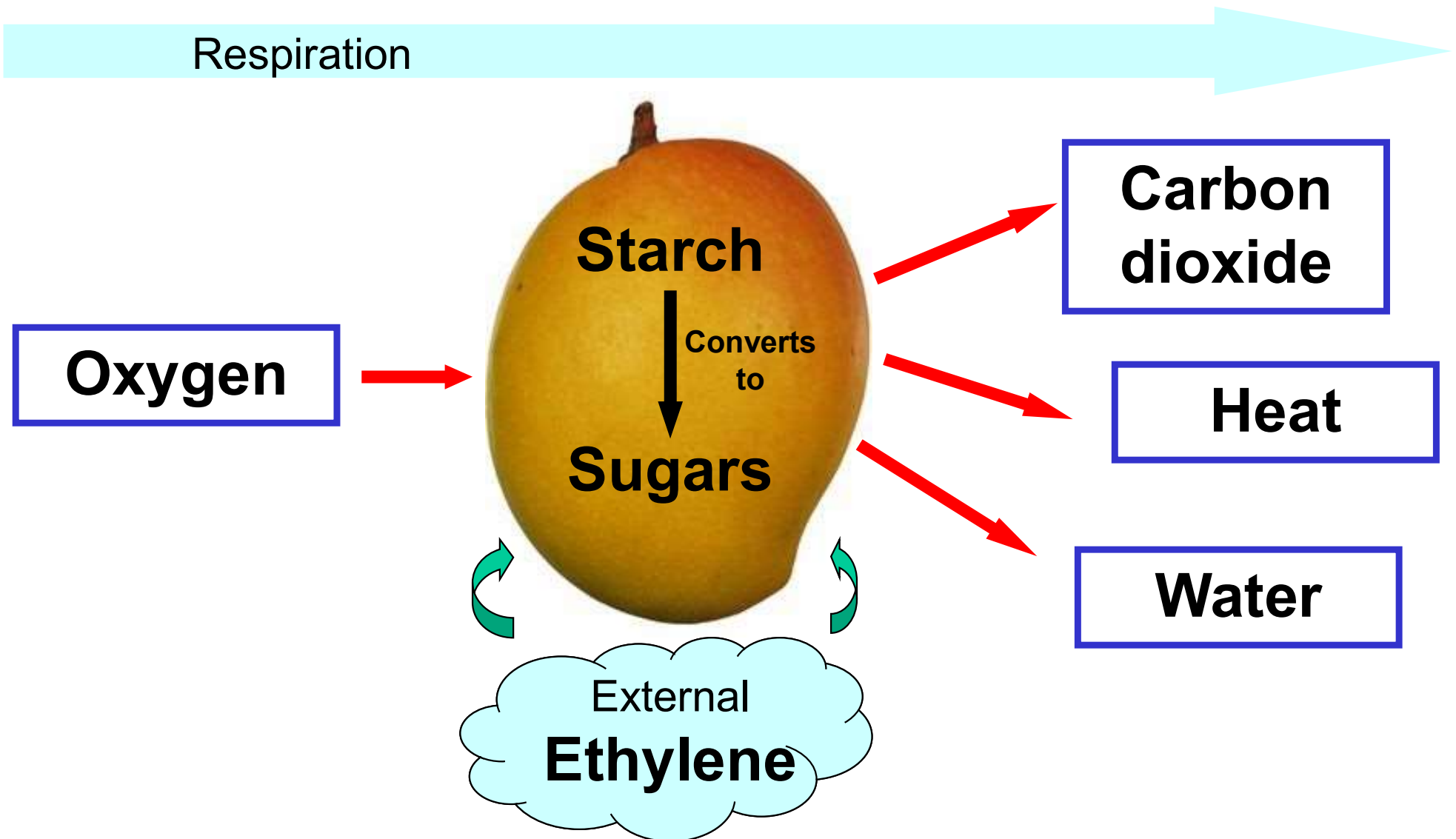
Training for supply chain members

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What changes occur after harvest?



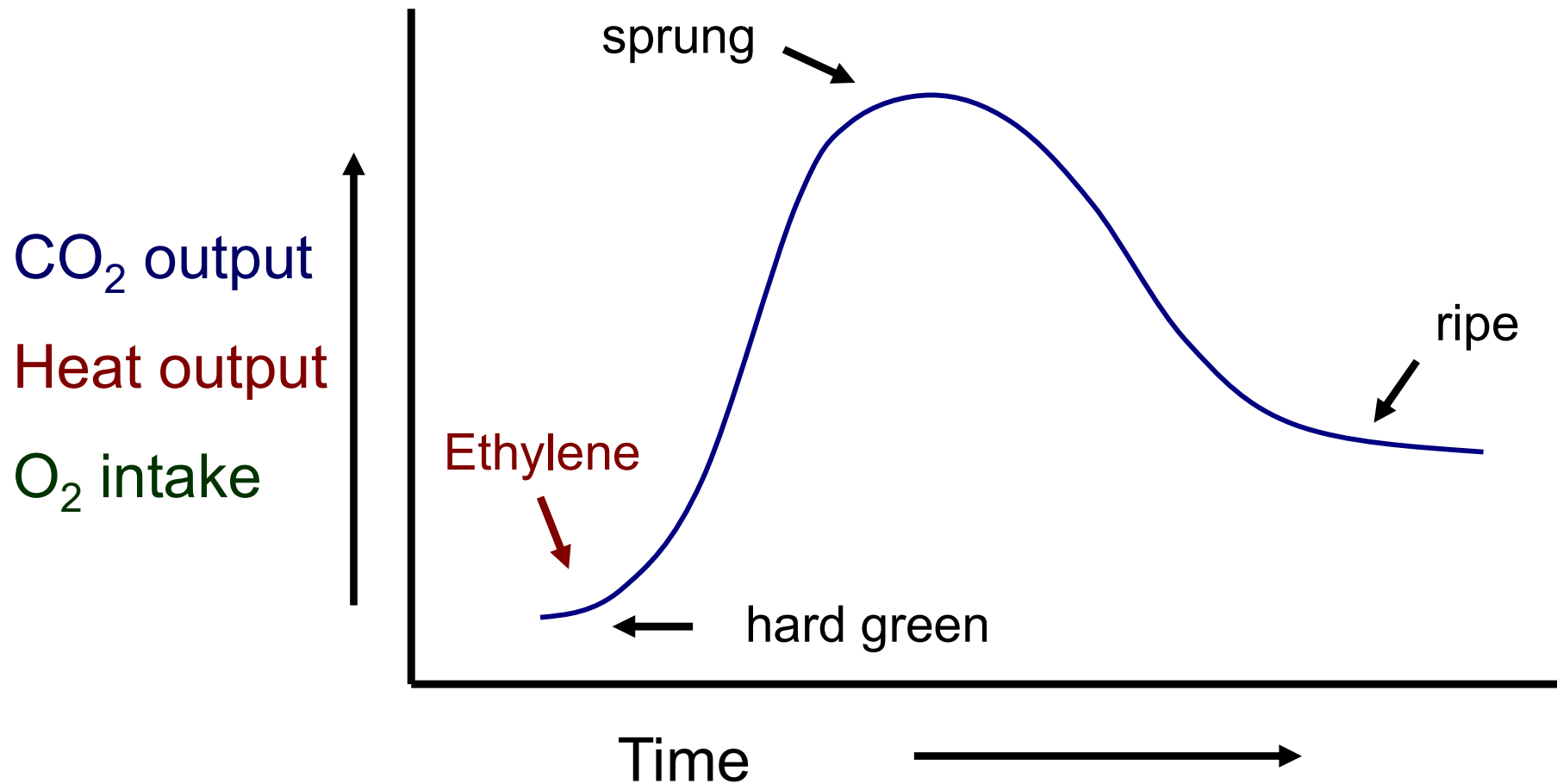
Mangoes are still alive



Respiration rate varies with produce

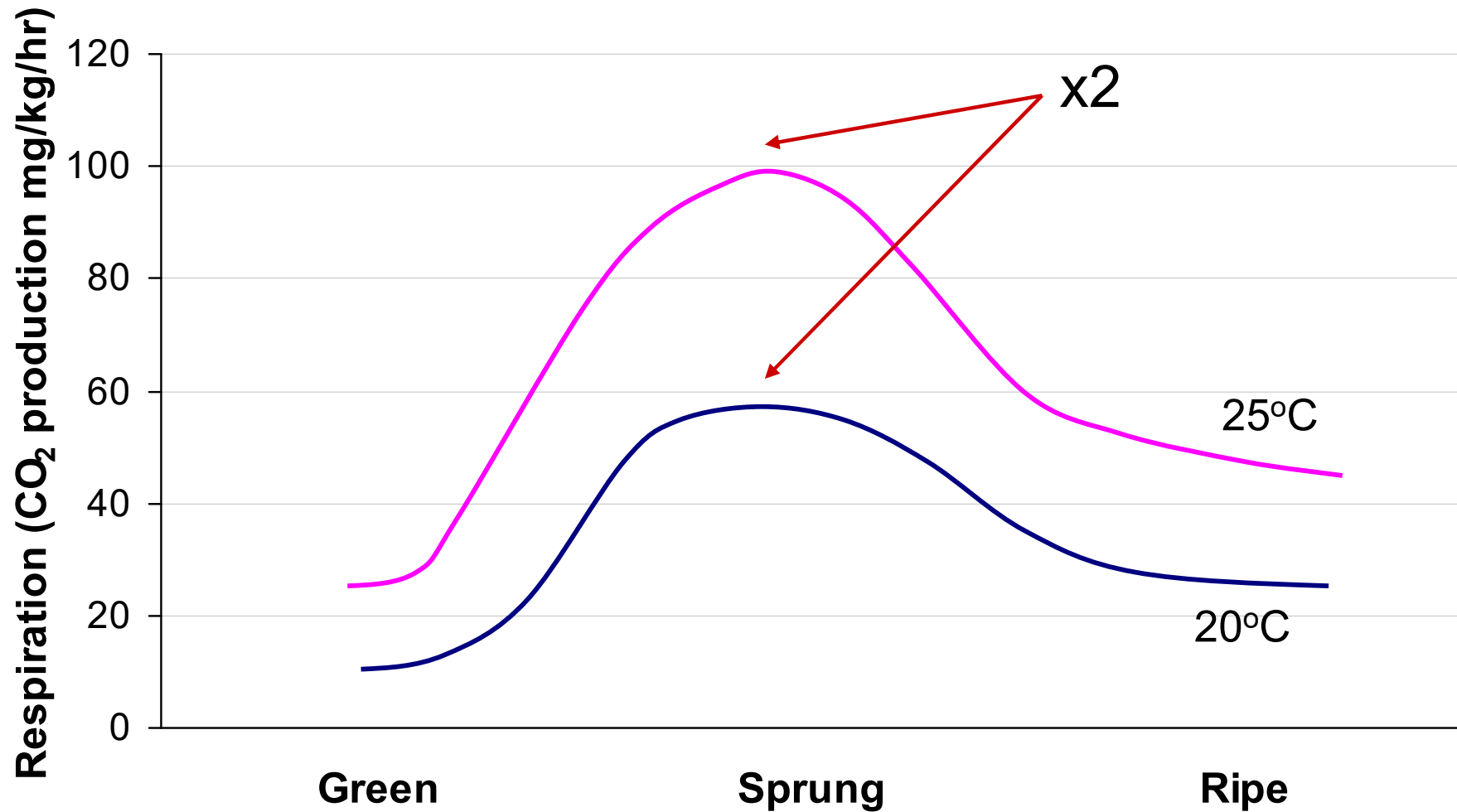


Respiration rises during ripening

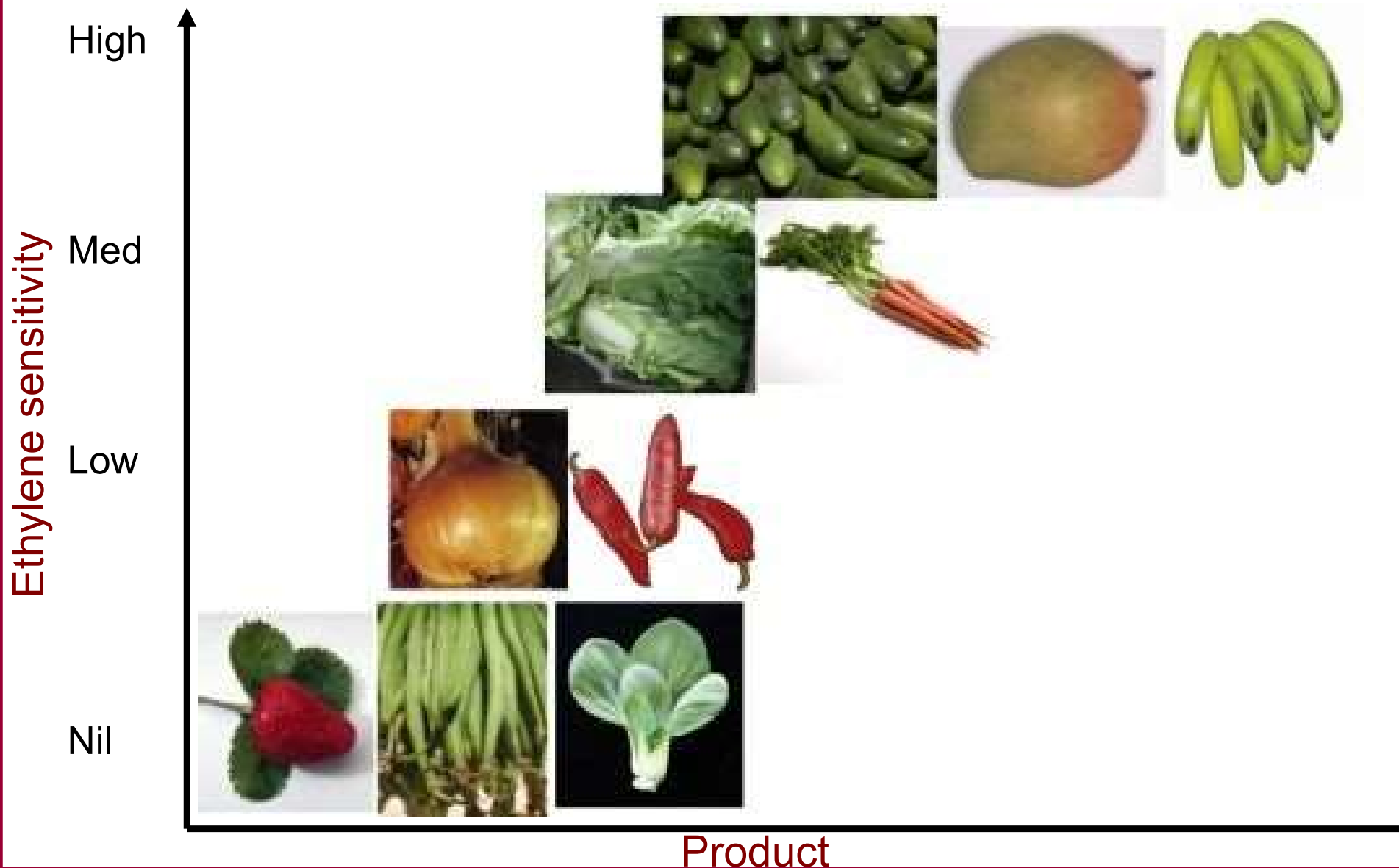


- Respiration rises as mango ripens to sprung stage and then falls
- Ethylene triggers ripening and rise in respiration

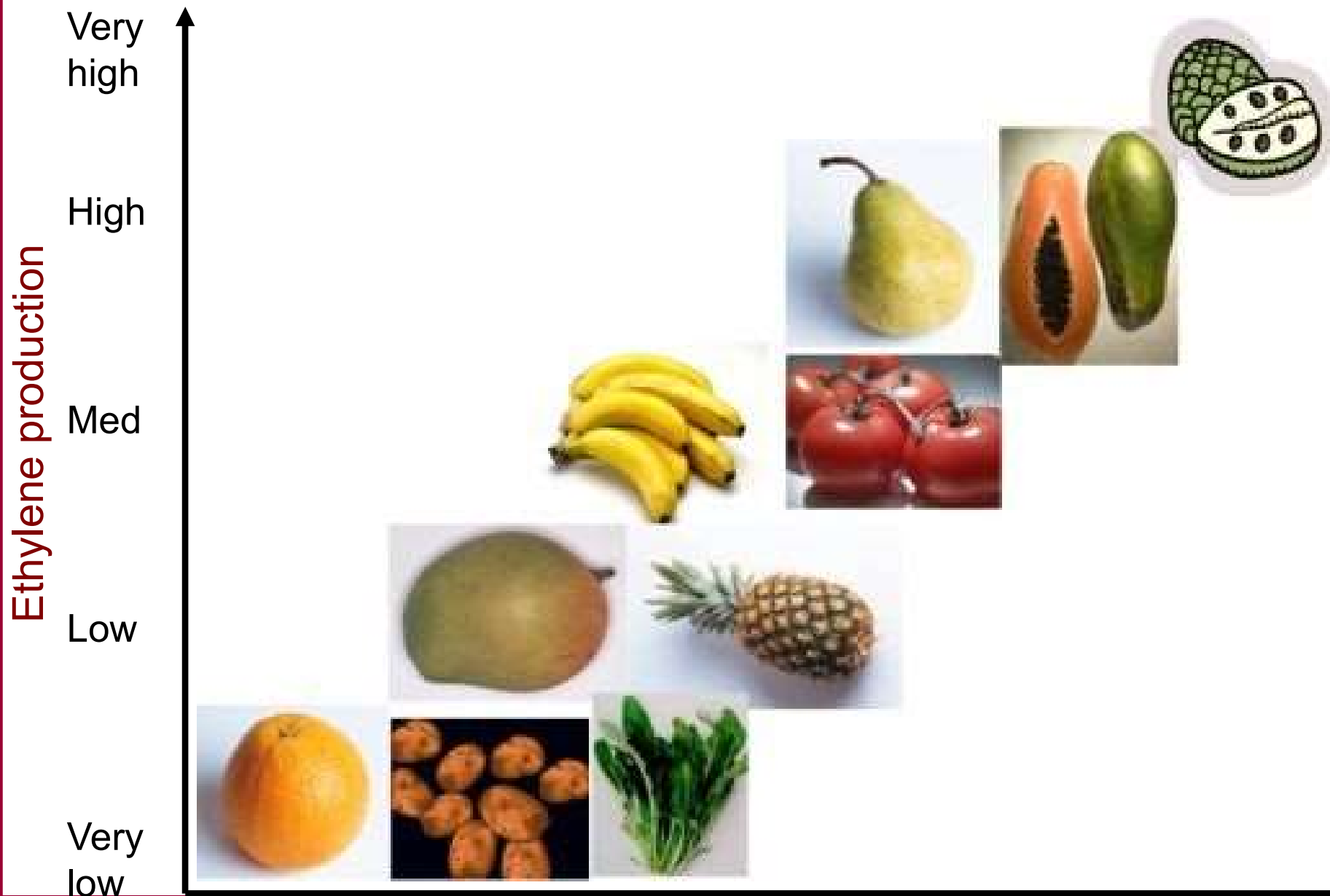
Temperature affects respiration



Ethylene sensitivity



Ethylene production



Fruit rots

Incorrect ripeness

Chilling injury

Poor skin yellowing

What can reduce saleability?

Lenticel spotting

Bruising and cracking

Incorrect grading

Sap burn and skin browning



Incorrect ripeness

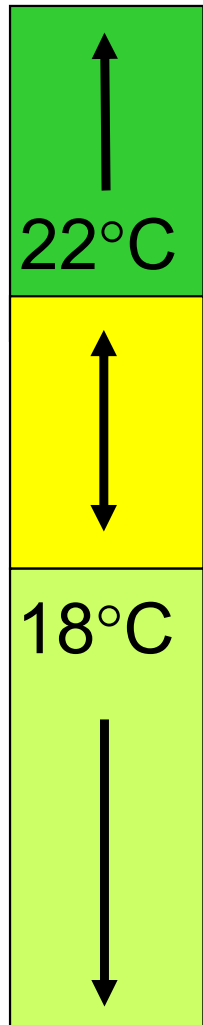
- Too ripe
- Not ripe enough
- Mixed ripe

Affected by:

- Temperature
- Ethylene



Temperature affects ripening



Too high

Soft, blotchy green colour, more rots



Best



Too low

Pale yellow colour high acidity, rots develop



Ethylene increases ripening rate and uniformity

No ethylene 7 days 20°C



Ethylene 2 days + 5 days 20°C

Ethylene duration affects ripening

Honey Gold mangoes held at 20°C for 6 days



No ethylene



10 ppm ethylene for 1 day



10 ppm ethylene for 2 days

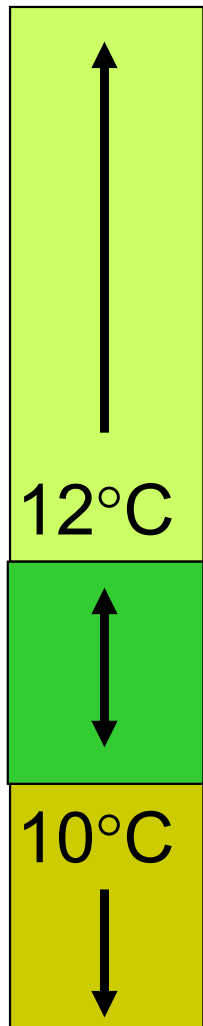


10 ppm ethylene for 3 days

Storing mangoes

- Before ripening
 - Store at 12°C for maximum 3 days (from arrival at market)
- After ripening
 - Store at 12°C for maximum 2 days
- Risks
 - Increase in green colour
 - Dull appearance
 - More rots
 - More lenticel spotting

Effect of temperature during storage



Too high

Softens, pale yellow colour, high acidity, rots develop



Best



Too low

Chilling injury

What causes poor skin yellowing?



- Orchard management
 - Too much nitrogen
 - Water stress
 - Excessive shading
 - Marginal fruit maturity
- Ripening temperature too high or too low
- High carbon dioxide levels during ripening
- Skin injury

High carbon dioxide reduces skin yellowing

Air



4.5% CO₂



Mangoes held under ethylene for 2 days at 20°C and then 3 days in air or CO₂

Managing temperature during ripening



Precool or warm fruit to 18-20°C – forced-air is best
Remove respiration heat – leave space around each pallet for air circulation or use forced-air every 6-8 hours

Controlling ethylene during ripening

Manual injection



Automated injection



Ethylene is available as pure ethylene or Ripe Gas (7% ethylene)

Shot – inject 100ppm ethylene every 8-12 hours for 2-3 days
Trickle – inject 10ppm ethylene continuously for 2-3 days

Managing ventilation during ripening

Inlet



Outlet



Automatic venting – place inlet behind cooling coil and outlet on opposite wall near floor (CO_2 is heavier than air)
Manual venting – open door for at least 10 minutes every 8-12 hours

Managing temperature during storage



Fruit temperature
2°C cooler in pallet
under cooling coil

Leave space around pallets to allow air circulation
Position cooling coils to ensure even air distribution

Recommendations for ripening and storage

Storage of hard green fruit

Temperature – 10-12°C, ensure even air circulation

Humidity – at least 85%

Ripening

Temperature – 18-20°C, forced-air system is best

Humidity – at least 85%

Shot - 100ppm ethylene every 8-12 hrs for 2-3 days

- open doors for at least 10 minutes to vent before re-gassing

Trickle - 10ppm ethylene continuous for 2-3 days

- automatic venting, 1 room volume change every hour

Holding ripening fruit

Temperature – 18-20°C until ready for sale

Venting – open doors for at least 10 minutes every 8-12 hours or use automatic venting

Holding ripe fruit

Temperature – 10-12°C for maximum of 3 days

Handle quick, talk often



Retail tips



- Mangoes should be well coloured (stage 4-5) and firm.
- Size of retail space should reflect daily sales.
- Display should be single layer.
- Mangoes should be handled carefully to avoid bruising (even though they are firm).
- Rotate stock so mangoes do not stay on display for more than 2 days.
- Remove fruit from display if rots develop.
- Hold unripe mangoes in air-conditioning (18-20°C) and ripe fruit in a cool room at 10-12°C.

Size of retail display



Do not stack mangoes on top of a single layer

Will this many mangoes be sold in one day?