Eliminating astringency’s bite

Astringency in pears leaves not only an unpleasant taste in consumers’ mouths, it also eats into the viability of a lucrative export industry. Fortunately science is coming to the rescue.

**THE TASTE AND TEXTURE** of a prefect pear is one of life’s joys. When consumers bite into a pear expecting that, only to be met with an unpleasant puckering experience, their disenchantment with the fruit can be complete.

Astringency commonly occurs in ‘Forelle’, a bi-colour pear that has a mandatory 12-week cold-storage requirement to prevent mealiness from developing. This storage requirement delays marketing and causes a gap in bi-colour pear availability between the last volumes of ‘Rosemarie’ and ‘Flamingo’, and the onset of ‘Forelle’. One of the main causes of astringency is the drive to harvest ‘Forelle’ as early as possible to start the required 12-week cold-storage period.

In an attempt to bridge the bi-colour pear supply gap, a new cultivar, ‘Cheeky’®, was introduced. However, increasing reports of astringency in ‘Cheeky’® have been received from overseas supermarkets.

In response, Hortgro Science, on behalf of the South African Apple and Pear Producers’ Association (SAAPPA), called on Dr Ian Crouch to investigate possible causes and solutions. Ian is the director of research at ExperiCo (Agri-Research Solutions).

"Unless a solution to astringency is found, there is the risk that supermarkets may refuse to stock ‘Cheeky’®," says Ian.

To find such a solution, Ian designed a two-year study to determine ways in which to predict, and eliminate or control astringency, without compromising the overall quality of the fruit. "Once we know which environmental, pre-harvest and/or post-harvest factors cause astringency in pears, we can put in place protocols to control it," he says.

The study, which started in February 2012 as a Hortgro Science project and continued as a PHI Programme project from 2015, initially set out to assess the impact of five factors on the expression of astringency in the ‘Cheeky’® and ‘Forelle’ cultivars. These are harvest maturity, storage duration, SmartFresh™, CO₂ spiking and storage temperature.

In addition, the research team wanted to develop a biochemical method to measure astringency and assess its potential as a means of prediction.

However, following the success of the FEMA programme (see box on page 89), the Hortgro Science Technical Advisory Committee requested that the study’s scope and objective be revised. As a result, work on ‘Forelle’ was stopped. Resources were instead devoted to understanding the physiological profile of ‘Cheeky’® with particular reference to the effects of harvest maturity and storage conditions.
duration on fruit quality, and the expression
of astringency and internal browning. Harvest
maturity was deemed particularly important,
given that orchards are becoming older and
producing higher yields.

**Study methods**

‘Cheeky’® pears from four orchards in two
areas – Ceres and Grabouw – were harvested
according to specific maturity parameters
during the commercial harvest window, and
seven to 10 days on either side of it.

The pears were packed into MCOTT telescopic
cartons with standard non-perforated pear
liners. Bags were closed four weeks before the
scheduled examination to simulate packing and
shipping.

Each harvest was stored for four, eight, 12
and 16 weeks at 0.5°C regular atmosphere (RA),
followed by a shelf-life period of seven days at
20°C.

At harvest and after each cold-storage
period, the fruit was examined and results
recorded. In all cases, flesh firmness was
measured using a fruit texture analyser, while
skin ground colour was recorded according to
the South African industry colour chart for green
apples and pears.

Further tests were carried out at harvest
to determine the following: percentage of
total soluble solids (TSS); titratable acidity,
expressed as the percentage of malic acid (MA)
equivalents; starch breakdown percentage; and
fruit size.

The following were determined post-
harvest:

- Internal quality, determined on a random
  sample of 20 fruit per replicate. The fruit was
cut in half and visually assessed for mealiness
  and internal browning.
- Astringency, by tasting five fruit per replicate (%)
- Decay (%) on all fruit in a carton.

In addition to internal quality, astringency and
decay, the TSS percentage and titratable acidity
of the fruit that had been exposed to the seven-
day shelf-life period, were also recorded.

**Key results**

Astringency occurred in later harvests, from
six weeks in 2012 and from 12 weeks in 2013.
Incidence declined with storage duration and
was no longer evident after 18 weeks of cold-
storage.

No mealiness occurred in 2012, and only low
levels after six weeks storage in 2013 and 2014.
No internal browning and very little
astringency were evident in the 2015 season.
Astringency was only detected in Ceres fruit of
optimal maturity that was cold stored for eight
weeks.

Depending on seasonal variations, it is
important to monitor skin ground colour, as
in some years this may be a limiting factor
and result in colour break during extended
RA storage. In these instances, fruit should be
marketed within eight weeks of harvest.

**Key recommendations**

- Early-optimum fruit should be cold stored
  for longer than four weeks to ensure normal
  ripening post shelf life.
- Optimum and post-optimum fruit should not
  be stored for longer than eight weeks RA to
  prevent skin ground colour break (a3,0).

The measurement of astringency is not a
simple process and currently there is no litmus

test that gives an objective astringency value.
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This method is, however, very subjective, and
is the reason why scientists are working on
establishing an objective test.