

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 perfect 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

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Dr Ian Crouch



1 Dr Ian Crouch, project leader.



PROJECT TITLE

Identification of factors involved and control of astringency in pears

PRINCIPAL INVESTIGATOR

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CONTACT DETAILS

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DURATION

Two years

PHI PROGRAMME & INDUSTRY CONTRIBUTIONS

R295 210 & R285 210

LEAD INSTITUTIONS

Hortgro Science and ExperiCo (Pty) Ltd

BENEFICIARY

The pome industry

FOCUS AREA

Post-harvest physiology

HUMAN CAPITAL DEVELOPMENT

None

PUBLICATIONS

One

PRESENTATIONS

Four



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 MO7T 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

IT'S (STILL) A MATTER OF TASTE

The measurement of astringency is not a simple process and currently there is no litmus test that gives an objective astringency value. The most reliable and quickest assessment of astringency remains tasting the fruit, either in the orchard at time of harvest, or in the laboratory after storage.

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

THE FEMA SOLUTION

An innovative solution to market 'Forelle' pears earlier, and without the 12-week mandatory cold-storage period, has reduced pressure on producers to harvest the fruit as early as possible.

The 'Forelle' Early Market Access (FEMA) programme allows pears to ripen on the tree and then through the use of SmartFresh™, an ethylene blocker, prevents the expression of mealiness by keeping the fruit sweet and crisp. Fruit is sold within four weeks of harvest. As a result, the marketing gap is filled and bi-colour pear continuity is maintained.

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.

Fruit stored under RA conditions for up to 14 weeks exhibited acceptable flesh firmness that almost always ripen normally after a shelf-life period. TSS remained relatively constant over a period of 16 weeks across all harvest maturities, but MA declined. There were possibly more decay, shrivel and internal disorders with extended storage and later harvests.

Mealiness occurred in optimum harvested fruit when cold stored for eight weeks, but not before or after this time.

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 (≥3,0).

1 The new red blush pear variety, 'Cheeky'®, is currently being grown on 350 hectares in the Western Cape. (Courtesy of Caldevco (Pty) Ltd)

2&3 'Cheeky'®, a new addition to the South African pear cultivar portfolio, was bred and developed by the Agricultural Research Council, and marketed and commercialised by Culdevco (Pty) Limited. (Courtesy of Caldevco (Pty) Ltd)

