

Preservatives, sugars and metals in fruit juices



OBJECTIVES

- **To check the compliance of orange juice, fruit juice and orange fruit drinks with standard requirements.**
- **To determine the preservative content in these products relative to standard requirements.**
- **To check quality parameters of these products.**

BACKGROUND

The last survey conducted on orange juice, fruit juice and orange fruit drinks was in 1997. That survey assessed the levels of benzoic and sorbic acid preservatives present. The results showed good compliance to standard requirements and to ingredient labelling information on the packaging.

This follow-up survey again assesses the preservative content and also includes the analysis of other parameters namely: sulphur dioxide preservative, analysis of salt, potassium, sugar, and magnesium concentrations.

FOOD STANDARDS

Part O-Non Alcoholic Beverages of the Food Standards Code (Ref_1) contains standards for these products.

Of particular interest are the following Standards: -

Standard O2 - Fruit Juice and Related Products

Standard O7 - Orange Juice and Related Products

Standard O9 - Fruit Drinks and Fruit Drink Products

Standard O2 - Fruit Juice and Related Products relates to *fruit juice not otherwise standardised in the Code is the liquid portion of, with or without the pulp, obtained from sound mature fruit and, in the case of citrus fruit (other than limes), is juice extracted only from the endocarp.* This means all fruit juices other than juice made solely from orange, as orange juice is standardised in Standard O7. This standard therefore includes juices made either solely from or mixtures of apple, pear, mango, lemon, peaches, apricot, blackcurrant, grapefruit, pineapple amongst others and mixtures of these with orange juice, for example, orange and mango juice.

Standard O7 - Orange Juice and Related Products describes orange juice as *...the liquid portion with or without pulp expressed from the endocarp of sound, mature oranges (Citrus sinensis(L.) Osbeck).* This standard definition describes those fruit juices, which are solely derived from orange juice.

Standard O9 - Fruit Drinks and Fruit Drink Products describes fruit drink as the *...product (other than a product standardised in Standard O2) prepared from one or more of fruit juice, fruit puree, concentrated fruit juice, concentrated fruit puree, comminuted fruit and orange peel extract and one or more of the following: water, mineral water, mineralised water.* The standard goes on to describe the technical terms: fruit puree, concentrated fruit puree, comminuted fruit, and orange peel extract. The standard also adds: *Fruit drink must contain at least 50 mL/L of fruit, whether juice, puree, comminution or orange peel extract, with the exception of passionfruit drink which must contain at least 35 mL/L of passionfruit juice, puree or comminution.*

For each of these different juices and drinks, the permitted levels of preservatives are identical. The following preservatives are permitted at the stated maximum level:

Preservative	Food Additive No.	Permitted level
Sorbic Acid	200-3	400 milligrams per kilo or
Benzoic Acid	210-13	400 milligrams per kilo and
Sulphur Dioxide	220-28	115 milligrams per kilo.

As for the use of any food additive, the addition of preservative requires the product to be labelled accordingly. In most cases this is shown in the Ingredients listing as *Preservative added: Food Additive Number(s)*.

Further to the standards on preservative amounts, *Standard O7 - Orange Juice and Related Products* contain other requirements that relate to authenticity of these foods. In particular there are standard requirements for:

- sugars (including sucrose, glucose, fructose);
- elemental concentrations (including potassium, sodium, magnesium, calcium, phosphate);
- food acid concentrations (including citrate, isocitrate, malic acid) and
- amino acid concentrations (including proline, alanine, arginine, aspartic acid, glutamic acid, glycine, isoleucine, leucine, lysine, methionine, phenylalanine, serine, threonine, tyrosine and valine).

SURVEY

A total of 54 juice samples were collected from Canberra supermarket and grocery stores during the period of January - March 1999. Sample information was recorded and analysis performed immediately, or frozen for later use. Samples requiring reconstitution were done so according to manufacturer's instructions using laboratory grade water followed by appropriate testing.

The following table indicates the samples that were collected, the varieties and the number in each different category. The definition of juice and drink are from the standards (as indicated above). Another parameter considered was *added sugar*. Due to processing and the need to meet consumer appeal, sugar is often added to the product. The amount of added sugar permissible is standardised (set to maximum levels). Products with added sugar must be labelled accordingly.

Category	Number of Samples
Orange juice – no added sugar	22
Orange juice – added sugar	1
Orange drink – no added sugar	0
Orange drink – added sugar	2
Orange fruit juice - no added sugar	7
Orange fruit juice - added sugar	1
Orange fruit drink - no added sugar	1
Orange fruit drink - reduced sugar	1
Orange fruit drink - added sugar	19

RESULTS

Preservatives

All samples obtained were tested for preservatives. The following table shows the incidence of preservative labelling:

Preservative	Food Additive Number.	Number of Samples
None listed	-	27
Potassium sorbate	202	10
Potassium sorbate + sodium benzoate	202, 211	13
Potassium sorbate + sodium metabisulphite	202, 223	3
Potassium sorbate + sodium benzoate + sodium metabisulphite	202, 211, 223	1

Testing demonstrated high compliance with preservative labelling requirements. All samples were compliant with their respective preservative labels and for those samples with preservatives, the levels were within standard requirements. It is interesting to note that the use of sulphur dioxide preservative (as sodium metabisulphite) is not common. Only one sample declared the use of sulphur dioxide type preservative and analysis failed to detect any levels. Of more interest was the fact that 50 % of samples (as indicated in the table) did not use preservatives and testing found them to comply.

Packaging and Life-time Stability

Packaging details for these foods was also collected and compared. Generally for these product types, three different containers are used: carton, plastic bottle and tetra-pak. The following table indicates the number of samples in these categories.

Category	Volume of package	No. Of samples
Plastic bottle	0.5, 1, 1.5, 2 Litre	29
Carton	0.5, 2 Litre	12
Tetra-pak	0.2, 0.25, 1 Litre	13

The plastic bottle was by far the most common form of packaging. This represented both refrigerated and shelf-stable products. The 1 and 2 Litre volumes are popular, but increasing numbers of 0.5 and the 1.5 Litre containers are beginning to appear. For cartons and tetra paks the number of samples collected were lower. The tetra paks mostly consist of shelf stable products and their appeal seems to originate from their single-serve packaging of 200 and 250 mL containers. These were purchased in the supermarkets as 6-paks, however larger paks are also available. For cartons, the 0.5 Litre container is common for concentrated drinks and juices requiring reconstitution. There are also 2 Litre refrigerated fruit drinks available.

The samples collected were equally divided between those requiring refrigeration and being shelf-stable. It is important to note that upon opening, juices should be refrigerated if not consumed immediately. Because fruit juices and drinks are processed products with reasonable amounts of sugar, they provide an ideal environment for yeast and mould growth.

The problem of contamination with moulds and fungus can sometimes occur during the manufacturing stage, should hygienic conditions not be maintained. Upon infestation, yeast is able to multiply and contaminate the product. In extreme cases, withdrawal of the product has been required due to the danger of exploding packaging caused by excessive gas pressure.

To check for yeast contamination, microbiological procedures can be employed, but are labour and time intensive. Instead of this, the laboratory performed alcohol testing as an indicative test because alcohol is a major compound produced by yeast fermentation. The level permitted in non-alcoholic beverages is also standardised and must not exceed 5 mL/L (or 0.5% volume/volume).

All samples had levels of alcohol below 5mL/L with the highest level recorded at 0.9 mL/L. Most samples contained some quantities of alcohol, but as indicated, were found to be within allowable levels and were unlikely to be contaminated with yeasts.

Sugars

The sweetness of fruit is mostly attributed to sugar (mainly sucrose). The amount of sucrose sugar found in fresh oranges varies between 2 and 4%, depending upon seasonal and product variability. The other major sugars found include fructose and glucose, which together with sucrose accounts for more than 90% of the total sugars found in oranges. The total amount is in the vicinity of 7 to 8 %.

Test results show a good correlation of the juices and drinks with the stated amount of sugars on the package. The differences in sugar content between juices and drinks is indicated by the average amounts in the following table:

Category	No. of samples	Fructose %	Glucose %	Sucrose %	Total %
OJ – sugar	19	2.0	1.9	3.3	7.2
OFD + sugar	22	1.1	1.1	6.8	9.0

Although the amount of total sugars is similar, the proportion of sucrose in orange fruit drinks (OFD) is more than double that of the straight orange juice. This added sucrose creates a much sweeter drink because in terms of relative sweetness fructose (1.1) is sweeter than sucrose (1), which is then sweeter than glucose (0.7). So in terms of relative sweetness the OFD + sugar is 29% sweeter than straight orange juice.

Salts

The analysis of commonly available salts was also performed. This included analysis for sodium (common table salt – sodium chloride), potassium and magnesium. Although there are no prescribed standards for sodium and potassium levels, they are the most common metallic ions in this food. The following table demonstrates the mean and range of values for orange juice and orange fruit drink:

Category	No. Samples	Sodium	Potassium	Magnesium
OJ – sugar	19	1.9 (0.4 – 4.1)	166 (140 – 220)	8.6 (7.2 – 10.8)
OFD + sugar	22	4.7 (1.4 – 7.3)	49 (35 – 66)	2.7 (1.6 – 4.0)

All results expressed in milligrams per decilitre (mg/dL).

As indicated, the amount of sodium is slightly elevated in the fruit drink and is most probably due to the water added because the water conversely affects the levels for potassium and magnesium. Sodium chloride could also be added to the product as it acts as a sweetness enhancer.

DISCUSSION

As demonstrated in the previous survey, compliance to preservative usage is very good. No samples failed to meet this requirement. The analysis of quality issues associated with packaging and storage requirements provides an interesting insight to the present status of the market. There appears to be a high proportion of samples produced without the addition of preservatives which necessitates good hygiene and sanitation controls in the manufacturing process. In recent years there has been a move away from over reliance on the use of preservatives which may be seen as a response to consumer expectations.

CONCLUSION

This survey demonstrated no quality issues of concern in relation to these food products.

BIBLIOGRAPHY

1. Australia and New Zealand Food Authority, *Food Standards Code*, incorporating amendments up to and including Amendment 38, April 1998.
2. *Food Act 1992* (ACT), reprinted as at 31 January 1996.

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