

# Maturity testing equipment in apples



SUSIE MURPHY WHITE<sup>1</sup> AND STEELE JACOB<sup>2</sup>

<sup>1</sup> POMWEST

<sup>2</sup> DPIRD

**T**here are three tools required to test apple maturity; penetrometer, refractometer and iodine solution they measure Firmness, Brix and Starch.

These maturity parameters are used to determine the maturity of fruit and to predict when fruit will be at optimum maturity. By testing fruit before harvest it will ensure that all apple eaters experience a great apple every time they bite into an apple.

► **ELECTRONIC** penetrometers used to test fruit firmness.

There are three tools to measure apple maturity; penetrometers, refractometers and iodine solution.

## Firmness

Flesh firmness is measured using a **penetrometer**. Electronic and mechanical types of penetrometers are available from a number of manufacturers. Electronic penetrometers are available and may have a built in sensor to determine if operator action is within an acceptable range of time or speed. To avoid operator differences it is recommended that mechanical penetrometers be mounted on a rack and pinion drill stand. The accuracy of the result is reliant on the consistency of the operator and the equipment used. The 11.1mm penetrometer tip is used for assessment of apples and Asian pears and 7.9mm for European pears.

Flesh firmness is expressed as the number of kilograms force (Kg-f) needed to push a metal probe of specific diameter a known distance into the flesh of the fruit and the higher the number registered the firmer the fruit is considered. Low numbers indicate that fruit may be soft or have poor texture.

## Total Soluble Solids (Brix<sup>o</sup>)

The compounds that form the total soluble solids (TSS) content in apples are sugars (fructose, sucrose and glucose), acids, vitamin C, amino acids and pectins. In most ripe fruit sugar forms the main component of total soluble solids. Soluble solids help determine fruit maturity and as sugars contribute to the nutritional and sensory qualities of fruit, it is used as a marketing tool.

The most economical method of determining soluble solids levels is by using a hand held or pocket **refractometer**.

This measures the refractive index of the juice and gives readings in either % Sucrose or % Brix.

Typical ranges are 10.5–12.0 at the beginning of harvest, to 12.0–16.0 at the end, depending on variety and season.

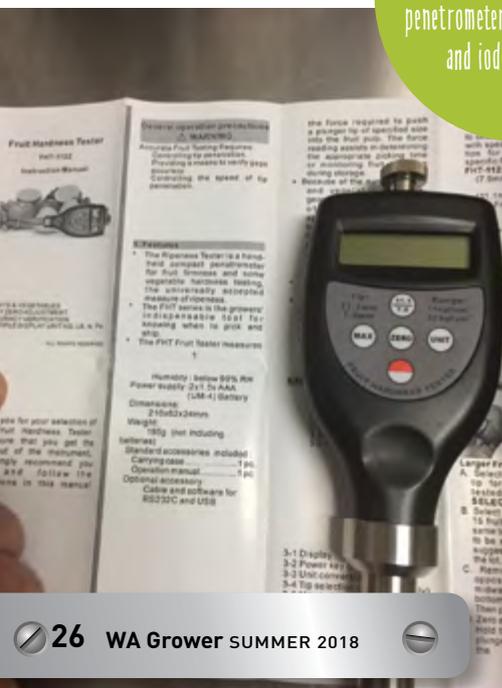
There are two types: Hand-held refractometers, which have a prism with a lid for holding the juice sample or digital refractometers, which have a well for holding the juice sample.

## Starch Index Pattern

This measurement relies on the simple fact that starch will stain blue/black in the presence of iodine and potassium iodide, but is only suitable for fruit assessed within 48 hours of harvest. It is the pattern that is of particular interest when determining SPI, rather than the darkness or intensity of blue/black colour, and is scored compared to the appropriate reference chart.

Conversely the clear yellow/white pattern indicates regions of nil or low starch levels, where starch hydrolysis or conversion to simple sugars has occurred. Little starch staining (higher SPI) at harvest means shorter storage life, and often increases in storage disorder incidence, such as senescent breakdown. Insufficient hydrolysis may mean less than optimal eating and post storage quality, with lack of flavour, high and/or low sugar levels and increased risk of superficial scald for some varieties. 🍏

**NOTE:** The Iodine solution must be kept in a dark bottle out of direct sunlight.



# Measuring maturity

- 1 Using a potato peeler or knife, remove a small section of skin from both sides of the apple. Using a Penetrometer with an 11mm tip, push into the fruit as far as the indicator line (1cm) to record Fruit Pressure and record the pressure.
- 2 With a small dish or directly onto the refractometer, collect the juice that drips out as you insert the penetrometer to measure the sugar (%TSS) of each apple.
- 3 Place the top half of each apple into a container of 1-2cm deep Iodine Solution and leave for about 2 minutes. Or spray each apple half with Iodine Solution using a small spray bottle. Take each half out of Iodine Solution and place down on paper towel for a few seconds to dry.
- 4 Leave to dry and starch to stain for at least 10 minutes before scoring using the 1-6 Starch Pattern Index.

