Report on Desk Study to Investigate the Relationship between Dry Matter Content and Fruit Quality.

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FAST LLP
Fruit composition

~84.5% Water

~15.5% Dry Matter

Fresh fruit weight
Fruit composition

~ 90%

Carbohydrates

Organic acids

Lipids

Minerals

Proteins

Dry Matter

‘Dry matter includes compounds that may directly contribute to the flavour of the fruit and compounds that will be incorporated into the structural elements of the cell and influence the textural properties of the fruit’
Carbohydrates

Structural
- Cellulose
- Hemicellulose
- Pectin

Non-Structural
- Starch
- Fructose
- Sucrose
- Glucose
- Sorbitol

Carbohydrates
‘As fruit grows, complex physiological and metabolic processes interact and contribute to the in-flow of carbon, nitrogen and minerals.

The accumulation of dry matter is a simple way of measuring the outcome of these complicated processes’

‘Dry matter content specifically represents the biological processes responsible for setting up the textural characteristics, carbohydrate status and flavour potential of the fruit’
Relationship with Fruit Quality

• Good correlation between harvest DMC and ex-store firmness in Cox. *East Malling 1985*

• Good correlation between harvest DMC and ex-store TSS and eating quality of Gala & Jazz.

• Poor correlation between harvest TSS and ex-store TSS. *New Zealand 2010*
Relationship of Harvest Sugar to Ex-Store Sugar

Royal Gala from 4 orchards in Nelson and four orchards in Hawke’s Bay

$r^2 = 0.41$
Relationship of Harvest DMC to Ex-Store Sugar (Gala)

Royal Gala from 4 orchards in Nelson and four orchards in Hawke’s Bay

From Palmer et al. 2010

$r^2 = 0.82$
Relationship of Harvest DMC to Ex-Store Sugar (Gala+Jazz)

(From Palmer et al. 2010)
Consumer Scores at different levels of DMC

Consumers’ scores for ‘Royal Gala’ apples from different DMC categories after 10–12 weeks of cool storage.

From Palmer et al. 2010
Dry matter relationships

• To ex-store sugar  +++
• To firmness in store  +
• To rate of softening  +
• To eating quality  ++
• To consumer preference  ++
Cultivar and yearly differences

- Consistent differences between varieties with P Lady high and Gala low
- EMRS found large variations over 9 years in Cox from the same trees
Tree physiology and DMC

• Dry matter productivity is essentially a linear function of total radiant energy interception over the season.
• At early fruit set the demand for carbohydrates by the fruit is very high and there is strong competition with the rapid shoot growth.
• Close to harvest carbohydrate can be limiting due to declining light and temperatures.
Effect of Crop Load

Thinned trees had:

• Larger fruits
• Higher soluble solids
• Increased fruit firmness
• Increased dry matter
• Advanced maturity
Effect of light and fruit position

• Close correlation between light level within the canopy and dry matter at harvest
• Rate of increase in dry matter can be slowed by just 6 days of shade
• Tree shape had significant impact on dry matter
• Reflective mulches can improve dry matter
Effect of Irrigation

• Inconsistent results
• If irrigation influences vegetative growth it can adversely affect dry matter
• Some evidence that withholding water late in the season can improve dry matter, and some PRD experiments also increased dry matter
Effect of Nutrition

• If excess N leads to larger fruit dry matter is reduced in Cox
• In Gala pot experiments increasing N gave larger fruits with improved dry matter
• Some evidence in stone fruit that higher K can improve dry matter
Uses of Dry Matter Measurements

• As a measure of overall fruit quality
• To predict eating quality potential out of store
• As a complimentary quality index to harvest maturity tests
• To differentiate between consignments of the same variety

Proposed by J Palmer (New Zealand 2010)
# UK DMC Data

<table>
<thead>
<tr>
<th></th>
<th>Low</th>
<th>High</th>
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<tbody>
<tr>
<td>Cox</td>
<td>14.6%</td>
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<tr>
<td>Gala</td>
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<td>Braeburn</td>
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