RWANDA STANDARD

DRS 16-1

Second edition

2017-mm-dd

Fruit-based soft drinks — Specification —

Part 1:

Soft drinks with fruit juice

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Rwanda Standards Board

Reference number

DRS 16-1:2017

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Contents

Page

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Foreword

Rwanda Standards are prepared by Technical Committees and approved by Rwanda Standards Board (RSB) Board of Directors in accordance with the procedures of RSB, in compliance with Annex 3 of the WTO/TBT agreement on the preparation, adoption and application of standards.

The main task of technical committees is to prepare national standards. Final Draft Rwanda Standards adopted by Technical committees are ratified by members of RSB Board of Directors for publication and gazettment as Rwanda Standards.

RS 16-1 was prepared by Technical Committee RSB/TC 001, *Beverages*.

In the preparation of this standard, reference was made to the following standard:

KS 05- 328, *Fruit based soft drinks: part 1 and 2 – Specification*

The assistance derived from the above source is hereby acknowledged with thanks.

This second edition cancels and replaces the first edition (RS 16-1:2004), which has been technically revised.

RS 16 consists of the following parts, under the general title *Fruit-based soft drinks — Specification:*

— *Part 1: Soft drinks with fruit juice*

— *Part 2: Comminuted fruit based soft drinks*

Committee membership

The following organizations were represented on the Technical Committee on Beverages (RSB/TC 001) in the preparation of this standard.

AFRICAN BAFFALO GIN

Enterprise URWIBUTSO

Imbaraga z'ibimera Health Center (IHC Ltd)

IMPANO Products Ltd

SALUNA Company Ltd

SPERANZA Group Ltd

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University of Rwanda, College of Agriculture, Animal sciences and Veterinary medicine (UR-CAVM)

Rwanda Standards Board (RSB) – Secretariat

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Fruit-based soft drinks — Specification — Part 1: Soft drinks with fruit juice

1 Scope

This Draft Rwanda Standard specifies the requirements and methods of sampling and test for soft drinks with fruit juice intended for human consumption.

This part of this Draft Rwanda Standard does not cover fruit based or non-fruit based health drinks and comminuted fruit based soft drinks.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

AOAC 940.19, *Acidity (volatile) in wines exclusive of SO2, by Barium hydroxide treatment*

AOAC 979.17, *Lead in evaporated milk and fruit juice, Anodic stripping voltametric method*

RS ISO 16649-1, *Microbiology of food and animal feeding stuffs — Horizontal method for the enumeration of beta-glucuronidase-positive Escherichia coli — Part 1: Colony-count technique at 44 degrees C using membranes and 5-bromo-4-chloro-3-indolyl Beta-D-glucuronide*

ISO 17239, *Fruits, vegetables and derived products — Determination of arsenic content — Method using hydride generation atomic absorption spectrometry*

RS ISO 17240, *Fruit and vegetable products — Determination of tin content — Method using flame atomic absorption spectrometry*

RS ISO 4833-1, *Microbiology of food and animal feeding stuffs — Horizontal method for the enumeration of microorganisms — Part 1: Colony count at 30 degrees C by the pour plate technique*

RS ISO 6579, *Microbiology of food and animal feeding stuffs — Horizontal method for the detection of Salmonella spp*

RS ISO 6636-2, *Fruits, vegetables and derived products — Determination of zinc content — Part 2: Atomic absorption spectrometric method*

RS ISO 6637, *Fruits, vegetables and derived products — Determination of mercury content — Flameless atomic absorption method*

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RS ISO 6888-1*, Microbiology of food and animal feeding stuffs — Horizontal method for the enumeration of coagulase-positive staphylococci (Staphylococcus aureus and other species) — Part 1: Technique using Baird-Parker agar medium*

RS ISO 7952*, Fruits, vegetables and derived products — Determination of copper content — Method using flame atomic absorption spectrometry*

RS EAS 12, *Potable Water — Specification*

RS CAC/RCP 1*, Code of practice — General Principles of Food Hygiene*

RS EAS 38*, General Standard for the Labelling of Pre-packaged Foods*

RS CODEX STAN 192*, General Standard for Food Additives*

RS ISO 21527-1*, Microbiology of food and animal feeding stuffs — Horizontal method for the enumeration of yeasts and moulds — Part 1: Colony count technique in products with water activity greater than 0,95*

RS ISO 21527-2*, Microbiology of food and animal feeding stuffs — Horizontal method for the enumeration of yeasts and moulds — Part 2: Colony count technique in products with water activity less than or equal to 0,95*

3 Terms and definitions

For the purposes of this standard, the following terms and definitions apply.

3.1

soft drink

drink that either contains carbonated or non-carbonated water, permitted sweeteners and a natural or artificial flavouring

3.2

soft drinks with fruit juice

drinks, which contain not less than 10 percent fruit juice by mass. These maybe composed of a mixture of two or more fruit juices

3.3

fruit juice

unfermented but fermentable liquid obtained from the edible part of sound, appropriately mature and fresh fruit or of fruit maintained in sound condition by suitable means including post-harvest surface treatment

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3.4

food grade packaging material

packaging material, made of substances which are safe and suitable for their intended use and which will not impart any toxic substance or undesirable odour or flavour to the product.

4 Quality requirements

4.1 General requirements

Soft drinks with fruit juice shall be:

a) free from any extraneous matter;

b) free from any substances injurious to health;

c) flavouring agents, if used, in accordance with CAC/GL 66. shall be free from foreign material such as grit and dirt;

d) possess characteristic taste and flavour and shall be free from heavy metals in amounts which may represent a hazard to human health; and

e) free from any signs of fermentation and shall be free from damage caused by insects and diseases.

4.2 Compositional requirements

Soft drinks with fruit juice shall comply with the compositional requirements specified in Table 1

Table 1 — Compositional requirements for soft drinks with fruit juice

S/N	Characteristic	Requirement	Method of test
1.	Brix, min	10	Annex A
2.	pH	2.4-5.8	AOAC 940.19
3.	Fructose, % min	3.5	RS EAS 104
4.	Glucose, % m/m min	0.5	
5.	Total Acidity as anhydrous citric-acid, % m/m max.	0.25	
6.	Sucrose, % m/m	5.0-9.0	
7.	Malic acid, , % m/m max	0.25	

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5 Food additives

Food additives permitted by RS CODEX STAN 192 and existing national laws that may be used include but are not limited to the following:

a) colorants;

b) antifoaming agents;

c) emulsifiers and stabilizers;

d) flavouring agents;

e) flavour enhancers;

f) preservatives; and

g) sweeteners – natural and synthetic.

6 Hygiene

6.1 Soft drinks with fruit juice shall be processed, packaged, stored and distributed under hygienic conditions prescribed in the RS CAC/RCP 1.

6.2 When tested in accordance with appropriate methods, soft drinks with fruit juice shall be free from microorganisms in amounts which may represent a hazard to health and shall meet the requirements specified in Table 2.

Table 2 — Microbiological limits for soft drinks with fruit juice

S/N	Characteristic	Requirements	Method of Test
1.	Total plate counts, CFU/ml, max	10^2	RS ISO 4833-1
2.	*E. coli*, CFU/ml, max	Absent	RS ISO 16649-1
3.	*Salmonella*, CFU per 25 ml max	Absent	RS ISO 6579
4.	*Staphylococcus aureus,* CFU/ml, max	Absent	RS ISO 6888-1
5.	Yeast and moulds, CFU/ml, max	100	RS ISO 21527-1-2

7 Contaminants

7.1 Pesticides residues

The products covered by the provisions of this Standard should comply with those maximum residue limits for pesticides established by the Codex Alimentarius Commission for these products.

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7.2 Other Contaminants

Soft drinks with fruit juice shall not contain metal contaminants in excess of the limits indicated in Table 3.

Table 3 — Metal contaminants in Soft drinks with fruit juice

S/N	Characteristic	Maximum limits (mg/l)	Test method
1.	Arsenic , As	0.1	ISO 17239
2.	Leads, Pb	0.2	AOAC 979.17
3.	Copper, Cu	1.5	ISO 7952
4.	Mercury, Hg	0.05	ISO 6637
5.	Zinc, Zn	5.0	ISO 6636-2
6.	Tin, Sn	250	RS ISO 17240

8 Packaging

Soft drinks with fruit juice shall be packaged in food grade packaging materials that shall not affect the quality of the product.

9 Labelling

In addition to the requirements specified in RS EAS 38, labelling of soft drinks with fruit juice shall include the following:

a) name of the product: "soft drink with fruit juice’’;

b) name, address and physical location of the manufacturer;

c) list of ingredients;

d) batch number;

e) date of manufacture;

f) net contents;

g) country of origin or the declaration ‘made in Rwanda’ for locally manufactured products; and

h) expiry date

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10 Sampling

Each container of soft drink with fruit juice sampled at random shall constitute a sample for purpose of testing.

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Annex A
(normative)

Determination of degree Brix

A.1 Refractometric method

A.1.1 Principle

A.1.1.1 This involves measurement of the refractive index of a test solution at 20 °C, using a refractometer, and use of tables correlating refractive index with soluble solids content (exposed as sucrose) or direct reading of the soluble solids content on the refractometer.

A.1.2 Apparatus

A.1.2.1 Refractometer indicating the refractive index by means of a scale graduated in 0.001, in order to allow readings to be estimated to 0.002. This refractometer shall be adjusted so that at 20 °C it registers for distilled water a refractive index of 1.333 0.

A.1.2.2 Alternative refractometer indicating the percentage by mass of sucrose by means of the scale graduated in 0.50 %, in order to allow readings to be estimated to 0.25 %. This refractometer shall be adjusted so that at 20 °C it registers for distilled water a soluble solids (sucrose) content of zero.

A.1.2.3 Means for circulating water to maintain the temperature of the prisms of the refractometer (A.1.2.1 or A.1.2.2) constant to within ± 0.5 °C, in the neighbourhood of 20 °C, which is the reference temperature (see A.1.4.1)

A.1.2.4 Beaker, capacity 250 ml.

A.1.3 Procedure

A.1.3.1 Preparation of test solution

A.1.3.1.1 Clear liquid products — thoroughly mix the laboratory sample and use it directly for the determination.

A.1.3.1.2 Semi-thick products (pure'e, etc.) — thoroughly mix the laboratory sample. Press a part of the sample through gauze folded in four. Reject the first drops of the liquid and reserve the remainder of the liquid for the determination.

A.1.3.1.3 Determination — adjust the water circulation (A.1.2.3) in order to operate at the required temperature (between 15 °C and 25 °C) and allow it to flow to bring the prisms of the refractometer (A.1.2.1 or A.1.2.2) to the same temperature, which shall remain constant to within ± 0.5 °C during the determination. Bring the test solution (A.1.3.1) to the measuring temperature. Put a small quantity of the test solution (2 or 3 drops are sufficient) on the fixed prism of the refractometer (A.1.2.1 or A.1.2.2) and immediately adjust the movable prism. Suitably, illuminate the field of view. The use of a sodium vapour lamp allows more precise

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results to be obtained (especially in the case of coloured and dark products). Bring the line dividing the light and dark parts of the surface in the view to the crossing of the thread and read the value of the refractive index or the percentage by mass of sucrose, according to the instrument used.

A.1.3.1.4 Number of determinations — carry out two determinations on the same laboratory sample.

A.1.4 Expression of results

A.1.4.1 **Corrections** — If the determination has been carried out at a temperature other than 20 °C ± 0.5 °C, the following corrections are required:

a) For the scale indicating the refractive index (see A.1.2.1) apply the formula:

$$n_D^{20} = n_D^t + 0.00013(t - 20)$$

Where,

t = the temperature of measurement in degree Celsius

b) For the scale indicating the percentage by mass of sucrose (see A.1.2.2), correct the result according to Table A.2 (Annex A).

A.1.4.2 **Method of Calculation and Formula** — The double solids content, expressed as a percentage by mass, is obtained as follows:

A.1.4.2.1 Refractometer with refractive index scale — Read from Table A.3 (Annex A) the percentage by mass of sucrose corresponding to the value and read in accordance with A.1.3.1.3, corrected, if necessary, in accordance with A.1.4.1 (*a*). In the case of liquid or semi-thick products (A.1.3.1.1 or A.1.3.1.2), the soluble solids content is equal to the number found.

A.1.4.2.2 Refractometer with sucrose scale — In the case of liquid or semi-thick products (A.1.3.1.1 or A.1.3.1.2), the soluble solids content, as percentage by mass of sucrose, is equal to the value, read in accordance with A.1.3.1.3, corrected, if necessary, in accordance with A.1.4.1(*b*). Take as the result the arithmetic mean of the two determinations, if the requirement of repeatability (see A.1.2.3) is satisfied. Express the result to one decimal place.

A.1.4.3 **Repeatability** — The difference between the results of two determinations carried out in rapid succession by the same analyst shall not exceed 0.5 g of soluble solids per 100 g of product.

A.1.5 Test Report

The test report shall show the method used and the result obtained. It shall mention any operational details not specified in this standard or regarded as optional, as well as any incidents which may have influenced the results. The result shall give all information required for complete identification of the sample.

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Table A.1 —Degree brix, specific gravity and degree baume of sugar solutions

Degree brix or per cent by weight of sucrose	Specific gravity at 20°C/20°C	Specific gravity at 20°C/4°C	Degree baume (modulus 145)
0.0	1.000 00	0.998 234	0.00
0.2	1.000 78	0.999 010	0.11
0.4	1.001 55	0.999 786	0.22
0.6	1.002 33	1.000 563	0.34
0.8	1.003 11	1.001 342	0.45
1.0	1.003 89	1.002 120	0.56
1.2	1.004 67	1.002 897	0.63
1.4	1.005 45	1.003 675	0.79
1.6	1.006 23	1.004 453	0.90
1.8	1.007 01	1.005 234	1.01
2.0	1.007 79	1.006.015	1.12
2.2	1.008 58	1.006 796	1.23
2.4	1.009 36	1.007 580	1.34
2.6	1.010 15	1.008 363	1.46
2.8	1.010 93	1.009 148	1.57
3.0	1.011 72	1.009 934	1.68
3.2	1.012 51	1.010 721	1.79
3.4	1.013 30	1.011 510	1.90
3.6	1.014 09	1.012 298	2.02
3.8	1.014 88	1.013 089	2.13
4.0	1.015 67	1.013 881	2.24
4.2	1.016 47	1.014 673	2.35
4.4	1.017 26	1.015 467	2.46
4.6	1.018 06	1.016 261	2.57
4.8	1.018 86	1.017 058	2.68
5.0	1.019 65	1.017 854	2.79
5.2	1.020 45	1.018 652	2.91
5.4	1.021 25	1.019 451	3.02
5.6	1.022 06	1.020 251	3.13
5.8	1.022 86	1.021 053	3.24

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Table A.1 — Degree brix, specific gravity and degree baume of sugar solutions (cont'd)

Degree brix or per cent by weight of sucrose	Specific gravity at 20°C/20°C	Specific gravity at 20°C/4°C	Degree baume (Modulus 145)
6.0	1.023 66	1.021 855	3.35
6.2	1.024 47	1.022 659	3.46
6.4	1.025 27	1.023 463	3.57

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6.6	1.026 08	1.024 270	3.69
6.8	1.026 89	1.025 077	3.80
7.0	1.027 70	1.025 885	3.91
7.2	1.028 51	1.026 694	4.02
7.4	1.029 32	1.027 504	4.13
7.6	1 030 13	1.028 316	4.24
7.8	1.030 95	1.029 128	4.35
8.0	1.031 76	1.029 942	4.46
8.2	1.032 58	1.030 757	4.58
8.4	1.033 40	1.031 573	4.69
8.6	1.034 22	1.032 391	4.80
8.8	1.035 04	1.033 209	4.91
9.0	1.035 86	1.034 029	5.02
9.2	1.036 68	1.034 850	5.13
9.4	1.037 50	1.035 671	5.24
9.6	1.038 33	1.036 494	5.35
9.8	1.039 15	1.037 318	5.46
10.0	1.039 98	1.038 143	5.57
10.2	1.040 81	1.038 970	5.68
10.4	1.041 64	1.039 797	5.80
10.6	1.042 47	1.040 626	5.91
10.8	1.043 30	1.041 456	6.92
11.0	1.044 13	1.042 288	6.13
11.2	1.044 97	1.043 121	6.24
11.4	1.045 80	1.043 954	6.35
11.6	1.046 64	1.044 788	6.46
11.8	1.047 47	1.045 625	6.57
12.0	1.048 31	1.046 462	6.68
12.2	1.049 15	1.047 300	6.79
12.4	1.049 99	1.048 140	6.90
12.6	0.050 84	1.048 980	7.02
12.8	1.051 68	1.049 822	7.13
13.0	1.052 52	1.050 665	7.24
13.2	1.053 37	1.051 510	7.35
13.4	1.054 22	1.052 356	7.46
13.6	1.055 06	1.053 202	7.57
13.8	1.055 91	1.054 050	7.68

Table A.1— Degree brix, specific gravity and degree baume of sugar solutions (cont'd)

Degree brix or per cent by weight of sucrose	Specific gravity at 20°C/20°C	Specific gravity at 20°C/4°C	Degree baume (Modulus 145)
14.0	1.056 77	1.054 900	7.79
14.2	1.057 62	1.055 751	7.90
14.4	1.058 47	1.056 602	8.01
14.6	1.059 33	1.057 455	8.12

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14.8	1.060 18	1.058 310	8.23
15.0	1.061 04	1.059 165	8.34
15.2	1.061 90	1.060 022	8.45
15.4	1.062 76	1.060 880	8.56
15.6	1.063 62	1.061 738	8.67
15.8	1.064 48	1.062 598	8.78
16.0	1.065 34	1.063 460	8.89
16.2	1.066 21	1.064 324	9.00
16.4	1.067 07	1.065 188	9.11
16.6	1.067 94	1.066 054	9.22
16.8	1.068 81	1.066 921	9.33
17.0	1.069 68	0.067 789	9.45
17.2	1.070 55	1.068 658	9.56
17.4	1.071 42	1.069 529	9.67
17.6	1.072 29	1.070 400	9.78
17.8	1.073 17	1.071 273	9.89
18.0	1.074 04	1.072 147	10.00
18.2	1.074 92	1.073 023	10.11
18.4	1.075 80	1.73 900	10.22
18.6	1.076 68	1.074 777	10.33
18.8	1.077 56	1.075 657	10.44
19.0	1.078 44	1.076 537	10.55
19.2	1.079 32	1.077 419	10.66
19.4	1.080 21	1.078 302	10.77
19.6	1.081 10	1.079 187	10.88
19.8	1.081 98	1.080 072	10.99
20.0	1.082 87	1.080 959	11.10
20.2	1.083 76	1.081 848	11.21
20.4	1.084 65	1.082 737	11.32
20.6	1.085 54	1.083 628	11.43
20.8	1.086 44	1.084 520	11.54
21.0	1.087 33	1.085 414	11.65
21.2	1.088 23	1.086 309	11.76
21.4	1.089 13	1.087 205	11.87
21.6	1.090 03	1.088 101	11.98
21.8	1.090 93	1.089 000	12.09
22.0	1.091 83	1.089 900	12.20
22.2	1.092 73	1.090 802	12.31
22.4	1.093 64	1.091 704	12.42
22.6	1.094 54	1.092 607	12.52
22.8	1.095 45	1.093 513	12.63

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Table A.1 —Degree brix, specific gravity and degree baume of sugar solutions (cont'd)

Degree brix or per cent by weight of sucrose	Specific gravity at 20°C/20°C	Specific gravity at 20°C/4°C	Degree baume (Modulus 145)
23.0	1.096 36	1.094 420	12.74
23.2	1.097 27	1.095 328	12.85
23.4	1.098 18	1.096 236	12.96
23.6	1.099 09	1.097 147	13.07
23.8	1.100 00	1.098 058	13.18
24.0	1.100 92	1.098 971	13.29
24.2	1.101 83	1.099 886	13.40
24.4	1.102 75	1.100 802	13.51
24.6	1.103 67	1.101 718	13.62
24.8	1.104 59	1.102 637	13.73
25.0	1.005 51	1.103 557	13.84
25.2	1.106 43	1.104 478	13.95
25.4	1.107 36	1.105 400	14.06
25.6	1.108 28	1.106 324	14.17
25.8	1.109 21	1.107 248	14.28
26.0	1.110 14	1.108 175	14.39
26.2	1.111 06	1.109 103	14.49
26.4	1.112 00	1.110 033	14.60
26.6	1.112 93	1.110 963	14.71
26.8	1.113 86	1.111 895	14.82
27.0	1.114 80	1.112 828	14.93
27.2	1.115 73	1.113 763	15.04
27.4	1.116 67	1.114 697	15.15
27.6	1.117 61	1.115 635	15.26
27.8	1.118 55	1.116 572	15.37
28.0	1.119 49	1.117 512	15.48
28.2	1.120 43	1.118 453	15.59
28.4	1.121 38	1.119 395	15.69
28.6	1.122 32	1.120 339	15.80
28.8	1.123 27	1.121 284	15.91
30.0	1.128 98	1.126 984	16.57
30.2	1.129 93	1.127 939	16.67
30.4	1.130 89	1.128 896	16.78
30.6	1.131 85	1.129 853	16.89
30.8	1.132 81	1.130 812	17.00
31.0	1.133 78	1.131 773	17.11
31.2	1.134 74	1.132 785	17.22
31.4	1.135 70	1.133 698	17.33
31.6	1.136 67	1.134 663	17.43
31.8	1.137 64	1.135 628	17.54

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Table A.1 — Degree brix, specific gravity and degree baume of sugar solutions (cont'd)

Degree brix or per cent by weight of sucrose	Specific gravity at 20°C/20°C	Specific gravity at 20°C/4°C	Degree baume (Modulus 145)
32.0	1.138 61	1.136 596	17.65
32.2	1.139 58	1.137 565	17.76
32.4	1.140 55	1.138 534	17.87
32.6	1.141 52	1.139 506	17.96
32.8	1.142 50	1.140 479	18.08
33.0	1.143 47	1.141 453	18.19
33.2	1.144 45	1.142 429	18.30
33.4	1.145 43	1.143 405	18.41
33.6	1.146 41	1.144 384	18.52
33.8	1.147 39	1.145 363	18.63
34.0	1.148 37	1.146 345	18.73
34.2	1.149 36	1.147 328	18.84
34.4	1.150 34	1.148 313	18.95
34.6	1.151 33	1.149 298	19.06
34.8	1.152 32	286	19.17
35.0	1.153 31	1.151 275	19.28
35.2	1.154 30	1.152 265	19.38
35.4	1.155 30	1.153 256	19.49
35.6	1.156 29	1.154 249	19.60
35.8	1.157 29	1.155 242	19.71
36.0	1.158 28	1.156 238	19.81
36.2	1.159 28	1.157 235	20.03
36.4	1.160 28	1.158 233	20.03
36.6	1.161 28	1.159 233	20.24
36.8	1.162 28	1.160 233	20.25
37.0	1.163 29	1.161 236	20.35
37.2	1.164 30	1.162 240	20.46
37.4	1.165 30	1.163 245	20.57
37.6	1.166 31	1.164 252	20.68
37.8	1.167 32	1.165 259	20.78
38.0	1.168 33	1.166 269	20.89
38.2	1.169 34	1.167 281	21.00
38.4	1.170 36	1.168 293	21.11
38.6	1.171 38	1.169 307	21.21
38.8	1.172 39	1170 322	21.32

Table A.1— Degree brix, specific gravity and degree baume of sugar solutions (cont'd)

Degree brix or per cent by weight of sucrose	Specific gravity at 20°C/20°C	Specific gravity at 20°C/4°C	Degree Baume (Modulus 145
39.0	1.173 41	1.171 340	21.43
39.2	1.174 43	1.172 359	21.54

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39.4	1.175 45	1.173 379	21.64
39.6	1.176 48	1.174 400	21.75
39.8	1.177 50	1.175 423	21.86
40.0	1.178 53	1.176 447	21.97
40.2	1.179 56	1.177 473	22.07
40.4	1.180 58	1.178 501	22.18
40.6	1.181 62	1.179 527	22.29
40.8	1.182 65	1.180 560	22.39
41.0	1.183 68	1.181 592	22.50
41.2	1.184 72	1.182 625	22.61
41.4	1.185 75	1.183 660	22.72
41.6	1.186 79	1.184 496	22.82
41.8	1.187 83	1.185 734	22.93
42.0	1.188 87	1.186 773	23.04
42.2	1.189 92	1.187 814	23.14
42.4	1.190 96	1.188 856	23.25
42.6	1.192 01	1.189 901	23.36
42.8	1.193 05	1.190 946	23.46
43.0	1.194 10	1.191 993	23.57
43.2	1.195 15	1.193 041	23.68
43.4	1.196 20	1.194 090	23.78
43.6	1.197 26	1.195 141	23.89
43.8	1.198 31	1.196 153	24.00
44.0	1.199 36	1.197 247	24.10
44.2	1.200 42	1.198 303	24.21
44.4	1.201 48	1.199 360	24.32
44.6	1.202 54	1.200 420	24.42
44.8	1.203 60	1.201 480	24.53
45.0	1.204 67	1.202 540	24.63
45.2	1.205 73	1.203 603	24.74
45.4	1.206 80	1.204 668	24.85
45.6	1.207 87	1.205 733	24.95
45.8	1.208 94	1.206 801	25.06
46.0	1.210 01	1.207 870	25.17
46.2	1.211 08	1.208 940	25.27
46.4	1.212 15	1.210 013	25.38
46.6	1.213 23	1.211 086	24.48
46.8	1.214 31	1.212 162	25.59
47.0	1.215 38	1.213 238	25.70
47.2	1.216 46	1.214 317	25.80
47.4	1.217 55	1.215 395	25.91
47.6	1.218 63	1.216 476	26.01
47.8	1.219 71	1.217 559	26.12

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48.0 48.2 48.4 48.6 48.8	1.220 80 1.221 89 1.222 98 1.224 06 1.225 16	1.218 643 1.219 929 1.220 815 1.221 904 1.222 995	26.23 26.33 26.44 26.54 26.65
49.0 49.2 49.4 49.6 49.8	1.226 25 1.227 35 1.228 44 1.229 54 1.230 64	1.224 086 1.225 180 1.226 274 1.227 371 1.228 469	26.75 26.86 26.96 27.07 27.18
50.0 50.2 50.4 50.6 50.8	1.231 74 1.232 84 1.233 95 1.235 06 1.236 16	1.229 567 1.230 668 1.231 770 1.232 874 1.233 979	27.28 27.39 27.49 27.60 27.70

Table A.2 — Correction of readings of the refractometer with scale indicating sucrose for a temperature different from 20 °C ± 0.5 °C

Temp. °C		**Scale reading for soluble solids content, per cent (m/m)**									
		5	10	15	20	25	30	40	50	60	70
		Corrections to be subtracted									
15		0.29	0.31	0.33	0.34	0.34	0.35	0.37	0.38	0.39	0.40
16		0.24	0.25	0.26	0.27	0.28	0.28	0.30	0.30	0.31	0.32
17		0.18	0.19	0.20	0.21	0.21	0.21	0.22	0.23	0.23	0.24
18		0.13	0.13	0.14	0.41	0.14	0.14	0.15	0.15	0.16	0.16
19		0.06	0.06	0.07	0.07	0.07	0.07	0.08	0.08	0.08	0.08
		Corrections to be added									
21		0.07	0.07	0.07	0.07	0.08	0.08	0.08	0.08	0.08	0.08
22		0.13	0.14	0.14	0.15	0.15	0.15	0.16	0.16	0.16	0.16
23		0.20	0.21	0.22	0.22	0.23	0.23	0.23	0.24	0.24	0.24
24		0.27	0.28	0.29	0.30	0.30	0.31	0.31	0.31	0.32	0.32
25		0.35	0.36	0.37	0.38	0.38	0.39	0.40	0.40	0.40	0.40

Table A.3 — Refractive index and corresponding percentage by mass of soluble solids (sucrose)

Refractive index	**Soluble solids (sucrose) content**	**Refractive index**	**Soluble solids (sucrose) content**	**Refractive index**	**Soluble solids (sucrose) content**	**Refractive index**	**Soluble solids (sucrose) content**
n_D^{20}	Per cent (m/m)	n_D^{20}	Per cent (m/m)	n_D^{20}	Per cent (m/m)	n_D^{20}	Per cent (m/m)

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1.333 0	0	1.376 2	22	1.407 6	44	1.455 8	66
1.334 4	1	1.368 9	23	1.409 6	45	1.458 2	67
1.335 9	2	1.370 6	24			1.460 6	68
1.337 3	3	1.372 3	25	1.411 7	46	1.463 0	69
1.338 8	4			1.413 7	47	1.465 4	70
1.340 3	5	1.374 0	26	1.415 8	48		
		1.375 8	27	1.417 9	49	1.467 9	71
1.341 8	6	1.377 5	28	1.420 1	50	1.470 3	72
1.343 3	7	1.379 3	29			1.472 8	73
1.344 8	8	1.381 1	30	1.422 2	51	1.475 3	74
1.346 3	9			1.424 3	52	1.477 8	75
1.347 8	10	1.382 9	31	1.426 5	53		
		1.384 7	32	1.428 6	54	1.480 3	76
1.349 4	11	1.386 5	33	1.430 8	55	1.482 9	77
1.350 9	12	1.388 3	34			1.485 4	78
1.352 5	13	1.390 2	35	1.433 0	56	1.488 0	79
1.354 1	14			1.435 2	57	1.490 6	80
1.355 7	15	1.392 0	36	1.437 4	58		
		1.393 9	37	1.439 7	59	1.493 3	81
1.357 3	16	1.395 8	38	1.441 9	60	1.495 9	82
1.358 9	17	1.397 8	39			1.498 5	83
1.360 5	18	1.399	40	1.444 2	1.444 2	1.501 2	84
1.362 2	19			1.446 5	1.446 5	1.503 9	85
1.363 8	20	1.401 6	41	1.448 8	1.448 8		
		1.403 6	42	1.451 1	1.451 1		
1.365 5	21	1.405 6	43	1.453 5	1.453 5		

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Annex B
(informative)

Microbiology of soft drinks and fruit juices

B.1 Background spoilage microbiology

B.1.1 Many micro-organisms are found in soft drinks as environmental or raw material contaminants,

B.1.2 Yeasts are the most significant group of micro-organisms associated with spoilage of soft drinks and fruit juices, for example *Zygosaccharomyces rouxii* and *Z.baillii*. Spoilage will be seen as the growth and production of metabolic byproducts, for example, CO_2, acid, and tainting compounds.

B.1.3 Soft drinks enhanced by the addition of low levels of fruit juice tend to exhibit similar spoilage flora to fruit juices. Microbial problems within soft drinks and fruit juices can be divided into two groups:

a) growth in, and deterioration of, the product by general organisms to produce spoilage;

b) growth in, or contamination of, the product by pathogens to produce food poisoning

Table B.1 — Examples of fruit's pH and risk organisms

Fruits	Approximate pH ranges	Risk organisms
Apples	2.9–3.91	Yeasts
Grapes	3.20–4.51	Yeasts
Oranges	3.20–4.3	Yeasts
Raspberries	3.12	Yeasts
Blackcurrants	2.48–3.60	Yeasts
Pineapples	3.3–3.7	Yeasts and bacteria
Mangoes	3.95–4.50	Yeasts and bacteria
Tomatoes	3.80–4.80	Yeasts, bacteria and moulds/bacteria

B.2 Risk microorganisms and their metabolites

B.2.1 Bacteria

Bacteria that have been associated with spoilage in the soft drinks industry include *Escherichia coli, Salmonella enterica, Acetobacter, Alicyclobacillus acidoterrestris, Bacillus, Clostridium, Gluconobacter, Lactobacillus, Leuconostoc, Saccharobacter, Zymobacter* and *Zymomonas*.

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B.2.2 Moulds

B.2.2.1 Mould problems can be divided into two types: growth of a variety of moulds due to poor hygiene within the factory or field environment, and growth of heat-resistant moulds within heat-processed juices. The former type can cause tainting, discolouration and other general problems associated with gross mould growth. The latter type can result in slow growth of the mould within the processed product.

B.2.2.2 Heat-resistant moulds able to cause spoilage of fruit juices and soft drinks include *Aspergillus ochraceus, Aspergillus tamarii, Aspergillus flavus, Byssochlamys nivea, Byssochlamys fulva, Paecilomyces variotii, Neosartorya fischeri, Eupenicillium brefeldianum, Phialophora mustea, Talaromyces flavus, Talaromyces trachyspermus* and *Thermoascus aurantiacum.* Others include *Penicillium notatum, Penicillium roquefortii* and *Cladosporum spp*.

B.2.3 Mycotoxins

Mycotoxins are toxic secondary metabolites produced by fungi growing within or on foods. Patulin is the most common mycotoxin associated with fruit juice, particularly apple juice

Table B.2 — Examples of toxin-producing moulds associated fruit with fruit raw materials and soft drinks products

Fruit	Mould	Toxin(s)
Apple	*Penicillium expansum*	Patulin, citrinin, roquefortine C
Citrus	*P. digitatum*	Trptoquivalins
Carbonated beverages	*P. glabrum*	Citromycetin
Bottled water	*P. roqueforti*	Roquefortine C
Diluted fruit/water beverages	*P. roqueforti*	Isofumigaclavine A and B
Treated orange juice	*Fusarium oxysporum*	Oxysporone
Fruit juices	*Aspergillus versicolor*	Geosmin sterigmatocystin

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