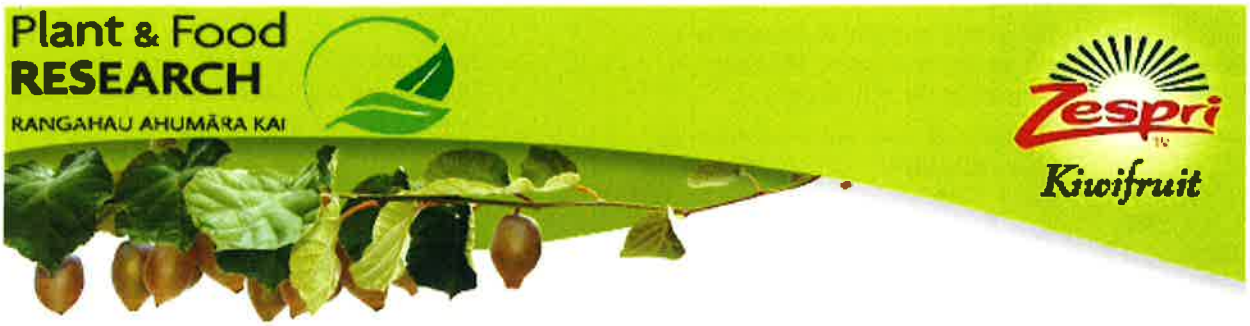

KiwiTech Bulletin No. N45
Taste, Dry Matter & Brix

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The importance of Taste

Market research has shown that sensory characteristics (appearance, taste, and flavour) are the main reason people buy fruit. Survey work in the U.K indicated that 80% of consumers considered fruit taste to be more important than fruit price. Satisfying the taste expectations of consumers has direct consequences on the likelihood of them coming back and buying more of our kiwifruit.

The Taste ZESPRI® programme has been built on the knowledge that kiwifruit dry matter content has a positive influence on consumer taste preference; most consumers prefer higher dry matter kiwifruit. This is true of all nationalities tested to date. Research in the Japanese market clearly demonstrated that fruit taste was more important than either fruit size or price in influencing consumer re-purchase intent.

What is Taste?

The taste of a ripe kiwifruit is primarily driven by the amount of sugars and acids in the fruit. Both sugars and acids are detected by our tongues with sugars providing the 'sweetness' and acids giving the tangy, zesty taste associated with kiwifruit. Volatiles given off by the fruit contribute to flavour and aroma when they are carried from the mouth onto the sensory receptors in the nose as we chew and swallow food.

The volatiles are only present in minute amounts, at parts per million, but have a huge impact on the flavour of kiwifruit.

Sugars + Acids = Taste

Taste + Aroma = Flavour

Dry matter

Most of a kiwifruit is water and the rest is made up of solids referred to as dry weight. Fruit dry matter content is the ratio of the water content to the dry weight. The dry matter content of a fruit is therefore a function of the water and solids it has accumulated on the vine during the growth period.

Figure 1. Composition of a kiwifruit with a DM of 17%.

The dry matter (DM) content of a ripe kiwifruit is made up mostly of sugars, fibre and acids (Volatiles form only a tiny fraction of the dry matter content). As an example, a kiwifruit weighing 110g with a DM of 17% would consist of 18.7g of dry weight and 91.3ml of water; of that 18.7g dry weight, 10g would be sugars, 4.3g of fibre, and 1.7g of acids.

In general, high DM fruit have the sweetest taste and the strongest overall flavour. Acidity, sugar content and vitamin C content of fruit all increase with increasing fruit dry matter content. Consequently, consumer preferences for high DM fruit may reflect more than just the added sweetness of the fruit.

Therefore, fruit dry matter content at harvest is a very effective, and easily measured, indicator of potential taste quality when the fruit is ripe.

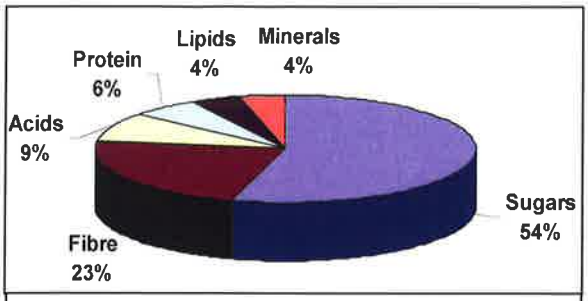

Figure 2. The proportions of the constituents that make up the kiwifruit dry matter content.

How do we predict Taste?

At harvest the majority of DM present in kiwifruit is in the form of starch, with only limited soluble sugars present in juice. As a kiwifruit ripens the starch is broken down into simple soluble sugars. It is these sugars we taste when we eat kiwifruit.

The fruit's dry matter content is made up of cell structural material and stored starch. It is this stored starch which is broken down into the soluble sugars during the ripening process. The higher a fruit's dry matter content, the greater the concentration of soluble sugars it will have when fully ripe. Fruit will continue to accumulate dry matter throughout the growing season but once harvested, a fruit's dry matter content is fixed. This sets the upper limit for the soluble sugars the fruit can develop when ripe. Hence, measurement of fruit dry matter content at harvest enables the prediction of final sugar concentration at eating ripeness referred to as ripe soluble solids (rSSC), and measured as brix.

Brix

A fruit's soluble sugar content (SSC) is measured with a refractometer which uses light refraction to measure different sugar concentrations. Degrees of brix (°brix) are the units of measure a refractometer uses. Soluble solid concentration (SSC) and brix are effectively interchangeable terms.

Brix is used by industry in two different ways:

1. For Hayward, at harvest brix is a measure of fruit maturity, measuring how far through the ripening process the fruit is (Figure 3). Generally the more mature the fruit is at harvest the better it will develop its full taste potential and the better it will store.
2. When the fruit is eating ripe, brix is a measure of how 'sweet' the fruit is. Fruit is increasingly being brix tested by retailers at the point of sale as an assessment of quality. The higher the dry matter of fruit at harvest the higher its brix will be when sold at eating firmness at point of sale.

DM at harvest is a robust predictor of fruit sugar content when ripe under a range of harvest maturities and supply chain management conditions. The relationship between harvest DM and ripe sugar content enables the industry to supply fruit of the correct taste quality to our key markets.

The relationship between dry matter and brix

There is no direct relationship between the brix at harvest and eating brix. Brix at harvest is a measure of how mature the fruit is and by in large does not influence what the eating brix will be.

Not all DM can be converted to eating brix as some dry matter is tied up in cell structural components however the relationship between DM at harvest and brix of ripe fruit is a simple one. It is however influenced by variety, the time the fruit has been in storage and how much water loss has occurred from the fruit. The longer a fruit is stored for, the more respiration occurs, a process that burns up sugars.

However this is offset by water loss from fruit transpiration as with increasing water loss the sugars become more concentrated.

As a rough rule of thumb:

Eating Brix = $DM_{Harvest} - 3$
(i.e. A Fruit with a dry matter of 18 will have an eating brix of approximately 15).

For more precise calculations the correction coefficients provided in Table 1 can be used. For example, GOLD fruit having a DM at harvest of 17.3% that is stored for 10 weeks with 2% water loss would be expected to have SSC content when eating ripe of:

rSSC = 17.3 – 3.16 = 14.14 %

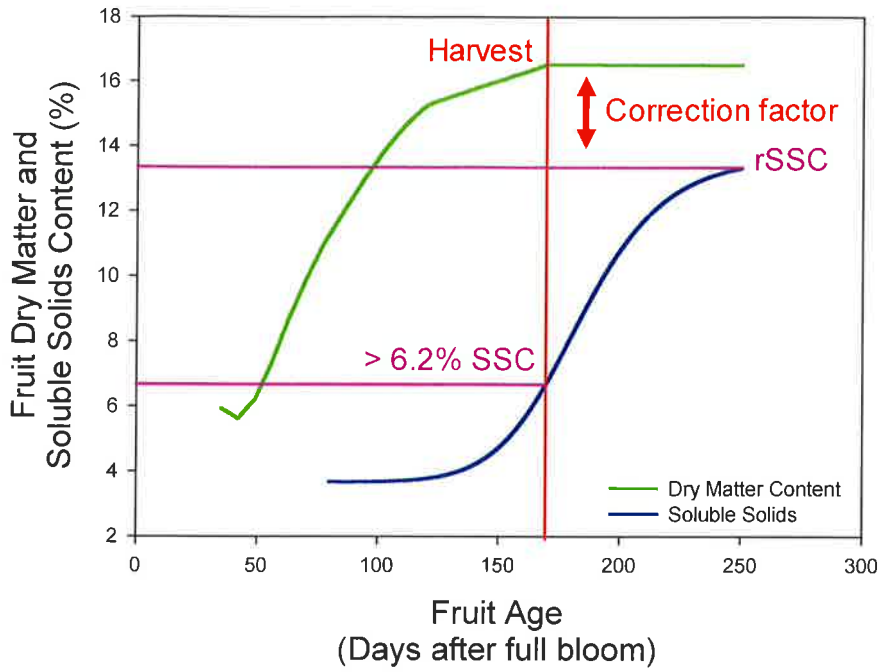

Figure 3. The relationship between dry matter and brix content. Measurement of fruit dry matter content at harvest enables the prediction of final sugar concentration at eating ripeness (rSSC) using the correction factors presented in Table 1.

Cultivar	Weight Loss (%)	Storage Time (Weeks)				
		5	10	15	20	25
GOLD Fruit	1	3.13	3.31	3.50	3.69	3.88
	2	2.97	3.16	3.35	3.54	3.72
	3	2.82	3.01	3.20	3.38	3.57
GREEN Fruit	1	2.88	3.07	3.26	3.44	3.63
	2	2.73	2.92	3.10	3.29	3.48
	3	2.58	2.77	2.95	3.14	3.33

Table 1. Correction coefficients for converting fruit DM to eating brix.

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- Taste information on the Canopy Website

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