

LENTICEL

disorders on apples: The impact of cooling on lenticel damage

talk by Dr Ian Crouch
summary and illustrations by Anna Mouton

Dr Ian Crouch, research and development director at ExperiCo, explained the different types of lenticel disorders on apples and summarised the best practices for avoiding these.

"AS a postharvest physiologist, I get many calls about lenticel breakdown," said Crouch. "It's important to recognise the different types of lenticel disorders on apples." Crouch described six disorders that could be confused: bitter pit; blister pit; Jonathan spot; chemical burn; lenticel spot or breakdown; and lenticel blotch or blotch pit.

Bitter pit

- Spots on surface are initially highly coloured but then become grey, brown or black
- Spots sink in a round or slightly angular pattern
- Flesh under spots is corky (dry, brown and spongy)
- Physiological disorder that begins on the tree but manifests during storage
- Worse in light crops from young trees; larger apples; apples picked when immature
- Increased by irregular watering; heavy application of nitrogen; heavy pruning and thinning; magnesium nitrate
- Reduced by calcium nitrate



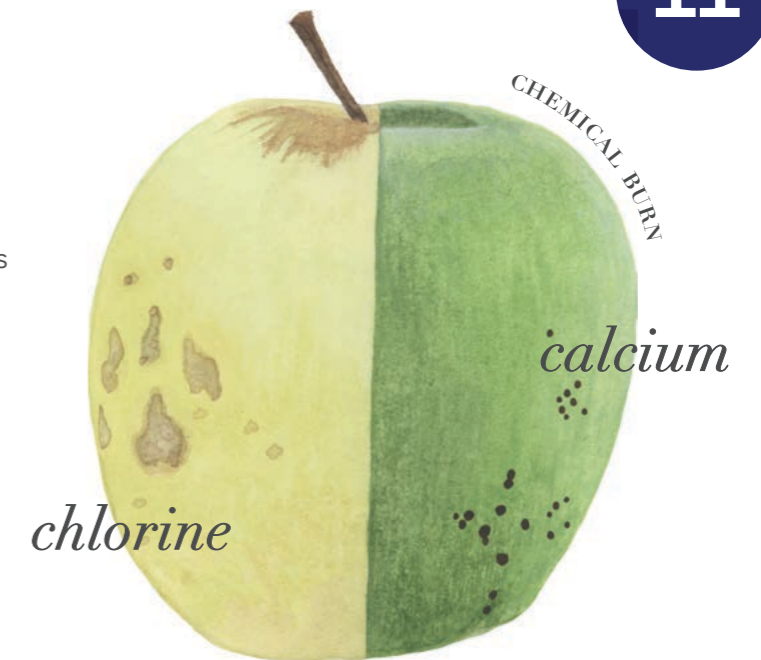
Blister pit

- Small raised blisters on the surface appear as brown spots
- Caused by a bacterial infection (*Pseudomonas syringae*)
- Not common in South Africa



Chemical burn

- Chemical damage can be confused with lenticel disorders
- Caused by both pre- and postharvest chemicals
- Chlorine drench blemishes skin but damage is not restricted to lenticels
- Calcium application affects lenticels and manifests as clusters of small, black or brown spots



Jonathan spot

- Spots on surface originate at lenticels which become dark brown or black
- Spots may be slightly sunken with a surrounding halo
- Flesh under spot may be corky (dry, brown and spongy)
- Worse after a dry season; on larger apples; in late-harvested fruit; when fruit are cooled slowly
- Cause is unknown



Lenticel spot or breakdown

- Spots on surface are round; sunken; centered on a lenticel; and sharply defined
- Spots become deeper and larger over time and may coalesce
- Flesh under spot is not affected – differs from bitter pit and Jonathan spot
- Appears on less exposed side or colour margins of fruit
- Physiological disorder affected by pre- and postharvest factors and manifests after storage



Lenticel blotch or blotch pit

- Spots on surface have an irregular outline – differs from round spots in lenticel spot
- Spots are centered on a lenticel and become sunken
- Flesh under spot is brown – similar to bitter pit and Jonathan spot
- Appears on calyx or more exposed side of fruit – differs from lenticel spot
- Physiological disorder that begins on the tree but manifests during storage



Crouch presented results of a cooling trial conducted with Golden Delicious apples. Fruit packed directly in boxes, without bags, cooled fastest. The speed at which fruit in bags cooled depended on whether the bags were perforated and the size of the perforations. Non-perforated bags slowed down cooling and larger perforations promoted more rapid cooling. Fruit packed in non-perforated bags had less lenticel spot but more bitter pit than other treatments.

According to Crouch, the increased bitter pit can be explained by the higher levels of ethylene trapped in the bags. This research indicated that additional cooling stress after packing may increase expression of lenticel disorders and that care should be taken in the rate of cooling of lenticel sensitive cultivars.

Researchers and industry have put together a best-practice guide for lenticel-damage mitigation. "Evidence shows that lenticel damage can be related to moisture loss," said Crouch. "All practices that prevent moisture loss will have a beneficial effect." Crouch shared the best practices with the audience.

At harvest

- Harvest each cultivar at optimum maturity
- Deliver bins within 12 hours (preferably six hours)
- Limit exposure to high temperatures after picking
- Fruit at risk of developing lenticel disorders should only be stored short-term in controlled atmosphere, followed by 10 days at regular atmosphere, and sorted before packing.

Prior to storage

- Move fruit from loading areas to cold stores as soon as possible
- Do not apply calcium postharvest to sensitive cultivars (Braeburn, Fuji and Kanzi).

Step-down cooling

- Use a seven-day gradual step-down cooling period
- Do not cool below the recommended temperature for the cultivar.

Storage

- Market fruit from warmer orchards (north-facing, sandy soils or warm area) earlier in the season
- Fruit at risk of developing lenticel disorders should only be stored in regular atmosphere or short-term controlled atmosphere to allow development before sorting
- Wait ten days before packing fruit from controlled atmosphere storage, to allow development of lenticel disorders before sorting.

Packaging

- Use micro-perforated bags.

Crouch pointed out that the recommendation on packaging may be revised following recent research results. "What's important," concluded Crouch, "is to not stress the fruit." •