

CODEx ALIMENTARIUS COMMISSION



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**JOINT FAO/WHO FOOD STANDARDS PROGRAMME
CODEX COMMITTEE ON METHODS OF ANALYSIS AND SAMPLING**

44th Session

Virtual

5 – 8 May and 14 May 2025

METHODS OF ANALYSIS FOR FRUIT JUICES AND NECTARS

(submitted by Germany and IFU)

CCMAS44 is invited to consider the following Annexes included in this document:

- Annex 1: Methods of analysis for fruit juices and nectars with provisions included in CXS 192-1995; and
- Annex 2: Methods of analysis with no provision and for which a re-evaluation is needed to determine if they are still fit-for-purpose.

Annex 1: Methods of analysis for fruit juices and nectars with provisions included in CXS 192-1995

Commodity	Provision	Codex Standard	Method	Principle	Type	Comment
Fruit juices and nectars	Ascorbic acid-L	CXS 247-2005 (section 4 Additives)	IFU 17a (1995) (2022);	High performance liquid chromatography (HPLC)	II	Updated version
Fruit juices and nectars	Ascorbic acid-L	CXS 247-2005 (section 4 Additives)	AOAC 967.21 (1967)	Indophenol method	III	unchanged
Fruit juices and nectars	Ascorbic acid-L	CXS 247-2005 (section 4 Additives)	AOAC 967.21 (1967) ISO 6557-2:1995	Titrimetry (for strongly coloured) Spectrometry	III?	Validation data is not available? Type of method?
Fruit juices and nectars	Ascorbic acid-L	CXS 247-2005 (section 4 Additives)	IFU 17b (2024)	Iodine method	III	Updated version of IFU Method; different from AOAC and ISO method, separate listing
Fruit juices and nectars	Ascorbic acid-L	CXS 247-2005 (section 4 Additives)	ISO 6557-1:1995	Fluorescence spectrometry (reference method)	IV I	Unchanged, still fit for purpose? ISO?
Fruit juices and nectars	Carbon dioxide	CXS 247-2005 (section 4 Additives and 5 Processing aids)	IFU 42 (1976)	Titrimetry	IV	Not available anymore
Fruit juices and nectars	Citric acid	CXS 247-2005 (section 4 Additives)	AOAC 986.13 (1996)	High performance liquid chromatography (HPLC)	II	Unchanged

Commodity	Provision	Codex Standard	Method	Principle	Type	Comment
Fruit juices and nectars	High Fructose Corn Syrup and Hydrolyzed Inulin Syrup in apple juice (permitted ingredients)	CXS 247-2005	Determination of HFCS & HIS by Capillary GC method AOAC 84, 486 (2001)	QAP GC Method Gaschromatography	IV	Unchanged, but no official AOAC method
Fruit juices and nectars	Malic acid (additives)	CXS 247-2005 (Sections 4 Additives)	AOAC 993.05 (1997)	Enzymatic determination and High performance liquid chromatography (HPLC)	III	Unchanged, validation? Type?
Apple juice	Malic acid-D in apple juice	CXS 247-2005	AOAC 995.06 (1998)	High performance liquid chromatography (HPLC)	II	Unchanged, but method is only validated for apple juice
Fruit juices and nectars	Malic acid-L	CXS 247-2005	EN 1138 IFU 21 (1985) (2004) (2005)	Enzymatic determination	II	EN method withdrawn, Updated version of IFU Method
Fruit juices and nectars	Preservatives in fruit juices (sorbic acids and its salts)	CXS 247-2005	ISO 5519:1978 2008 2011	Spectrometry	III	Updated ISO Method; No validation information, 2 techniques within the method
Fruit juices and nectars	Quinic, malic & citric acid in cranberry juice cocktail and apple juice (permitted ingredients and additives)	CXS 247-2005 (Section 3.2 Permitted ingredients and 4 Additives)	AOAC 986.13 (1986)	High performance liquid chromatography (HPLC)	III	Unchanged, but scope of method is cranberry juice cocktail and apple juice; Should it be Type II as indicated above for citric acid?

Commodity	Provision	Codex Standard	Method	Principle	Type	Comment
Fruit juices and nectars	Saccharin	CXS 247-2005 (Permitted additive in nectars)	NMKL 122 (1997)	Liquid chromatography	II	unchanged
Fruit juices and nectars	Soluble solids	CXS 247-2005	AOAC 983.17 (2000) EN 12143 IFU 8 (1994) (2017) ISO 2173:2003 2011	Indirect by refractometry	I	EN method withdrawn, Updated version of IFU Method; ISO, AOAC and IFU method are equivalent
Fruit juices and nectars	Sucrose	CXS 247-2005 (Section 3.1.2 Permitted ingredients)	EN 12146 IFU 56 (1985/1998) (2005)	Enzymatic determination	III	EN method withdrawn, Updated version of IFU Method
Fruit juices and nectars	Sucrose	CXS 247-2005 (Section 3.1.2 Permitted ingredients)	EN 12630 IFU 67 (1996) (2005) NMKL 148 (1993)	High performance liquid chromatography (HPLC)	II	EN method withdrawn, Updated version of IFU Method
Fruit juices and nectars	Phosphorus/phosphate	CXS 247-2005 (Sections 3.2 Quality Criteria and 3.3 Authenticity)	EN 1136 IFU 50 (1983) (2005)	Photometric determination	II	EN method withdrawn, Updated version of IFU Method, two ways use

Annex 2: Methods of analysis with no provision and for which a re-evaluation is needed to determine if they are still fit-for-purpose

Commodity	Provision	Codex Standard	Method	Principle	Type	Comment
Fruit juices and nectars	Cellobiose	CXS 247-2005	IFU Recommendation No. 4 October 2000	Capillary gas chromatography	IV	Unchanged
Fruit juices and nectars	Citric acid	CXS 247-2005 (section 4 Additives)	IFU 22 (1985) (2005)	Enzymatic determination	III	Updated version of IFU Method
Fruit juices and nectars	Glucose-D and fructose-D	CXS 247-2005 (Section 3.1.2 Permitted ingredients)	EN 1140 IFU 55 (1985) (2005)	Enzymatic determination	II	EN method withdrawn, Updated version of IFU Method
Fruit juices and nectars	Malic acid-D	CXS 247-2005	EN 12138 IFU 64 (1995) (2005)	Enzymatic determination	II	EN method withdrawn, Updated version of IFU Method
Fruit juices and nectars	Pectin	CXS 247-2005 (Section 4 Additives)	IFU 26 (1964/1996) (2012)	Precipitation/photometry	I	Updated version of IFU Method
Fruit juices and nectars	Benzoic acid and its salts; sorbic acid and its salts	CXS 247-2005	IFU 63 (1995) (2005) NMKL 124 (1997)	High performance liquid chromatography (HPLC)	II	Updated version of IFU Method
Fruit juices and nectars	Benzoic acid and its salts	CXS 247-2005	ISO 5518:1978 2007 2011 ISO 6560:1983	Spectrometry	III	Updated ISO Method; Not identical methods, 6560 is for fruit/vegetable products with >200 mg/L (or kg). Which is Type II, or are these Type III, with NMKL/IFU in above line being identified as Type II? They are on different lines and do not have exactly the same provision. No validation information included

Commodity	Provision	Codex Standard	Method	Principle	Type	Comment
Fruit juices and nectars	Sulphur dioxide	CXS 247-2005 (Section 4 Additives)	Optimized Monier Williams AOAC 990.28 (2005) IFU 7A (2000) (2018) NMKL 132 (1989)	Titrimetry after distillation	II	Updated version of IFU Method; need to verify if AOAC, NMKL and IFU method are equivalent
Fruit juices and nectars	Sulphur dioxide	CXS 247-2005 (Section 4 Additives)	NMKL 135 (1990)	Enzymatic determination	III	Unchanged
Fruit juices and nectars	Sulphur dioxide	CXS 247-2005 (Section 4 Additives)	ISO 5522:1984/1995 ISO 5523:1984/1995	Titrimetry after distillation	III	Updated version; Not identical, if disputes, ISO 5522 is supposed to be used as per ISO 5523
Fruit juices and nectars	Tartaric acid in grape juice	CXS 247-2005 (Section 4 Additives)	EN 12137 (1997) IFU 65 (1995) (2005)	High performance liquid chromatography (HPLC)	II	EN method withdrawn, Updated version of IFU Method
Fruit juices and nectars	Total nitrogen	CXS 247-2005	EN 12135 IFU 28 (1994) (2005)	Digestion/titration	I	EN method withdrawn, Updated version of IFU Method
Fruit juices and nectars	Acetic acid (acetate)	CXS 247-2005 (Sections 3.2 Quality Criteria and 3.3 Authenticity)	EN 12632 IFU 66 (1996) (2016) (2019)	Enzymatic determination	II	EN method withdrawn, Updated version of IFU Method
Fruit juices and nectars	Alcohol (ethanol)	CXS 247-2005 (Sections 3.2 Quality Criteria and 3.3 Authenticity)	IFU 52 (1996) (2005)	Enzymatic determination	II	Updated version of IFU Method
Fruit juices and nectars	Anthocyanins	CXS 247-2005	IFU 71 (1998) (2023)	High performance liquid chromatography (HPLC)	I	Updated version of IFU Method

Commodity	Provision	Codex Standard	Method	Principle	Type	Comment
		(Sections 3.2 Quality Criteria and 3.3 Authenticity)				
Fruit juices and nectars	Ash	CXS 247-2005 (Sections 3.2 Quality Criteria and 3.3 Authenticity)	EN 1135 IFU 9 (1989)-(2005): 500-550°C AOAC 940.26 (1940): 525°C	Gravimetry	I	EN method withdrawn, IFU method updated –There are multiple temperatures for ash. IFU and AOAC are not identical given the different temperatures. Which is the Type I method?
Fruit juices and nectars	Beet sugar	CXS 247-2005 (Sections 3.2 Quality Criteria and 3.3 Authenticity)	AOAC 995.17 (1998)	SNIF-NMR	II	Unchanged
Orange juice	Benzoic acid	CXS 247-2005 (Sections 3.2 Quality Criteria and 3.3 Authenticity)	AOAC 994.11 (1964)	High performance liquid chromatography (HPLC)	III	Unchanged, but method is only validated for orange juice; Could it be a Type II, given that it is only for orange juice? Benzoic acid and its salts using HPLC for fruit juices was Type II
Fruit juices and nectars	C ¹³ /C ¹² ratio of ethanol derived from fruit juices	CXS 247-2005 (Sections 3.2 Quality Criteria and 3.3 Authenticity)	JAOAC 79. No. 1 1996, 62-72	Stable isotope mass spectrometry	II	Unchanged; discuss calculation
Fruit juices and nectars	Carbon stable isotope ratio	CXS 247-2005 (Sections 3.2 Quality Criteria and 3.3 Authenticity)	AOAC 981.09 (1997) JAOAC 64, 85 (1981)	Stable isotope mass spectrometry	II	Unchanged; discuss calculation

Commodity	Provision	Codex Standard	Method	Principle	Type	Comment
Fruit juices and nectars	Carbon stable isotope ratio	CXS 247-2005 (Sections 3.2 Quality Criteria and 3.3 Authenticity)	AOAC 982.21 (1997)	Stable isotope mass spectrometry	II	Unchanged; discuss calculation
Fruit juices and nectars	Carotenoid, total/individual groups	CXS 247-2005 (Sections 3.2 Quality Criteria and 3.3 Authenticity)	EN 12136 IFU 59 (1994) (2008)	Spectrophotometry	I	EN method withdrawn, Updated version of IFU Method
Fruit juices and nectars	Centrifugable pulp	CXS 247-2005 (Sections 3.2 Quality Criteria and 3.3 Authenticity)	EN 12134 IFU 60 (1994) (2005)	Centrifugation / % value	I	EN method withdrawn, Updated version of IFU Method
Fruit juices and nectars	Chloride (expressed as sodium chloride)	CXS 247-2005 (Sections 3.2 Quality Criteria and 3.3 Authenticity)	EN 12133 IFU 37 (1994) (2005)	Electrochemical titrimetry	III	EN method withdrawn, Updated version of IFU Method
Vegetables juice	Chloride	CXS 247-2005	AOAC 971.27 (1976) ISO 3634:1979/1995	Titration	II	Unchanged; But are methods identical?
Fruit juices and nectars	Essential oils	CXS 247-2005 (Sections 3.2 Quality Criteria and 3.3 Authenticity)	AOAC 968.20 (1969) IFU 45 (2005)	(Scott) distillation, titration	I	Unchanged; But are methods identical?

Commodity	Provision	Codex Standard	Method	Principle	Type	Comment
Citrus fruit	Essential oils in citrus fruit	CXS 247-2005 (Sections 3.2 Quality Criteria and 3.3 Authenticity)	ISO 1955:1982/1995	Distillation and direct reading of the volume determination	I	Unchanged, but method is only validated for citrus fruit; Can this remain as a separate Type I, since it is only for citrus? There was a note about multiple Type Is in CXS 247 for these methods
Fruit juices and nectars	Fermentability	CXS 247-2005 (Sections 3.2 Quality Criteria and 3.3 Authenticity)	IFU 18 (1974) (1998)	Microbiological method	I	Updated version of IFU Method
Fruit juices and nectars	Formol number	CXS 247-2005 (Sections 3.2 Quality Criteria and 3.3 Authenticity)	EN 1133 IFU 30 (1984) (2005)	Potentiometric titration	I	EN method withdrawn, Updated version of IFU Method
Fruit juices and nectars	Free amino acids	CXS 247-2005 (Sections 3.2 Quality Criteria and 3.3 Authenticity)	EN 12742 IFU 57 (1989) (2005)	Liquid chromatography	II	EN method withdrawn, Updated version of IFU Method
Fruit juices and nectars	Fumaric acid	CXS 247-2005 (Sections 3.2 Quality Criteria and 3.3 Authenticity)	IFU 72 (1998)	High performance liquid chromatography (HPLC)	II	Unchanged

Commodity	Provision	Codex Standard	Method	Principle	Type	Comment
Fruit juices and nectars	Glucose, fructose, saccharose	CXS 247-2005 (Section 3.1.2 Permitted ingredients)	EN 12630 IFU 67 (1996) (2005) NMKL 148 (1993)	High performance liquid chromatography (HPLC)	II	EN method withdrawn, IFU method updated; need to verify if NMKL and IFU method are equivalent; Should this be revised to read: Glucose, fructose, sucrose?
Fruit juices and nectars	Gluconic acid	CXS 247-2005 (Sections 3.2 Quality Criteria and 3.3 Authenticity)	IFU 76 (2004) (2006)	Enzymatic determination	II	Updated version of IFU Method
Fruit juices and nectars	Glycerol	CXS 247-2005 (Sections 3.2 Quality Criteria and 3.3 Authenticity)	IFU 77 (2004) (2005)	Enzymatic determination	II	Updated version of IFU Method
Fruit juices and nectars	Hesperidin and naringin	CXS 247-2005 (Sections 3.2 Quality Criteria and 3.3 Authenticity)	EN 12448 IFU 58 (1994) (2005)	High performance liquid chromatography (HPLC)	II	EN method withdrawn, Updated version of IFU Method
Apple juice	High Fructose Corn Syrup and Hydrolyzed Inulin Syrup	CXS 247-2005 (Section 3.1.2 Permitted ingredients)	JAOAC 84, 486 (2001)	Capillary gas chromatography (CAP GC Method) Gaschromatography	IV	Unchanged, but only validated for apple juice; Type of method? Journal reference not official method
Fruit juices and nectars	Hydroxymethylfurfural	CXS 247-2005 (Sections 3.2 Quality Criteria and 3.3 Authenticity)	IFU 69 (1996) (2005)	High performance liquid chromatography (HPLC)	II	Updated version of IFU Method

Commodity	Provision	Codex Standard	Method	Principle	Type	Comment
Fruit juices and nectars	Hydroxymethylfurfural	CXS 247-2005 (Sections 3.2 Quality Criteria and 3.3 Authenticity)	ISO 7466:1986	Spectrometry	III	unchanged
Fruit juices and nectars	Isocitric acid-D	CXS 247-2005 (Sections 3.2 Quality Criteria and 3.3 Authenticity)	IFU 54 (1984) (2005)	Enzymatic determination	II	Updated version of IFU Method
Fruit juices and nectars	Lactic acid-D and L	CXS 247-2005 (Sections 3.2 Quality Criteria and 3.3 Authenticity)	EN 12634 IFU 53 (1983/1996) (2005)	Enzymatic determination	II	EN method withdrawn, Updated version of IFU Method
Apple juice	L-malic/total malic acid ratio – to detected added D-malic acid	CXS 247-2005 (Sections 3.2 Quality Criteria and 3.3 Authenticity)	AOAC 993.05 (1997)	Enzymatic determination and High performance liquid chromatography (HPLC)	II	Unchanged, but only validated for apple juice
Orange juice	Naringin and Neohesperidin	CXS 247-2005 (Sections 3.2 Quality Criteria and 3.3 Authenticity)	AOAC 999.05 (2002)	High performance liquid chromatography (HPLC)	III	Unchanged, but only validated to orange juice; Type?
Fruit juices and nectars	pH-value	CXS 247-2005 (Sections 3.2 Quality Criteria and 3.3 Authenticity)	NMKL 179 (2005)	Potentiometry	II	unchanged

Commodity	Provision	Codex Standard	Method	Principle	Type	Comment
Fruit juices and nectars	pH-value	CXS 247-2005 (Sections 3.2 Quality Criteria and 3.3 Authenticity)	EN 1132 IFU 11 (1989) (2015) ISO 1842:1994/1995	Potentiometry	IV	EN method withdrawn; Updated version of IFU Method; need to verify if ISO and IFU method are equivalent
Fruit juices and nectars	Proline	CXS 247-2005 (Sections 3.2 Quality Criteria and 3.3 Authenticity)	EN 1141 IFU 49 (1983) (2005)	Photometry	I	EN method withdrawn, Updated version of IFU Method
Fruit juices and nectars	Relative density	CXS 247-2005 (Sections 3.2 Quality Criteria and 3.3 Authenticity)	IFU 01A (2005)	Densitometry	III	Updated version of IFU Method; Relative density is Type I for fats and oils, need only one Type I method
Fruit juices and nectars	Relative density	CXS 247-2005 (Sections 3.2 Quality Criteria and 3.3 Authenticity)	EN 1131 IFU 1 (1989) (2005) & IFU Method No. General sheet (1971)	Pycnometry	II	EN method withdrawn, Updated version of IFU Method
Fruit juices and nectars	Sodium, potassium, calcium, magnesium	CXS 247-2005 (Sections 3.2 Quality Criteria and 3.3 Authenticity)	EN 1134 IFU 33 (1984) (2005)	Atomic Absorption Spectroscopy	II	EN method withdrawn, Updated version of IFU Method
Fruit juices and nectars	Sorbitol-D	CXS 247-2005 (Sections 3.2 Quality Criteria and 3.3 Authenticity)	IFU 62 (1995) (2005)	Enzymatic determination	II	Updated version of IFU Method

Commodity	Provision	Codex Standard	Method	Principle	Type	Comment
Pulp of fruit juices and nectars	Stable carbon isotope ratio	CXS 247-2005 (Sections 3.2 Quality Criteria and 3.3 Authenticity)	ENV 13070 (1998) Analytica Chimica Acta 340 (1997)	Stable isotope mass spectrometry	II	EN method withdrawn; will shortly be published as IFU method (based on CEN); Calculation? Type?
Fruit juices and nectars	Stable carbon isotope ratio of sugars from fruit juices	CXS 247-2005 (Sections 3.2 Quality Criteria and 3.3 Authenticity)	ENV 12140 (1996) Analytica Chimica Acta 271 (1993)	Stable isotope mass spectrometry	II	EN method withdrawn; will shortly be published as IFU method (based on CEN); Calculation? Type?
Fruit juices and nectars	Stable hydrogen isotope ratio of water	CXS 247-2005 (Sections 3.2 Quality Criteria and 3.3 Authenticity)	ENV 12142 (1997)	Stable isotope mass spectrometry	II	EN method withdrawn, no method available; Calculation? Type?
Fruit juices and nectars	Stable oxygen isotope ratio of water	CXS 247-2005 (Sections 3.2 Quality Criteria and 3.3 Authenticity)	ENV 12141 (1997)	Stable isotope mass spectrometry	II	EN method withdrawn, no method available; will shortly be published as IFU method (based on CEN); Calculation? Type?
Fruit juices and nectars	Starch	CXS 247-2005 (Sections 3.2 Quality Criteria and 3.3 Authenticity)	AOAC 925.38 (1925) IFU 73 (2000)	Colorimetric	I	unchanged
Orange juice	Sugar beet derived syrups in frozen concentrated orange juice	CXS 247-2005 (Sections 3.2 Quality Criteria and 3.3 Authenticity)	AOAC 992.09 (1997)	Oxygen isotope ratio analysis ($\delta^{18}\text{O}$ in water)	I	Unchanged; Journal reference; Calculation? Type?

Commodity	Provision	Codex Standard	Method	Principle	Type	Comment
Fruit juices and nectars	Titrateable acids	CXS 247-2005 (Sections 3.2 Quality Criteria and 3.3 Authenticity)	EN 12147 IFU 03 (1968) (2017) ISO 750:1998	Titrimetry	I	EN method withdrawn, Updated version of IFU Method; ISO method has 2 methods: Potentiometry for reference method Titrimetry for the routine method
Fruit juices and nectars	Total dry matter at 70°C	CXS 247-2005 (Sections 3.2 Quality Criteria and 3.3 Authenticity)	EN 12145 IFU 61 (1994) (2005)	Gravimetric determination Gravimetry	I	EN method withdrawn, Updated version of IFU Method
Fruit juices and nectars	Total solids (Microwave oven drying)	CXS 247-2005 (Sections 3.2 Quality Criteria and 3.3 Authenticity)	AOAC 985.26 (2001)	Gravimetric determination Gravimetry	I	unchanged
Fruit juices and nectars	Vitamin C	CXS 247-2005 (Sections 3.2 Quality Criteria and 3.3 Authenticity)	EN 14130 (2003)	High performance liquid chromatography (HPLC)	II	EN method withdrawn
Fruit juices and nectars	Vitamin C (dehydro-ascorbic acid and ascorbic acid)	CXS 247-2005 (Sections 3.2 Quality Criteria and 3.3 Authenticity)	AOAC 967.22 (1968)	Microfluorometry	III	unchanged