



STANDARD FOR NAMED VEGETABLE OILS

CXS 210-1999

Adopted in 1999. Revised in 2001, 2003, 2009, 2017, 2019.
Amended in 2005, 2011, 2013, 2015, 2019, 2021, 2022.

Corrigendum

01/02/2023

The following corrections were made to the PDF of the standard after it was published.

| Page | Location | Text in printed PDF | Text in corrected PDF |
|------|-----------------------------------------------------------------------|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| 5 | Section 4. FOOD ADDITIVES | | The flavourings used in products covered by this standard should comply with the <i>Guidelines for the Use of Flavourings</i> (CXG 66-2008). |
| 7 | Table 1 column 4 row 7 Value for fatty acid C16:1 pistachio oil | ND-0.2 | ND-2.0 |

2022 Amendments

The following amendments were made to the text of the standard following decisions taken at the forty-fifth session of the Codex Alimentarius Commission in December 2022.

| Page | Location | Original text | Printed text |
|------|-----------------------------------------------------------------------------|---------------|--------------|
| 7 | Table 1 column 12 row 11 Value for fatty acid C18:1 sunflowerseed oil | 14.0-39.4 | 14.0-43.0 |
| 7 | Table 1 column 12 row 12 Value for fatty acid C18:2 sunflowerseed oil | 48.3-74.0 | 45.4-74.0 |

| | | | |
|----|---------------------------------------------------------------------------------------------------|-------------|-------------|
| 12 | Table 2 column 12 row 1 Value for relative density (x°C/water at 20°C) sunflowerseed oil | 0.918-0.923 | 0.916-0.923 |
| 12 | Table 2 column 12 row 3 Value for refractive index (ND 40°C) sunflowerseed oil | 1.461-1.468 | 1.461-1.475 |
| 12 | Table 2 column 12 row 4 Saponification value (mg KOH/g oil) sunflowerseed oil | 188-194 | 187-194 |

1. SCOPE

This standard applies to the vegetable oils described in Section 2.1 presented in a state for human consumption.

2. DESCRIPTION

2.1 Product definitions

(Note: synonyms are in brackets immediately following the name of the oil)

Almond oil is derived from the kernel of almond fruit (*Amygdalus communis* L.).

Arachis oil (peanut oil; groundnut oil) is derived from groundnuts (seeds of *Arachis hypogaea* L.).

Babassu oil is derived from the kernel of the fruit of several varieties of the palm *Orbignya* spp.

Coconut oil is derived from the kernel of the coconut (*Cocos nucifera* L.).

Cotton seed oil is derived from the seeds of various cultivated species of *Gossypium* spp.

Flaxseed (Linseed) oil is derived from the seeds of various cultivated species of *Linum usitatissimum*

Grape seed oil is derived from the seeds of the grape (*Vitis vinifera* L.).

Hazelnut oil is derived from the kernel of hazelnut fruit (*Corylus avellana* L.).

Maize oil (corn oil) is derived from maize germ (the embryos of *Zea mays* L.).

Mustard seed oil is derived from the seeds of white mustard (*Sinapis alba* L. or *Brassica hirta* Moench), brown and yellow mustard (*Brassica juncea* (L.) Czernajew and Cossen) and of black mustard (*Brassica nigra* (L.) Koch).

Palm kernel oil is derived from the kernel of the fruit of the oil palm (*Elaeis guineensis*).

Palm kernel olein is the liquid fraction derived from fractionation of palm kernel oil (described above).

Palm kernel stearin is the solid fraction derived from fractionation of palm kernel oil (described above).

Palm oil is derived from the fleshy mesocarp of the fruit of the oil palm (*Elaeis guineensis*).

Palm oil with a higher content of oleic acid is derived from the fleshy mesocarp of hybrid palm fruit (OxG) (*Elaeis oleifera* x *Elaeis guineensis*)

Palm olein is the liquid fraction derived from the fractionation of palm oil (described above).

Palm stearin is the high-melting fraction derived from the fractionation of palm oil (described above).

Palm superolein is a liquid fraction derived from palm oil (described above) produced through a specially controlled crystallization process to achieve an iodine value of 60 or higher.

Pistachio oil is derived from the kernel of pistachio fruit (*Pistacia vera* L.).

Rapeseed oil (turnip rape oil; colza oil; ravison oil; sarson oil; toria oil) is produced from seeds of *Brassica napus* L., *Brassica rapa* L., *Brassica juncea* L. and *Brassica tournefortii* Gouan species.

Rapeseed oil – low-erucic acid (low-erucic acid turnip rape oil; low-erucic acid colza oil; canola oil) is produced from low-erucic acid oil-bearing seeds of varieties derived from the *Brassica napus* L., *Brassica rapa* L. and *Brassica juncea* L., species.

Rice bran oil (rice oil) is derived from the bran of rice (*Oryza sativa* L.).

Safflower seed oil (safflower oil; carthamus oil; kurdee oil) is derived from safflower seeds (seeds of *Carthamus tinctorius* L.).

Safflower seed oil – high-oleic acid (high-oleic acid safflower oil; high-oleic acid carthamus oil; high-oleic acid kurdee oil) is produced from high-oleic acid oil-bearing seeds of varieties derived from *Carthamus tinctorius* L.

Sesame seed oil (sesame oil; gingelly oil; benne oil; ben oil; till oil; tillie oil) is derived from sesame seeds (seeds of *Sesamum indicum* L.).

Soya bean oil (soybean oil) is derived from soya beans (seeds of *Glycine max* (L.) Merr.).

Sunflower seed oil (sunflower oil) is derived from sunflower seeds (seeds of *Helianthus annuus* L.).

Sunflower seed oil – high-oleic acid (high-oleic acid sunflower oil) is produced from high-oleic acid oil-bearing seeds of varieties derived from sunflower seeds (seeds of *Helianthus annuus* L.).

Sunflower seed oil – mid-oleic acid (mid-oleic acid sunflower oil) is produced from mid-oleic acid oil-bearing sunflower seeds (seeds of *Helianthus annuus* L.).

Walnut oil is derived from the kernel of walnut fruit (*Juglans regia* L.).

2.2 Other definitions

Edible vegetable oils are foodstuffs which are composed primarily of glycerides of fatty acids being obtained only from vegetable sources. They may contain small amounts of other lipids such as phosphatides, of unsaponifiable constituents, and of free fatty acids naturally present in the fat or oil.

Virgin oils are obtained, without altering the nature of the oil, by mechanical procedures, e.g. expelling or pressing, and the application of heat only. They may have been purified by washing with water, settling, filtering and centrifuging only.

Cold pressed oils are obtained, without altering the oil, by mechanical procedures only, e.g. expelling or pressing, without the application of heat. They may have been purified by washing with water, settling, filtering and centrifuging only.

3. ESSENTIAL COMPOSITION AND QUALITY FACTORS

3.1 Gas-liquid chromatography (GLC) ranges of fatty acid composition (expressed as percentages)

Samples falling within the appropriate ranges specified in Table 1 are in compliance with this standard. Supplementary criteria, for example national geographical and/or climatic variations, may be considered, as necessary, to confirm that a sample complies with the standard.

Low-erucic acid rapeseed oil must not contain more than 2 percent erucic acid (as percentage of total fatty acids).

High-oleic acid safflower oil must contain not less than 70 percent oleic acid (as percentage of total fatty acids).

High-oleic acid sunflower oil must contain not less than 75 percent oleic acid (as percentage of total fatty acids).

Palm oil with a higher content of oleic acid must contain not less than 48 percent oleic acid (as percentage of total fatty acids).

3.2 Slip point

| | |
|---------------------|------------------------|
| Palm kernel olein | between 21 °C to 26 °C |
| Palm kernel stearin | between 31 °C to 34 °C |
| Palm olein | not more than 24 °C |
| Palm stearin | not less than 44 °C |
| Palm superolein | not more than 19.5 °C |

4. FOOD ADDITIVES

Antifoaming agents, antioxidants and emulsifiers used in accordance with Table 1 and Table 2 of the *General Standard for Food Additives* (CXS 192-1995)¹ in food category 02.1.2 (vegetable oils and fats) are acceptable for use in foods conforming to this standard.

No food additives are permitted in virgin or cold pressed oils.

The flavourings used in products covered by this standard should comply with the *Guidelines for the Use of Flavourings* (CXG 66-2008)².

5. CONTAMINANTS

The products covered by this standard shall comply with the maximum levels of the *General Standard for Contaminants and Toxins in Food and Feed* (CXS 193-1995).³

The products covered by this standard shall comply with the maximum residue limits for pesticides established by the Codex Alimentarius Commission.

6. HYGIENE

It is recommended that the products covered by the provisions of this standard be prepared and handled in accordance with the appropriate sections of the *General Principles of Food Hygiene* (CXC 1-1969)⁴ and other relevant Codex Alimentarius texts such as codes of hygienic practice and codes of practice.

The products should comply with any microbiological criteria established in accordance with the *Principles and Guidelines for the Establishment and Application of Microbiological Criteria Related to Foods* (CXG 21-1997).⁵

7. LABELLING

7.1 Name of the food

The product shall be labelled in accordance with the *General Standard for the Labelling of Pre-packaged Foods* (CXS 1-1985).⁶ The name of the oil shall conform to the descriptions given in Section 2 of this standard.

Where more than one name is given for a product in Section 2.1, the labelling of that product must include one of those names acceptable in the country of use.

7.2 Labelling of non-retail containers

Information on the above labelling requirements shall be given either on the container or in accompanying documents, except that the name of the food, lot identification and the name and address of the manufacturer or packer shall appear on the container.

However, lot identification and the name and address of the manufacturer or packer may be replaced by an identification mark, provided that such a mark is clearly identifiable with the accompanying documents.

8. METHODS OF ANALYSIS AND SAMPLING

8.1 Determination of GLC ranges of fatty acid composition

According to ISO 5508: 1990 and 5509: 2000; or AOCS Ce 2-66 (97), Ce 1e-91 (01) or Ce 1f-96 (02).

8.2 Determination of slip point

According to ISO 6321: 2002 for all oils; AOCS Cc 3b-92 (02) for all oils except for palm oils; AOCS Cc 3-25 (97) for palm oils only.

Table 1: Fatty acid composition of vegetable oils as determined by gas liquid chromatography from authentic samples^{a, b} (expressed as percentage of total fatty acids) (see Section 3.1 of the standard)

| Fatty acid | Arachis oil | Almond oil | Babassu oil | Coconut oil | Cotton seed oil | Flaxseed / linseed oil | Grape seed oil | Hazelnut oil | Maize oil | Mustard seed oil | Palm oil | Palm oil with a higher oleic acid | Palm kernel oil | Palm olein ^c | Palm kernel olein ^c | Palm kernel stearin ^c |
|------------|-------------|------------|-------------|-------------|-----------------|------------------------|----------------|--------------|-----------|------------------|-----------|-----------------------------------|-----------------|-------------------------|--------------------------------|----------------------------------|
| C6:0 | ND | ND | ND | ND-0.7 | ND | ND | ND | ND | ND | ND | ND | ND | ND-0.8 | ND | ND-0.7 | ND-0.2 |
| C8:0 | ND | ND | 2.6-7.3 | 4.6-10.0 | ND | ND | ND | ND | ND | ND | ND | ND | 2.4-6.2 | ND | 2.9-6.3 | 1.3-3.0 |
| C10:0 | ND | ND | 1.2-7.6 | 5.0-8.0 | ND | ND | ND | ND | ND | ND | ND | ND | 2.6-5.0 | ND | 2.7-4.5 | 2.4-3.3 |
| C12:0 | ND-0.1 | ND | 40.0-55.0 | 45.1-53.2 | ND-0.2 | ND-0.3 | ND | ND | ND-0.3 | ND | ND-0.5 | ND-0.6 | 45.0-55.0 | 0.1-0.5 | 39.7-47.0 | 52.0-59.7 |
| C14:0 | ND-0.1 | ND-0.1 | 11.0-27.0 | 16.8-21.0 | 0.6-1.0 | ND-0.2 | ND-0.3 | ND-0.1 | ND-0.3 | ND-1.0 | 0.5-2.0 | ND-0.8 | 14.0-18.0 | 0.5-1.5 | 11.5-15.5 | 20.0-25.0 |
| C16:0 | 5.0-14.0 | 4.0-9.0 | 5.2-11.0 | 7.5-10.2 | 21.4-26.4 | 4.0-11.3 | 5.5-11.0 | 4.2-8.9 | 8.6-16.5 | 0.5-4.5 | 39.3-47.5 | 23.0-38.0 | 6.5-10.0 | 38.0-43.5 | 6.2-10.6 | 6.7-10.0 |
| C16:1 | ND-0.2 | 0.2-0.8 | ND | ND | ND-1.2 | ND-0.5 | ND-1.2 | ND-0.5 | ND-0.5 | ND-0.5 | ND-0.6 | ND-0.8 | ND-0.2 | ND-0.6 | ND-0.1 | ND |
| C17:0 | ND-0.1 | ND-0.2 | ND | ND | ND-0.1 | ND-0.1 | ND-0.2 | ND-0.1 | ND-0.1 | ND | ND-0.2 | ND-0.2 | ND | ND-0.2 | ND | ND |
| C17:1 | ND-0.1 | ND-0.2 | ND | ND | ND-0.1 | ND-0.1 | ND-0.1 | ND-0.1 | ND-0.1 | ND | ND | ND | ND | ND-0.1 | ND | ND |
| C18:0 | 1.0-4.5 | ND-3.0 | 1.8-7.4 | 2.0-4.0 | 2.1-3.3 | 2.0-8.0 | 3.0-6.5 | 0.8-3.2 | ND-3.3 | 0.5-2.0 | 3.5-6.0 | 1.5-4.5 | 1.0-3.0 | 3.5-5.0 | 1.7-3.0 | 1.0-3.0 |
| C18:1 | 35.0-80 | 62.0-76.0 | 9.0-20.0 | 5.0-10.0 | 14.7-21.7 | 9.8-36.0 | 12.0-28.0 | 74.2-86.7 | 20.0-42.2 | 8.0-23.0 | 36.0-44.0 | 48.0-60.0 | 12.0-19.0 | 39.8-46.0 | 14.4-24.6 | 4.1-8.0 |
| C18:2 | 4.0-43.0 | 20.0-30.0 | 1.4-6.6 | 1.0-2.5 | 46.7-58.2 | 8.3-30.0 | 58.0-78.0 | 5.2-18.7 | 34.0-65.6 | 10.0-24.0 | 9.0-12.0 | 9.0-17.0 | 1.0-3.5 | 10.0-13.5 | 2.4-4.3 | 0.5-1.5 |
| C18:3 | ND-0.5 | ND-0.5 | ND | ND-0.2 | ND-0.4 | 43.8-70.0 | ND-1.0 | ND-0.6 | ND-2.0 | 6.0-18.0 | ND-0.5 | ND-0.6 | ND-0.2 | ND-0.6 | ND-0.3 | ND-0.1 |
| C20:0 | 0.7-2.0 | ND-0.5 | ND | ND-0.2 | 0.2-0.5 | ND-1.0 | ND-1.0 | ND-0.3 | 0.3-1.0 | ND-1.5 | ND-1.0 | ND-0.4 | ND-0.2 | ND-0.6 | ND-0.5 | ND-0.5 |
| C20:1 | 0.7-3.2 | ND-0.3 | ND | ND-0.2 | ND-0.1 | ND-1.2 | ND-0.3 | ND-0.3 | 0.2-0.6 | 5.0-13.0 | ND-0.4 | ND-0.2 | ND-0.2 | ND-0.4 | ND-0.2 | ND-0.1 |
| C20:2 | ND | ND | ND | ND | ND-0.1 | ND | ND | ND | ND-0.1 | ND-1.0 | ND | ND-0.5 | ND | ND | ND | ND |
| C22:0 | 1.5-4.5 | ND-0.2 | ND | ND | ND-0.6 | ND-0.5 | ND-0.5 | ND-0.2 | ND-0.5 | 0.2-2.5 | ND-0.2 | ND-0.3 | ND-0.2 | ND-0.2 | ND | ND |
| C22:1 | ND-0.6 | ND-0.1 | ND | ND | ND-0.3 | ND-1.2 | ND-0.3 | ND-0.1 | ND-0.3 | 22.0-50.0 | ND | ND | ND | ND | ND | ND |
| C22:2 | ND | ND | ND | ND | ND-0.1 | ND | ND | ND | ND | ND-1.0 | ND | ND | ND | ND | ND | ND |
| C24:0 | 0.5-2.5 | ND-0.2 | ND | ND | ND-0.1 | ND-0.3 | ND-0.4 | ND | ND-0.5 | ND-0.5 | ND | ND-0.2 | ND | ND | ND | ND |
| C24:1 | ND-0.3 | ND | ND | ND | ND | ND | ND | ND-0.3 | ND | 0.5-2.5 | ND | ND | ND | ND | ND | ND |

ND - non detectable, defined as ≤ 0.05 %

^a Data taken from species as listed in Section 2.

^b The fatty acid values in this table apply to the vegetable oils described in Section 2.1 presented in a state for human consumption. However, in order to provide clarity in trade of crude oils, the values of the table may also be applied for the corresponding crude forms of the vegetable oils described in Section 2.1.

^c Fractionated product from palm oil.

Table 1: Fatty acid composition of vegetable oils as determined by gas liquid chromatography from authentic samples^{a, b} (expressed as percentage of total fatty acids) (see Section 3.1 of the standard) (continued)

| Fatty acid | Palm stearin ^c | Palm superolein ^c | Pistachio oil | Rapeseed oil | Rapeseed oil (low-erucic acid) | Rice bran oil | Safflower seed oil | Safflower seed oil (high-oleic acid) | Sesame seed oil | Soyabean oil | Sunflower seed oil | Sunflower seed oil (high-oleic acid) | Sunflower seed oil (mid-oleic acid) | Walnut oil |
|------------|---------------------------|------------------------------|---------------|--------------|--------------------------------|---------------|--------------------|--------------------------------------|-----------------|--------------|--------------------|--------------------------------------|-------------------------------------|------------|
| C6:0 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| C8:0 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| C10:0 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| C12:0 | 0.1–0.5 | 0.1–0.5 | ND | ND | ND | ND–0.2 | ND | ND–0.2 | ND | ND–0.1 | ND–0.1 | ND | ND | ND |
| C14:0 | 1.0–2.0 | 0.5–1.5 | ND–0.6 | ND–0.2 | ND–0.2 | ND–1.0 | ND–0.2 | ND–0.2 | ND–0.1 | ND–0.2 | ND–0.2 | ND–0.1 | ND–1 | ND |
| C16:0 | 48.0–74.0 | 30.0–39.0 | 8.0–13.0 | 1.5–6.0 | 2.5–7.0 | 14–23 | 5.3–8.0 | 3.6–6.0 | 7.9–12.0 | 8.0–13.5 | 5.0–7.6 | 2.6–5.0 | 4.0–5.5 | 6.0–8.0 |
| C16:1 | ND–0.2 | ND–0.5 | ND–0.2 | ND–3.0 | ND–0.6 | ND–0.5 | ND–0.2 | ND–0.2 | ND–0.2 | ND–0.2 | ND–0.3 | ND–0.1 | ND–0.05 | ND–0.4 |
| C17:0 | ND–0.2 | ND–0.1 | ND–0.1 | ND–0.1 | ND–0.3 | ND | ND–0.1 | ND–0.1 | ND–0.2 | ND–0.1 | ND–0.2 | ND–0.1 | ND–0.05 | ND–0.1 |
| C17:1 | ND–0.1 | ND | ND–0.1 | ND–0.1 | ND–0.3 | ND | ND–0.1 | ND–0.1 | ND–0.1 | ND–0.1 | ND–0.1 | ND–0.1 | ND–0.06 | ND–0.1 |
| C18:0 | 3.9–6.0 | 2.8–4.5 | 0.5–3.5 | 0.5–3.1 | 0.8–3.0 | 0.9–4.0 | 1.9–2.9 | 1.5–2.4 | 4.5–6.7 | 2.0–5.4 | 2.7–6.5 | 2.9–6.2 | 2.1–5.0 | 1.0–3.0 |
| C18:1 | 15.5–36.0 | 43.0–49.5 | 50.0–70.0 | 8.0–60.0 | 51.0–70.0 | 38–48 | 8.4–21.3 | 70.0–83.7 | 34.4–45.5 | 17–30 | 14.0–43.0 | 75–90.7 | 43.1–71.8 | 14.0–23.0 |
| C18:2 | 3.0–10.0 | 10.5–15.0 | 8.0–34.0 | 11.0–23.0 | 15.0–30.0 | 21–42 | 67.8–83.2 | 9.0–19.9 | 36.9–47.9 | 48.0–59.0 | 45.4–74.0 | 2.1–17 | 18.7–45.3 | 54.0–65.0 |
| C18:3 | ND–0.5 | 0.2–1.0 | 0.1–1.0 | 5.0–13.0 | 5.0–14.0 | 0.1–2.9 | ND–0.1 | ND–1.2 | 0.2–1.0 | 4.5–11.0 | ND–0.3 | ND–0.3 | ND–0.5 | 9.0–15.4 |
| C20:0 | ND–1.0 | ND–0.4 | ND–0.3 | ND–3.0 | 0.2–1.2 | ND–0.9 | 0.2–0.4 | 0.3–0.6 | 0.3–0.7 | 0.1–0.6 | 0.1–0.5 | 0.2–0.5 | 0.2–0.4 | ND–0.3 |
| C20:1 | ND–0.4 | ND–0.2 | ND–0.6 | 3.0–15.0 | 0.1–4.3 | ND–0.8 | 0.1–0.3 | 0.1–0.5 | ND–0.3 | ND–0.5 | ND–0.3 | 0.1–0.5 | 0.2–0.3 | ND–0.3 |
| C20:2 | ND | ND | ND | ND–1.0 | ND–0.1 | ND | ND | ND | ND | ND–0.1 | ND | ND | ND | ND |
| C22:0 | ND–0.2 | ND–0.2 | ND | ND–2.0 | ND–0.6 | ND–1.0 | ND–1.0 | ND–0.4 | NN–1.1 | ND–0.7 | 0.3–1.5 | 0.5–1.6 | 0.6–1.1 | ND–0.2 |
| C22:1 | ND | ND | ND | >2.0–60.0 | ND–2.0 | ND | ND–1.8 | ND–0.3 | ND | ND–0.3 | ND–0.3 | ND–0.3 | ND | ND |
| C22:2 | ND | ND | ND | ND–2.0 | ND–0.1 | ND | ND | ND | ND | ND | ND–0.3 | ND | ND–0.09 | ND |
| C24:0 | ND | ND | ND | ND–2.0 | ND–0.3 | ND–0.9 | ND–0.2 | ND–0.3 | ND–0.3 | ND–0.5 | ND–0.5 | ND–0.5 | 0.3–0.4 | ND |
| C24:1 | ND | ND | ND | ND–3.0 | ND–0.4 | ND | ND–0.2 | ND–0.3 | ND | ND | ND | ND | ND | ND |

ND – non detectable, defined as ≤ 0.05 %

OTHER QUALITY AND COMPOSITION FACTORS

These quality and composition factors are supplementary information to the essential composition and quality factors of the standard. A product, which meets the essential quality and composition factors but does not meet these supplementary factors, may still conform to the standard.

1. QUALITY CHARACTERISTICS

The **colour, odour and taste** of each product shall be characteristic of the designated product. It shall be free from foreign and rancid odour and taste.

| | <u>Maximum level</u> |
|---------------------------------------------------------------------------------------|---------------------------------------------------|
| Matter volatile at 105 °C | 0.2 % m/m |
| Insoluble impurities | 0.05 % m/m |
| Soap content | 0.005 % m/m |
| Iron (Fe): | |
| Refined oils | 1.5 mg/kg |
| Virgin oils | 5.0 mg/kg |
| Crude palm kernel olein | 5.0 mg/kg |
| Crude palm kernel stearin | 7.0 mg/kg |
| Copper (Cu) | |
| Refined oils | 0.1 mg/kg |
| Virgin oils | 0.4 mg/kg |
| Acid value | |
| Refined oils | 0.6 mg KOH/g oil |
| Cold pressed and virgin oils (except crude palm kernel oil and virgin palm oil) | 4.0 mg KOH/g oil |
| Free fatty acid | |
| Virgin palm oil | 5.0 % (as palmitic acid) |
| Crude palm kernel oil | 4.0 % (as lauric acid) |
| Refined rice bran oil | 0.3 % (as oleic acid) |
| Peroxide value | |
| Refined oils | up to 10 milliequivalents of active oxygen/kg oil |
| Cold pressed and virgin oils | up to 15 milliequivalents of active oxygen/kg oil |

2. COMPOSITION CHARACTERISTICS

The **arachidic and higher fatty acid content** of arachis oil should not exceed 48 g/kg.

The **Reichert values** for coconut, palm kernel and babassu oils should be in the ranges 6–8.5, 4–7 and 4.5–6.5, respectively.

The **Polenske values** for coconut, palm kernel and babassu oils should be in the ranges 13–18, 8–12 and 8–10, respectively.

The **Halphen test** for cotton seed oil should be positive.

The **erythrodiol content** of grapeseed oil should be more than 2 percent of the total sterols.

The **total carotenoids** (as beta-carotene) for unbleached palm oil, unbleached palm olein and unbleached palm stearin should be in the range 500–2000, 550–2500 and 300–1500 mg/kg, respectively.

The **Crismer value** for low-erucic acid rapeseed oil should be in the range 67–70.

The **concentration of brassicasterol** in low-erucic acid rapeseed oil should be greater than 5 percent of total sterols.

The **Baudouin test** should be positive for sesame seed oil.

The **gamma oryzanols** in crude rice bran oil should be in the range of 0.9–2.1 percent.

3. CHEMICAL AND PHYSICAL CHARACTERISTICS

Chemical and physical characteristics are given in Table 2.

4. IDENTITY CHARACTERISTICS

Levels of desmethylsterols in vegetable oils as a percentage of total sterols are given in Table 3.

Levels of tocopherols and tocotrienols in vegetable oils are given in Table 4.

5. METHODS OF ANALYSIS AND SAMPLING

Determination of moisture and volatile matter at 105 °C

According to ISO 662: 1998.

Determination of insoluble impurities

According to ISO 663: 2000.

Determination of soap content

According to BS 684 Section 2.5; or AOCS Cc 17-95 (97).

Determination of copper and iron

According to ISO 8294: 1994; or AOAC 990.05; or AOCS Ca 18b-91 (03).

Determination of relative density

According to IUPAC 2.101, with the appropriate conversion factor.

Determination of apparent density

According to ISO 6883: 2000, with the appropriate conversion factor; or AOCS Cc 10c-95 (02).

Determination of refractive index

According to ISO 6320: 2000; or AOCS Cc 7-25 (02).

Determination of saponification value (SV)

According to ISO 3657: 2002; or AOCS Cd 3-25 (03).

Determination of iodine value (IV)

Wijs – ISO 3961: 1996; or AOAC 993.20; or AOCS Cd 1d-1992 (97); or NMKL 39(2003).

The method to be used for specific named vegetable oils is stipulated in the standard.

Determination of unsaponifiable matter

According to ISO 3596: 2000; or ISO 18609: 2000; or AOCS Ca 6b-53 (01).

Determination of peroxide value (PV)

According to AOCS Cd 8b-90 (03); or ISO 3960: 2001.

Determination of total carotenoids

According to BS 684 Section 2.20.

Determination of acidity

According to ISO 660: 1996, amended 2003; or AOCS Cd 3d-63 (03), or AOCS Ca 5a-40.

Determination of free fatty acids

According to ISO 660: 1996, amended 2003; or AOCS Ca 5a-40.

Determination of sterol content

According to ISO 12228: 1999; or AOCS Ch 6-91 (97).

Determination of tocopherol content

According to ISO 9936: 1997; or AOCS Ce 8-89 (97).

Halphen test

According to AOCS Cb 1-25 (97).

Crismer value

According to AOCS Cb 4-35 (97) and AOCS Ca 5a-40 (97).

Baudouin test (modified Villavecchia test or sesame seed oil test)

According to AOCS Cb 2-40 (97).

Reichert value and Polenske value

According to AOCS Cd 5-40 (97).

Determination of gamma oryzanol contentDefinition

This method is used to determine gamma oryzanol content (percentage) in oils from spectrophotometer absorption measurements at the wavelength of maximum absorption near 315 nm.

Scope

Applicable to crude rice bran oil.

Apparatus

- Spectrophotometer – for measuring extinction in the ultraviolet between 310 and 320 nm.
- Rectangular quartz cuvettes – having an optical light path of 1 cm.
- Volumetric flask – 25 ml.
- Filter paper – Whatman no.2, or equivalent.

Reagents

- n-Heptane – Spectrophotometrically pure.

Procedure

- (i) Before using, the spectrophotometer should be properly adjusted to a zero-reading filling both the sample cuvette and the reference cuvette with n-Heptane.
- (ii) Filter the oil sample through filter paper at ambient temperature.
- (iii) Weigh accurately approximately 0.02 g of the sample so prepared into a 25 ml volumetric flask, make up to the mark with n-Heptane.
- (iv) Fill a cuvette with the solution obtained and measure the extinction at the wavelength of maximum absorption near 315 m, using the same solvent as a reference.
- (v) The extinction values recorded must lie within the range 0.3–0.6. If not, the measurements must be repeated using more concentrated or more diluted solutions as appropriate.

Calculation

Calculate gamma oryzanol content as follows:

$$\text{Gamma oryzanol content, \%} = 25 \times (1 / W) \times A \times (1 / E)$$

Where W = mass of sample, g

A = extinction (absorbance) of the solution

E = specific extinction $E^{1\%}_{1\text{cm}} = 359$

Table 2: Chemical and physical characteristics of crude vegetable oils (see Appendix of the standard)

| | Arachis oil | Almond oil | Babassu oil | Coconut oil | Cotton seed oil | Flaxseed /linseed oil | Grape seed oil | Hazelnut oil | Maize oil | Mustard seed oil | Palm oil | Palm oil with a higher oleic acid | Palm kernel oil | Palm kernel olein ^c | Palm kernel stearin ^c |
|-----------------------------------------------|-----------------------|------------------------|-----------------------|-----------------------|-----------------------|---------------------------------------------------|-----------------------|---------------------------------------------------|------------------------|-----------------------|------------------------|-----------------------------------|-----------------------|--------------------------------|----------------------------------|
| Relative density (x °C/water at 20 °C) | 0.909–0.920 x=20°C | 0.911–0.929 x=25°C | 0.914–0.917 x=25°C | 0.908–0.921 x=40°C | 0.918–0.926 x=20°C | 0.925–0.935 x=25°C /water 25°C ; | 0.920–0.926 x=20°C | 0.898–0.915 x=20°C/ water 20°C | 0.917–0.925 x=20°C | 0.910–0.921 x=20°C | 0.891–0.899 x=50°C | 0.896–0.910 x=50°C | 0.899–0.914 x=40°C | 0.906–0.909 x=40°C | 0.902–0.908 x=40°C |
| Apparent density (g/ml) | | | | | | | | | | | 0.889–0.895 (50°C) | ND | | 0.904–0.907 | 0.904–0.906 |
| Refractive index (ND 40 °C) | 1.460–1.465 | 1.468–1.475 at 20°C | 1.448–1.451 | 1.448–1.450 | 1.458–1.466 | 1.472–1.487 at 20°C 1.472–1.475 at 40 °C | 1.467–1.477 | 1.468–1.473 at 20°C; 1.456–1.463 at 40°C | 1.465–1.468 | 1.461–1.469 | 1.454–1.456 at 50°C | 1.459–1.462 | 1.448–1.452 | 1.451–1.453 | 1.449–1.451 |
| Saponification value (mg KOH/g oil) | 187–196 | 183–207 | 245–256 | 248–265 | 189–198 | 185–197 | 188–194 | 188–198 | 187–195 | 168–184 | 190–209 | 189–199 | 230–254 | 231–244 | 244–255 |
| Iodine value | 77–107 | 85–109 | 10–18 | 6.3–10.6 | 100–123 | 170–211 | 128–150 | 81–95 | 103–135 | 92–125 | 50.0–55.0 | 58–75 | 14.1–21.0 | 20–28 | 4–8.5 |
| Unsaponifiable matter (g/kg) | ≤ 10 | ≤20 | ≤ 12 | ≤ 15 | ≤ 15 | ≤20 | ≤ 20 | ≤15 | ≤ 28 | ≤ 15 | ≤ 12 | ≤12 | ≤ 10 | <15 | <15 |
| Stable carbon isotope ratio * | | | | | | | | | –13.71 to –16.36 | | | | | | |

* See the following publications:

Woodbury SP, Evershed RP and Rossell JB (1998). Purity assessments of major vegetable oils based on gamma 13C values of individual fatty acids. *JAOCS*, 75 (3), 371–379.

Woodbury SP, Evershed RP and Rossell JB (1998). Gamma 13C analysis of vegetable oil, fatty acid components, determined by gas chromatography-combustion-isotope ratio mass spectrometry, after saponification or regiospecific hydrolysis. *Journal of Chromatography A*, 805, 249–257.

Woodbury SP, Evershed RP, Rossell JB, Griffith R and Farnell P (1995). Detection of vegetable oil adulteration using gas chromatography combustion/isotope ratio mass spectrometry. *Analytical Chemistry*, 67 (15), 2685–2690.

Ministry of Agriculture, Fisheries and Food (1996). Authenticity of single seed vegetable oils. Working Party on Food Authenticity, MAFF, UK.

Table 2: Chemical and physical characteristics of crude vegetable oils (see Appendix of the standard) (continued)

| | Palm olein ^c | Palm stearin ^c | Palm super olein ^c | Pistachio oil | Rapes eed oil | Rapes eed oil (low-erucic acid) | Rice bran oil | Safflower seed oil | Safflower seed oil (high-oleic acid) | Sesame seed oil | Soyab ean oil | Sunflo -wer seed oil | Sunflower seed oil (high-oleic acid) | Sunflower seed oil (mid-oleic acid) | Walnut oil |
|-----------------------------------------------|-------------------------|---------------------------|-------------------------------|---------------------------------------------------|-----------------------|---------------------------------|-----------------|-----------------------|---------------------------------------------------|-----------------------|-----------------------|-----------------------|--------------------------------------|-------------------------------------|---------------------------------------------------|
| Relative density (x °C/water at 20 °C) | 0.899–0.920 x=40°C | 0.881–0.891 x=60°C | 0.900–0.925 x=40°C | 0.915–0.920 15.5°C/water 15.5°C | 0.910–0.920 x=20°C | 0.914–0.920 x=20°C | 0.910– 0.929 | 0.922–0.927 x=20°C | 0.913–0.919 x=20°C; 0.910–0.916 x=25°C | 0.915–0.924 x=20°C | 0.919–0.925 x=20°C | 0.916–0.923 x=20°C | 0.909–0.915 x=25°C | 0.914–0.916 x=20°C | 0.923–0.925 25°C/water 25°C |
| Apparent density (g/ml) | 0.896–0.898 at 40°C | 0.881–0.885 at 60°C | 0.886–0.900 at 40°C | | | | | | 0.912–0.914 at 20°C | | | | | | |
| Refractive index (ND 40 °C) | 1.458–1.460 | 1.447–1.452 at 60°C | 1.459–1.460 | 1.467–1.470 at 25°C; 1.460–1.466 at 40°C | 1.465–1.469 | 1.465–1.467 | 1.46–1.473 | 1.467–1.470 | 1.460–1.464 at 40°C; 1.466–1.470 at 25°C | 1.465–1.469 | 1.466–1.470 | 1.461–1.475 | 1.467–1.471 at 25°C | 1.461–1.471 at 25°C | 1.472–1.475 at 25°C; 1.469–1.471 at 40°C |
| Saponification value (mg KOH/g oil) | 194–202 | 193–205 | 180–205 | 187–196 | 168–181 | 182–193 | 180–199 | 186–198 | 186–194 | 186–195 | 189–195 | 187–194 | 182–194 | 190–191 | 189–198 |
| Iodine value | ≥ 56 | ≤ 48 | ≥ 60 | 84–98 | 94–120 | 105–126 | 90–115 | 136–148 | 80–100 | 104–120 | 124–139 | 118–141 | 78–90 | 94–122 | 132–162 |
| Unsaponifiable matter (g/kg) | ≤ 13 | ≤ 9 | ≤ 13 | ≤30 | ≤ 20 | ≤ 20 | ≤ 65 | ≤ 15 | ≤ 10 | ≤ 20 | ≤ 15 | ≤ 15 | ≤ 15 | ≤15 | ≤20 |

Table 3: Levels of desmethylsterols in crude vegetable oils from authentic samples^{a,c} as a percentage of total sterols (see Appendix of the standard)

| | Arachis oil | Almond oil | Babassu oil | Coconut oil | Cotton seed oil | Flaxseed/linseed oil | Grapeseed oil | Hazelnut oil | Maize oil | Palm oil | Palm oil with higher oleic acid ^a | Palm olein ^c | Palm kernel oil | Palm kernel olein ^c | Palm kernel stearin ^c |
|------------------------------|-------------|------------|-------------|-------------|-----------------|----------------------|---------------|--------------|------------|-----------|----------------------------------------------|-------------------------|-----------------|--------------------------------|----------------------------------|
| Cholesterol | ND–3.8 | ND–1.0 | 1.2–1.7 | ND–3.0 | 0.7–2.3 | ND | ND–0.5 | ND–1.1 | 0.2–0.6 | 2.6–6.7 | 1.7–4.7 | 2.6–7.0 | 0.6–3.7 | 1.5–1.9 | 1.4–1.7 |
| Brassicasterol | ND–0.2 | ND–0.3 | ND–0.3 | ND–0.3 | 0.1–0.3 | ND–1.0 | ND–0.2 | ND | ND–0.2 | ND | ND–0.4 | ND | ND–0.8 | ND–0.2 | ND–2.2 |
| Campesterol | 12.0–19.8 | 2.0–5.0 | 17.7–18.7 | 6.0–11.2 | 6.4–14.5 | 25.0–31.0 | 7.5–14.0 | 3.0–6.2 | 16.0–24.1 | 18.7–27.5 | 16.6–21.9 | 12.5–39.0 | 8.4–12.7 | 7.9–9.1 | 8.2–9.7 |
| Stigmasterol | 5.4–13.2 | 0.4–4.0 | 8.7–9.2 | 11.4–15.6 | 2.1–6.8 | 7.0–9.0 | 7.5–12.0 | ND–2.0 | 4.3–8.0 | 8.5–13.9 | 11.2–15.5 | 7.0–18.9 | 12.0–16.6 | 13.4–14.7 | 14.1–15.0 |
| Beta-sitosterol | 47.4–69.0 | 73.0–86.0 | 48.2–53.9 | 32.6–50.7 | 76.0–87.1 | 45.0–53.0 | 64.0–70.0 | 76.45–96.0 | 54.8–66.6 | 50.2–62.1 | 57.2–67.0 | 45.0–71.0 | 62.6–73.1 | 67.1–69.2 | 67.0–70.0 |
| Delta-5-avenasterol | 5.0–18.8 | 5.0–14.0 | 16.9–20.4 | 20.0–40.7 | 1.8–7.3 | 8.0–12.0 | 1.0–3.5 | 1.0–5.1 | 1.5–8.2 | ND–2.8 | ND–1.9 | ND–3.0 | 1.4–9.0 | 3.3–4.6 | 3.3–4.1 |
| Delta-7-stigmastenol | ND–5.1 | ND–3.0 | ND | ND–3.0 | ND–1.4 | ND | 0.5–3.5 | ND–4.3 | 0.2–4.2 | 0.2–2.4 | ND–0.2 | ND–3.0 | ND–2.1 | ND–0.6 | ND–0.3 |
| Delta-7-avenasterol | ND–5.5 | ND–3.0 | 0.4–1.0 | ND–3.0 | 0.8–3.3 | ND | 0.5–1.5 | ND–1.6 | 0.3–2.7 | ND–5.1 | ND–1.0 | ND–6.0 | ND–1.4 | ND–0.5 | ND–0.3 |
| Others | ND–1.4 | ND–6.0 | ND | ND–3.6 | ND–1.5 | ND | ND–5.1 | ND | ND–2.4 | ND | ND–3.8 | ND–10.4 | ND–2.7 | 2.9–3.7 | 1.0–3.0 |
| Total sterols (mg/kg) | 900–2900 | 1590–4590 | 500–800 | 400–1200 | 2700–6400 | 2300–6900 | 2000–7000 | 1200–1800 | 7000–22100 | 300–700 | 519–1723 | 270–800 | 700–1400 | 816–1339 | 775–1086 |

| | Palm stearin ^c | Palm superolein ^c | Pistachio oil | Rapeseed oil (low- erucic acid) | Rice bran oil | Safflower seed oil | Safflower seed oil (high-oleic acid) | Sesame seed oil | Soyabean oil | Sunflower seed oil | Sunflower seed oil (high-oleic acid) | Sunflower seed oil (mid-oleic acid) | Walnut oil |
|----------------------------------|------------------------------|---------------------------------|------------------|------------------------------------------|---------------------|-----------------------|-----------------------------------------------|--------------------|-----------------|-----------------------|-----------------------------------------------|----------------------------------------------|---------------|
| Cholesterol | 2.5–5.0 | 2.0–3.5 | ND–1.0 | ND–1.3 | ND– 0.5 | ND–0.7 | ND–0.5 | 0.1–0.5 | 0.2–1.4 | ND–0.7 | ND–0.5 | 0.1–0.2 | ND |
| Brassicasterol | ND | ND | ND | 5.0–13.0 | ND– 0.3 | ND–0.4 | ND–2.2 | 0.1–0.2 | ND–0.3 | ND–0.2 | ND–0.3 | ND–0.1 | ND |
| Campesterol | 15.0–26.0 | 22.0–26.0 | 4.0–6.5 | 24.7–38.6 | 11.0– 35.0 | 9.2–13.3 | 8.9–19.9 | 10.1–20.0 | 15.8–24.2 | 6.5–13.0 | 5.0–13.0 | 9.1–9.6 | 4.0–6.5 |
| Stigmasterol | 9.0–15.0 | 18.2–20.0 | 0.5–7.5 | 0.2–1.0 | 6.0– 40.0 | 4.5–9.6 | 2.9–8.9 | 3.4–12.0 | 14.9–19.1 | 6.0–13.0 | 4.5–13.0 | 9.0–9.3 | ND |
| Beta-sitosterol | 50.0–60.0 | 55.0–70.0 | 75.0–94.0 | 45.1–57.9 | 25.0– 67.0 | 40.2–50.6 | 40.1–66.9 | 57.7–61.9 | 47.0–60 | 50–70 | 42.0–70 | 56–58 | 70.0– 92.0 |
| Delta-5- avenasterol | ND–3.0 | 0–1.0 | 6.0–8.0 | 2.5–6.6 | ND– 9.9 | 0.8–4.8 | 0.2–8.9 | 6.2–7.8 | 1.5–3.7 | ND–6.9 | 1.5–6.9 | 4.8–5.3 | 0.5–6.0 |
| Delta-7- stigmastenol | ND–3.0 | 0–0.3 | ND–0.7 | ND–1.3 | ND– 14.1 | 13.7–24.6 | 3.4–16.4 | 0.5–7.6 | 1.4–5.2 | 6.5–24.0 | 6.5–24.0 | 7.7–7.9 | ND–3.0 |
| Delta-7- avenasterol | ND–3.0 | 0–0.3 | ND–0.5 | ND–0.8 | ND– 4.4 | 2.2–6.3 | ND–8.3 | 1.2–5.6 | 1.0–4.6 | 3.0–7.5 | ND–9.0 | 4.3–4.4 | ND–2.0 |
| Others | ND–5.0 | 0–2.0 | ND | ND–4.2 | 7.5– 12.8 | 0.5–6.4 | 4.4–11.9 | 0.7–9.2 | ND–1.8 | ND–5.3 | 3.5–9.5 | 5.4–5.8 | ND |
| Total sterols (mg/kg) | 250–500 | 100 | 1840–4500 | 4500– 11300 | 10500– 31000 | 2100– 4600 | 2000– 4100 | 4500– 19000 | 1800–4500 | 2400–5000 | 1700–5200 | | 500– 1760 |

ND - Non-detectable, defined as ≤ 0.05 %

Table 4: Levels of tocopherols and tocotrienols in crude vegetable oils from authentic samples^{a, b} (mg/kg) (see Appendix of the standard)

| | Arachis oil | Almond oil | Babassu oil | Coconut oil | Cottonseed oil | Flaxseed/linseed oil | Grape seed oil | Hazelnut oil | Maize oil | Palm oil | Palm oil with a higher oleic acid | Palm olein ^c | Palm kernel oil | Palm kernel olein ^c | Palm kernel stearin ^c |
|--------------------------|-------------|------------|-------------|-------------|----------------|----------------------|----------------|--------------|-----------|----------|-----------------------------------|-------------------------|-----------------|--------------------------------|----------------------------------|
| Alpha-tocopherol | 49–373 | 20–545 | ND | ND–17 | 136–674 | 2–265 | 16–38 | 100–420 | 23–573 | 4–193 | 49–188 | 30–280 | ND–44 | ND–11 | ND–10 |
| Beta-tocopherol | ND–41 | ND–10 | ND | ND–11 | ND–29 | ND | ND–89 | 6–12 | ND–356 | ND–234 | ND | ND–250 | ND–248 | ND–6 | ND–2 |
| Gamma-tocopherol | 88–389 | ND–104 | ND | ND–14 | 138–746 | 100–712 | ND–73 | 18–194 | 268–2468 | ND–526 | 4–138 | ND–100 | ND–257 | ND–3 | ND–1 |
| Delta-tocopherol | ND–22 | ND–5 | ND | ND | ND–21 | ND–14 | ND–4 | ND–10 | 23–75 | ND–123 | ND–31 | ND–100 | ND | ND–4 | ND |
| Alpha-tocotrienol | ND | ND | 25–46 | ND–44 | ND | ND | 18–107 | ND | ND–239 | 4–336 | 74–256 | 50–500 | ND | ND–70 | ND–73 |
| Gamma-tocotrienol | ND | ND | 32–80 | ND–1 | ND | ND | 115–205 | ND | ND–450 | 14–710 | 406–887 | 20–700 | ND–60 | 1–10 | ND–8 |
| Delta-tocotrienol | ND | ND | 9–10 | ND | ND | ND | ND–3.2 | ND | ND–20 | ND–377 | 33–86 | 40–120 | ND | ND–2 | ND–1 |
| Total (mg/kg) | 170–1300 | 20–600 | 60–130 | ND–50 | 380–1200 | 150–905 | 240–410 | 200–600 | 330–3720 | 150–1500 | 562–1417 | 300–1800 | ND–260 | ND–90 | ND–89 |

| | Palm stearin ^c | Palm superolein ^c | Pistachio oil | Rapeseed oil (low-erucic acid) | Rice bran oil | Safflower seed oil | Safflower seed oil (high-oleic acid) | Sesame seed oil | Soyabean oil | Sunflower seed oil | Sunflower seed oil (high-oleic acid) | Sunflower seed oil (mid-oleic acid) | Walnut oil |
|--------------------------|---------------------------|------------------------------|---------------|--------------------------------|---------------|--------------------|--------------------------------------|-----------------|--------------|--------------------|--------------------------------------|-------------------------------------|------------|
| Alpha-tocopherol | ND–100 | 130–240 | 10–330 | 100–386 | 49–583 | 234–660 | 234–660 | ND–3.3 | 9–352 | 403–935 | 400–1090 | 488–668 | ND–170 |
| Beta-tocopherol | ND–50 | ND–40 | ND | ND–140 | ND – 47 | ND–17 | ND–13 | ND | ND–36 | ND–45 | 10–35 | 19–52 | ND–110 |
| Gamma-tocopherol | ND–50 | ND–40 | 0–100 | 189–753 | ND–212 | ND–12 | ND–44 | 521–983 | 89–2307 | ND–34 | 3–30 | 2.3–19.0 | 120–400 |
| Delta-tocopherol | ND–50 | ND–30 | ND–50 | ND–22 | ND–31 | ND | ND–6 | 4–21 | 154–932 | ND–7.0 | ND–17 | ND–1.6 | ND–60 |
| Alpha-tocotrienol | 20–150 | 170–300 | ND | ND | ND–627 | ND | ND | ND | ND–69 | ND | ND | ND | ND |
| Gamma-tocotrienol | 10–500 | 230–420 | ND | ND | 142–790 | ND–12 | ND–10 | ND–20 | ND–103 | ND | ND | ND | ND |
| Delta-tocotrienol | 5–150 | 60–120 | ND | ND | ND – 59 | ND | ND | ND | ND | ND | ND | ND | ND |
| Total (mg/kg) | 100–700 | 400–1400 | 100–600 | 430–2680 | 191–2349 | 240–670 | 250–700 | 330–1010 | 600–3370 | 440–1520 | 450–1120 | 509–741 | 309–455 |

ND - Non-detectable.

Note: Maize oil also contains ND–52 mg/kg beta tocotrienol.

NOTES

¹ FAO and WHO. 1995. *General Standard for Food Additives*. Codex Alimentarius Standard, No. CXS 192-1995. Codex Alimentarius Commission. Rome.

² FAO and WHO. 2008. *Guidelines for the Use of Flavourings*. Codex Alimentarius Guideline, No. CXG 66-2008. Codex Alimentarius Commission. Rome.

³ FAO and WHO. 1995. *General Standard for Contaminants and Toxins in Food and Feed*. Codex Alimentarius Standard, No. CXS 193-1995. Codex Alimentarius Commission. Rome.

⁴ FAO and WHO. 1969. *General Principles of Food Hygiene*. Codex Alimentarius Code of Practice, No. CXC 1-1969. Codex Alimentarius Commission. Rome.

⁵ FAO and WHO. 1997. *Principles and Guidelines for the Establishment and Application of Microbiological Criteria Related to Foods*. Codex Alimentarius Guideline, No. CXG 21-1997. Codex Alimentarius Commission. Rome.

⁶ FAO and WHO. 1985. *General Standard for the Labelling of Pre-packaged Foods*. Codex Alimentarius Standard, No. CXS 1-1985. Codex Alimentarius Commission. Rome.