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Item 4(a) of the Provisional Agenda

**APPLES
UNIFORMITY AND MATURITY**

Transmitted by New Zealand

Note by the secretariat: In this document the delegation of New Zealand presents proposals concerning uniformity and maturity of apples.

A. UNIFORMITY LIMITS FOR APPLES SIZED BY WEIGHT

Introduction

At the 49th Specialized Section on Fruit and Vegetables New Zealand undertook to prepare a paper on the wording within the apple standard under Section III, *Provisions Concerning Size* for discussion within the Apple Working Group.

Objective

To prepare a discussion document for considering the appropriateness of the existing uniformity limits included in the draft standard for weight sizing uniformity.

Background

The wording included in the draft standard is as follows;

For fruit sized according to weight, the difference in weight between fruit in the same package shall be limited to;

- *20% of the average individual fruit weight in the package for Class Extra and for Class I and II fruit packed in rows and layers*
- *25% of the average fruit weight in the package for Class I fruit packed loose in the package or in consumer packages*

During discussion at the 49th Specialized Section on Fruit and Vegetables and in the apple working group meeting held in conjunction with the 49th session, some concern was expressed at the use of a uniformity limitation which used a percentage of an average.

Consideration of Options

Option 1: Existing Wording

We considered whether the present wording could be used with reliance on the OECD explanatory brochure to explain that the “average” referred to is the net fruit weight of the pack (eg 18kg for a Z pack) divided by the number of fruit indicated on the pack (eg 150).

However, for this approach to be practical there is a need to easily identify the mean target weight of the package. This would require both the net fruit weight of the pack and the fruit numbers to be shown on the package.

This would therefore require the following changes to provisions concerning marking would be required;

- a. For fruit packed in rows or layers, the overall net fruit weight would need to be included on the pack label.
- b. For fruit packed loose the number of fruit would need to be included on the pack label.¹
- c. Or alternately for either fruit packed loose or packed in layers the average weight within the pack could be required to be shown.

We believe that such labelling changes would be commercially difficult.

¹ Section VI, *Provisions Concerning Marking*, subsection D, *Commercial Specifications*

Option 2: Specific weight limits

We considered the possible use of a fixed weight as a suitable limit for uniformity.

However, our analysis has concluded that it is difficult to determine a fixed weight tolerance which would be suitable for all size ranges. For example, a uniformity range of 15g for fruit of pack size 165 might be considered appropriate, but for fruit of pack size 60, a uniformity range of 65g may be appropriate.

We have concluded that this approach would require a reasonably complicated scaled tolerance. We do not recommend that this approach be considered.

Option 3: To use the diameter uniformity limits for weight and diameter

Commercial practice for packing into layers is to;

1. Firstly determine size by weight
2. To then pack within the layered pack to ensure the overall visual effect of the pack is consistent.
i.e. To ensure the visual presentation ensures similar diameter.

The commercial application for layered fruit would therefore suggest that the uniformity limits could still be determined by diameter.

We would welcome comment from countries more familiar with loose packs determined by size.

If appropriate, this proposal would result in the following changes to the standard;

III. PROVISIONS CONCERNING SIZING

To ensure there is uniformity of size:

For fruit sized according to diameter or weight, the difference in diameter between fruit in the same package shall be limited to:

- 5 mm for "Extra" Class fruit and for Class I and II fruit packed in rows and layers
- 10 mm for Class I fruit packed loose in the package or in consumer packages.

There is no sizing uniformity limit for Class II fruit packed loose in the package or in consumer packages.

B. MATURITY CRITERIA FOR APPLES**Introduction**

NZ was invited to present a paper on maturity criteria at the 48th specialised session on Fruit and Vegetables.

Objective

To consider relevant maturity criteria for the point of export that will lead to acceptable maturity in the market place.

Background

Developments in consumer trends as commented in the Commission Regulation (EC) No 85/2004 indicate the need for some examination of maturity criteria that will ensure only mature fruit is in the market place.

We have included in Appendix One excerpts from Roger Harker's *Report on standards relating to eating quality of apples and pears*, presented to the World Apple and Pear Association in 2002. Harker's report highlights that there is no single parameter to determine maturity, as each parameter is biologically independent. It is also of interest to note that when considering maturity from an organoleptic viewpoint it would be unreasonable to apply parameters over a range of geographic regions or varieties. However, from a grade standard perspective, New Zealand supports the concept of minimum levels for key maturity parameters and, in particular, flesh pressure and soluble solids concentration.

Recommendations

1. Regional Maturity Databases

New Zealand recommends to UNECE that all producing countries be encouraged to introduce maturity testing for each major growing region.

It is New Zealand's experience that maturity can only be accurately determined if there is a sound historical database on which to determine whether fruit will continue its natural ripening process. Using that database as a reference, minimum maturity standards can be developed which ensure fruit quality is maximised.

2. Varietal Range

That minimum brix and flesh pressure levels be considered as applicable to those varieties which form the majority of the trade in fresh apples.

In setting minimum or maximum parameters for use at any point in the supply chain it is our contention that there will be varietal exceptions, particularly in regard to minimum brix and maximum flesh pressure. There is a need to consider ways to accommodate the market for either traditional sour fruit or modern high flesh pressure fruit.

3. Minimum Brix

New Zealand is unable to make a specific recommendation for minimum brix. However, we can indicate that our own experience suggests that a minimum brix of 10 at point of export is consistent with our trade to all markets.

Attached in Appendix Two is a summary of data from recent shipments from New Zealand.

- The lowest mean brix for any given month showed that each variety tested (in market) ranged between 12.9 (Royal Gala) – 13.8 (Cox).
- The greatest test to this minimum brix is during the first month of arrival in the market of Royal Gala if considering the lowest values during the 3 years of data.

4. Minimum Flesh Pressure

As with brix, New Zealand cannot make a specific overall recommendation but indicate that recent data from our own exports suggests that a minimum pressure of 5.0 kgf, at point of export, is consistently be achievable for our trade to all markets.

New Zealand's recent data on flesh firmness is also included in Appendix Two;

- The lowest mean flesh firmness for each variety tested in the market ranged between 5.1 (Cox) -7.2 (Braeburn) kgf.
- The greatest test to this lower limit is shown by the Cox Orange Pippin data.

5. Maximum Flesh Pressure

New Zealand recommends that no maximum pressure is set. We believe that if a minimum brix level is established at around 10 for point of export, then there is no need to set a maximum flesh pressure, as all fruit with a brix above 10 can be expected to continue the ripening process.

There are, however, a few varieties traded which are considered mature at brix levels below 10. These varieties can be specifically identified and given a special brix category².

Appendix One

Definition of Maturity

The growth of fruit on the tree can be split into a number of different stages. After pollination the fruit will go through a period of cell division, followed by cell expansion as the fruit increases in size. While the apples are still increasing in size, but towards the end of the growing season, the fruit will enter a phase described as maturation by fruit scientists. This phase of development is associated with fruit gaining the capability to ripen when removed from the tree. A fruit that is mature is not necessarily ripe, but will have the ability to ripen when it leaves the storage and distribution network. Typically fruit that are harvested prior to reaching maturity will not progress through a natural ripening process. For example they may fail to soften and instead develop a rubbery texture, as well as failing to develop a full odour and flavour profile. If the fruit is left on the tree after reaching maturity, it will go into the ripening phase resulting in tree-ripened fruit. Many would argue that tree-ripened fruit provide the best sensory experience for consumers, however it is not possible to store these fruit. Fruit industries generally tailor harvest criteria between mature and tree-ripe depending on how long they want to store their produce. For example, fruit destined for long-term and short-term storage may have different maturity criteria.

Development of maturity indices has been driven by:

- The high price for the first fruit reaching the marketplace (the need to harvest early),
- The need to prolong the sales period and increase the length of the market window,
- The need to minimize shrinkage associated with the development of rots and disorders.
- The need to provide fruit that meet retail specifications and are acceptable to consumers

Thus, when considering existing grade standards, we must recognize that they reflect an attempt to minimize risk of storage disorders as well as an attempt to provide a good sensory experience to consumers. For example, apple storage disorders such as bitter pit, low temperature breakdown, core flush,

² See note 2 above

lenticel spot, soft scald, superficial scald, and watercore are all influenced by fruit maturity at harvest (Snowden, 1990). The risk that disorders will develop during storage can be increased (e.g. water core, core flush and brownheart) or decreased (e.g. bitter pit, superficial scald) when the harvest is delayed so that more mature fruit are picked.

Industry protocols generally used a small number of parameters to predict maturity of apples:

- Days from full bloom,
- Firmness,
- Starch pattern index (SPI),
- Background colour change (green to yellow),
- Blush (intensity of red and amount of fruit surface covered),
- Soluble solids concentration,
- Titratable acidity.

Academic studies often include a measurement of ethylene concentration or production rate, and some new technologies such as near-infra red (NIR) have been evaluated.

Overall:

- There is no single parameter that can absolutely identify that a fruit has reached a particular stage of maturity.
- All parameters are biologically independent (i.e. they are not linked).
- Determination of fruit maturity is part science, part art, and requires a level of experience to fully interpret changes that occur across a range of parameters/indices.
- Maturity programmes have been successful in allowing industries to provide retailers with a standard product that is robust enough to maintain high quality through the distribution chain.
- Individual countries/regions need to establish their own maturity standards, since it would be unreasonable to expect that standards can be simply transferred between countries or between cultivars.

Appendix Two

Varietal Summary of Brix & Flesh firmness (2001-2003)³

Variety	Brix			Flesh Firmness		
	Mean	Range (mean +/-95%)	Number tested	Mean	Range (mean +/-95%)	Number tested
Braeburn	13.1	10.8-15.4	3612	7.9	6.3-9.5	5316
Royal Gala	13.0	10.4-15.6	3248	7.2	5.7-7.8	4946
Fuji	14.1	11.6-16.6	519	7.1	5.7-8.5	727
Pacific Rose	13.7	11.1-16.3	268	6.8	5.6-7.9	284
Cox Orange Pippin	14.4	11.7-17.1	1076	6.9	5.4-8.4	1660

³ Measurements taken from "in-market" assessment of maturity