

CODEX ALIMENTARIUS

INTERNATIONAL FOOD STANDARDS



Food and Agriculture
Organization of
the United Nations



World Health
Organization

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GENERAL STANDARD FOR EDIBLE FUNGI AND FUNGUS PRODUCTS

CXS 38-1981

Adopted in 1981. Amended in 2022, 2023.

2022 Amendments

Following decisions taken at the Forty-fifth Session of the Codex Alimentarius Commission in December 2022, amendments were made in Section 8.4 Labelling of non-retail containers.

2023 Amendments

Following decisions taken at the Forty-sixth Session of the Codex Alimentarius Commission in December 2023, amendments were made in Section 9. Methods of analysis and sampling.

1. SCOPE

This standard (formerly CAC/RS 28-1970) contains general requirements applicable to all edible fungi, whether fresh or processed, permitted for sale by the competent authorities in the consuming countries, except canned cultivated mushrooms of the genus *Agaricus*. Different requirements for the products covered by this standard may be laid down in group of products standards or in individual standards.

2. DESCRIPTION

2.1 Definition of products

2.1.1 Edible fungi means fruit bodies of a specific plant group – fungi which either grow wild or are cultivated and which after necessary processing are suitable for use as a food.

2.1.2 Species means botanical species and closely related varieties, i.e. varieties of *Boletus edulis* and round or pointed *Morchella* shall be regarded as being of the same species.

2.1.3 Fresh fungi means edible fungi sorted and packed, delivered to the consumer as soon as possible after they have been picked.

2.1.4 Mixed fungi means the product prepared by mixing edible fungi or recognizable parts of edible fungi of different species according to established proportion after being sorted in accordance with subsection 2.4 of this standard.

2.1.5 Fungus products means dried edible fungi (including freeze-dried fungi, fungus grits, fungus powder), pickled fungi, salted fungi, fermented fungi, fungi in vegetable oils, quick-frozen fungi, sterilized fungi, fungus extract, fungus concentrate and dried fungus concentrate.

2.1.6 Dried fungi means the product obtained by drying or freeze-drying edible fungi of one species, whether whole or sliced.

2.1.7 Fungus grits means coarsely ground dried edible fungi of one species.

2.1.8 Fungus powder means dried edible fungi of one species ground so finely as to allow the powder to pass through a 200-micron mesh sieve.

2.1.9 Pickled fungi means fresh or previously preserved edible fungi of one or more species appropriately prepared after previous cleaning, washing and blanching, soaked in vinegar and with or without the addition of salt, spices, sugars, vegetable oils, acetic, lactic, citric or ascorbic acid, and then pasteurized in hermetically-sealed containers.

2.1.10 Salted fungi means fresh edible fungi of one species, either whole or sliced, preserved in brine after previous cleaning, washing and blanching.

2.1.11 Fermented fungi means fresh edible fungi of one species preserved by salt and by lactic acid fermentation.

2.1.12 Quick frozen fungi means fresh edible fungi of one species which, after cleaning, washing and blanching, are subjected to a freezing process in appropriate equipment and comply with the conditions laid down hereafter in this section and in subsection 7.2 of this standard. This freezing operation shall be carried out in such a way that the range of temperature of maximum crystallization is passed quickly. The quick-freezing process shall not be regarded as complete unless and until the product temperature has reached -18 °C (0 °F) at the thermal centre after thermal stabilization.

2.1.13 Fungus extract means a product concentrated from fresh edible fungi juice or from dried fungi water of edible fungi of one or more species with the addition of salt and which is concentrated to 7 percent of saltless extract.

2.1.14 Fungus concentrate means a product concentrated from fresh edible fungi juice or from dried fungi water of edible fungi of one or more species with the addition of salt and which is concentrated to 24 percent of saltless extract.

2.1.15 Dried fungus concentrate means the dried product obtained from fungus extract or fungus concentrate.

2.1.16 Sterilized fungi means edible fungi, either fresh, salted or frozen, of one or more species, whole or sliced, packed in airtight containers in water and salt, and heat treated to a degree guaranteeing the resistance of the product to spoilage.

2.1.17 Fungi in olive oil and other vegetable oils means edible fungi either fresh or previously salted, of one species, whole or sliced, packed in airtight containers in olive oil or other edible vegetable oil and heat treated to a degree guaranteeing the resistance of the product to spoilage.

2.1.18 Cakes or loaves of *fungus mycelium*.

2.2 Definition of defects

- 2.2.1 Damaged fungi** means fungi with more than quarter of the cap missing.
- 2.2.2 Crushed fungi** means parts of fungi passing through a sieve having a 15 x 15 mm mesh for fresh fungi and a 5 x 5 mm mesh for dried fungi.
- 2.2.3 Spoiled fungi** means fungi which are brownish or rotten as a result of attack by microorganisms and/or mould.
- 2.2.4 Maggot-damaged fungi** means fungi having holes caused by maggots.
- 2.2.5 Seriously maggot-damaged fungi** means fungi having four or more holes caused by maggots.
- 2.2.6 Organic impurities of vegetable origin** means admixtures of other edible fungi, parts of plants such as leaves and pine needles.
- 2.2.7 Mineral impurities** means those substances which, after ashing, remain as insoluble residues in hydrochloric acid.

2.3 Main species

All edible fungi permitted for sale by the competent authorities in the consuming countries.

2.4 Examination and sorting of raw material

As there are edible fungi which closely resemble inedible or poisonous fungi, care shall be taken to ensure, when the fungi are being picked, that only those of the same edible species are collected. Where such care has not been adequately exercised, the edible fungi species shall be sorted from the collected fungi, before they are marketed, preserved or used in the preparation of fungus products. Wild fungi which are to be marketed or preserved, or used in the preparation of fungus products shall be carefully examined by an expert to determine whether there are any inedible fungi amongst them, and such inedible fungi shall be removed.

3. ESSENTIAL COMPOSITION AND QUALITY FACTORS

3.1 Fresh fungi

- 3.1.1 Condition:** Fresh edible fungi shall be healthy, i.e. not spoiled, practically clean, firm, undamaged, free, as far as possible, from maggot damage and shall possess the flavour and taste appropriate for the species.
- 3.1.2 Composition:** The number of stalks shall not exceed the number of caps.
- 3.1.3 Tolerances for defects**

3.1.3.1 Wild-growing fungi

- | | |
|---|--|
| a) Mineral impurities | not more than 1% m/m |
| b) Organic impurities of vegetable origin | not more than 0.3% m/m |
| c) Content of Maggot-damaged fungi | not more than 6% m/m of total damage including not more than 2% m/m serious damage |

3.1.3.2 Cultivated fungi

- | | |
|---|---|
| a) Mineral impurities | not more than 0.5% m/m |
| b) Organic impurities (including compost material): | |
| for uncut fungi | not more than 8% m/m |
| for cut fungi | not more than 1% m/m |
| (c) Content of maggot-damaged fungi | not more than 1% m/m of total damage including not more than 0.5% m/m, serious damage |

3.2 Fungus products – general requirements

- 3.2.1 Raw material:** only fresh edible fungi which have been treated or processed immediately after they have been picked, before deterioration sets in, may be used in the preparation of fungus products. Both as raw material and as preserved fungi, they shall be healthy, clean, undamaged, free, as far as possible, of maggot damage and possess the flavour and taste appropriate to the species.

3.2.2 Permitted ingredients

Fungus products may contain salt (sodium chloride), vinegar, spices and herbs, sugars (any carbohydrate sweetening matter), refined edible vegetable oil, refined edible animal fat, butter, milk, milk powder, cream, water and wine.

3.2.3 Styles

Processed fungi may be presented in various styles, e.g. whole with stalks, whole caps (buttons) without stalks, slices, pieces and stalks, grits, powder or concentrate,

3.2.4 Other styles

Any other presentation of the product shall be permitted provided that the product:

- a) is sufficiently distinctive from other forms of presentation laid down in this standard;
- b) meets all relevant requirements of this standard, including requirements relating to limitations on defects, drained weight, and any other requirements in this standard which are applicable to that style in the standard which most closely resembles the style or styles intended to be provided for under this provision; and
- c) is adequately described on the label to avoid confusing or misleading the consumer.

3.2.5 Composition

Except in the case of fungus products consisting entirely of caps or where the addition of stalks is stated on the label in accordance with the provisions of subsection 8.1.6, the number of stalks shall not exceed the number of caps.

3.3 Fungus products – special requirements

3.3.1 Dried fungi

3.3.1.1 Quality criteria

- a) Colour and flavour shall be appropriate to the species.
- b) Water content

Product	Maximum water content
Freeze-dried fungi	6% m/m
Dried (other than freeze-dried) fungi	12% m/m
Dried fungus Shii-ta-ke	13% m/m

3.3.1.2 Permitted defects

- a) Mineral impurities not more than 2% m/m
- b) Organic impurities of vegetable origin not more than 0.02% m/m except for Shii-ta-ke mushrooms, for which the maximum shall be 1% m/m
- c) Content of maggot-damaged fungi:

wild-growing fungi	not more than 20% m/m of total damage, including serious damage
cultivated fungi	not more than 1% m/m of total damage, including not more than 0.5% m/m serious damage.

3.3.2 Fungus grits and fungus powder

3.3.2.1 Quality criteria

- a) Water content of fungus grits not more than 13% m/m
- b) Water content of fungus powder not more than 9% m/m

3.3.2.2 Permitted defects

Mineral impurities not more than 2% m/m

3.3.3 Pickled fungi**3.3.3.1 Permitted ingredients**

- a) Salt (sodium chloride) not more than 2.5% m/m
- b) Sugars not more than 2.5% m/m
- c) Vinegar not more than 2% m/m expressed as acetic acid

3.3.3.2 Tolerances for defects

- a) Mineral impurities not more than 0.1% m/m
- b) Organic impurities of vegetable origin not more than 0.02% m/m
- c) Content of maggot-damaged fungi:
 - wild-growing fungi not more than 6% m/m of total damage including not more than 2% m/m serious damage.
 - cultivated fungi not more than 1% m/m of total damage including not more than 0.5% m/m serious damage.

3.3.4 Fermented fungi**3.3.4.1 Essential composition and quality factor**

Lactic acid, naturally occurring as a result of the fermentation process not less than 1% m/m

3.3.4.2 Permitted ingredients

Salt (sodium chloride) not less than 3% m/m and not more than 6% m/m

3.3.4.3 Tolerances for defects

- a) Mineral impurities not more than 0.2% m/m
- b) Organic impurities of vegetable origin not more than 0.1% m/m
- c) Content of maggot-damaged fungi not more than 4% m/m

3.3.5 Fungi in olive oil and other vegetable oils**3.3.5.1 Permitted ingredients**

- a) Salt (sodium chloride) not more than 1% m/m
- b) Olive oil or other edible vegetable oil

3.3.5.2 Tolerances for defects

- a) Mineral impurities not more than 0.1% m/m
- b) Organic impurities of vegetable origin not more than 0.02% m/m
- c) Maggot-damaged fungi:
 - wild-growing fungi not more than 6% m/m of total damage including not more than 2% m/m serious damage
 - cultivated fungi not more than 1% m/m of total damage including not more than 0.5% m/m serious damage

3.3.6 Quick-frozen fungi**3.3.6.1 Tolerances for defects**

- | | |
|---|---|
| a) Mineral impurities | not more than 0.2% m/m |
| b) Organic impurities of vegetable origin | not more than 0.02% m/m |
| c) Content of maggot-damaged fungi: | |
| wild-growing fungi | not more than 6% m/m of total damage including not more than 2% m/m serious damage |
| cultivated fungi | not more than 1% m/m of total damage including not more than 0.5% m/m serious damage. |

3.3.7 Sterilized fungi**3.3.7.1 Permitted ingredient**

Salt (sodium chloride)	not more than 2% m/m
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3.3.7.2 Tolerances for defects

- | | |
|---|--|
| a) Mineral impurities | not more than 0.2% m/m |
| b) Organic impurities of vegetable origin | not more than 0.02% m/m |
| c) Content of maggot-damaged fungi: | |
| wild-growing fungi | not more than 6% m/m of total damage including not more than 2% m/m serious damage |
| cultivated fungi | not more than 1% m/m of total damage including not more than 0.5% m/m serious damage |

3.3.8 Fungus extract and fungus concentrate**3.3.8.1 Permitted ingredient**

Salt (sodium chloride)	not more than 20% m/m
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3.3.8.2 Tolerances for defects

- | | | |
|---|---|------|
| a) Mineral impurities |) | |
| b) Organic impurities of vegetable origin |) | none |
| |) | |

3.3.9 Dried fungus concentrate**3.3.9.1 Quality criteria**

Water content	not more than 9% m/m
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3.3.9.2 Permitted ingredient

Salt (sodium chloride)	not more than 5% m/m
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3.3.9.3 Permitted defects

- | | | |
|---|---|------|
| a) Mineral impurities |) | |
| b) Organic impurities of vegetable origin |) | none |
| |) | |

3.3.10 Salted fungi (semi-processed product)**3.3.10.1 Permitted ingredient**

Salt (sodium chloride)	not less than 15% m/m and not more than 18% m/m
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3.3.10.2 Tolerances for defects

- | | |
|---|---|
| a) Mineral impurities | not more than 0.3% m/m |
| b) Organic impurities of vegetable origin | not more than 0.05% m/m |
| c) Content of maggot-damaged fungi: | |
| wild-growing fungi | not more than 6% m/m of total damage including not more than 2% m/m serious damage |
| cultivated fungi | not more than 1% m/m of total damage including not more than 0.5% m/m serious damage. |

4. FOOD ADDITIVES

Additive	Maximum level
4.1 Acetic acid)	
4.2 Lactic acid)	Not limited except as provided for below in respect
4.3 Citric acid)	of pickled fungi and sterilized fungi
4.4 Ascorbic acid)	
4.5 Acetic	20 g/kg in pickled fungi
4.6 Lactic acid)	5 g/kg singly or in combination in sterilized
4.7 Citric acid)	fungi

5. HYGIENE

- 5.1 It is recommended that the product 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),¹ and other codes of practice recommended by the Codex Alimentarius Commission which are relevant to this product.
- 5.2 To the extent possible in good manufacturing practice, the product shall be free from objectionable matter.
- 5.3 When tested by appropriate methods of sampling and examination, the product:
- shall be free from microorganisms in amounts which may represent a hazard to health;
 - shall be free from parasites which may represent a hazard to health; and
 - shall not contain any substance originating from microorganisms in amounts which may represent a hazard to health.
- 5.4 Products covered by this standard which are in the dried or dehydrated form should be prepared in accordance with the provisions of the *Code of Hygienic Practice for Dehydrated Fruits and Vegetables including Edible Fungi* (CXC 5-1971)² recommended by the Codex Alimentarius Commission.
- 5.5 Products covered by this standard which have been pasteurized in hermetically-sealed containers should be prepared in accordance with the *Code of Hygienic Practice for Canned Fruit and Vegetable Products* (CXC 2-1969)³ recommended by the Codex Alimentarius Commission.
- 5.6 Products covered by this standard which are in the quick-frozen state should be prepared in accordance with the *Code of Hygienic Practice for the Processing and Handling of Quick-Frozen Foods* (CXC 8-1976).⁴
- 5.7 Products covered by this standard which do not fall within one of the categories at 5.4, 5.5 and 5.6 above, for example, fresh edible fungi, should be prepared in accordance with the relevant sections of the *General Principles of Food Hygiene* (CXC 1-1969).¹

6. WEIGHTS AND MEASURES**6.1 Fill of container**

Minimum fill: The container shall be well filled with mushrooms and the product (including packing medium) shall occupy not less than 90 percent of the water capacity of the container. The water capacity of the container is the volume of distilled water at 20 °C which the sealed container will hold when completely filled.

6.2 Minimum drained weight

The drained weight of the product shall be not less than the following percentages, calculated on the basis of the weight of distilled water at 20 °C which the sealed container will hold:

	Container size 0.5 l or less	Container size more than 0.5 l
Regular packs)		
Vinegar packs)	50% m/m	53% m/m
Wine packs)		

7. PACKING, STORAGE AND TRANSPORTATION

- 7.1 The packaging used for fresh fungi shall be perforated to allow the free passage of air, if needed.
- 7.2 The product shall be maintained at a low temperature such as will maintain the quality during transportation, storage and distribution up to and including the time of final sale. The recognized practice of thawing and repacking products under controlled conditions followed by the application of the quick-freezing process as defined in subsection 2.1.12 of this standard is permitted.
- 7.3 In the case of a) Dried Fungi, and b) Fungus Grits and Fungus Powder, attention is directed to the need to prevent these products from absorbing moisture and being attacked by insects, particularly moths and mites.

8. LABELLING

In addition to the requirements of the *General Standard for the Labelling of Pre-packaged Foods* (CXS 1-1985),⁵ the following specific provisions apply:

8.1 The name of the food

- 8.1.1 Products complying with the definitions and other requirements of this standard shall be appropriately designated to indicate their true nature. The terms "fungus" and "fungi" may be replaced by the terms which have customarily been used to describe the genus or species concerned in the country in which the product is intended to be sold, e.g. "mushroom" or "mushrooms" for the genus *Agaricus*. The method of processing to which the product has been subjected, e.g. "dried", "sterilized" or "quick-frozen", shall be indicated on the label.
- 8.1.2 In the case of fresh, dried, salted, quick-frozen, fermented, pickled and canned fungi, the common name of the species of fungi shall be stated in addition to the word "fungi". The scientific name of the species shall also be stated.
- 8.1.3 In the case of fungus products consisting of more than one species of fungus, the word "mixed" shall form part of the designation. Additionally, the name (including scientific name) of the species shall be stated on the label.
- 8.1.4 In the case of fungus products made from fungi other than fresh fungi, there shall be a statement on the label indicating the method of processing to which the fungi used in the preparation of the final product have been subjected.
- 8.1.5 Where salted fungi are used as raw material for the preparation of other fungus products, there shall be a statement on the label indicating that salted fungi have been used.
- 8.1.6 If stalks have been added to fresh fungi or fungus products, the words "stalks added" shall appear on the label.
- 8.2 **Other styles** – If the product is produced in accordance with the other styles provision (subsection 3.2.4), the label shall contain in close proximity to the name of the product such additional words or phrases that will avoid misleading or confusing the consumer.

8.3 List of ingredients

A complete list of ingredients shall be declared on the label in descending order of proportion except for dried fungi.

8.4 Labelling of non-retail containers

The labelling of non-retail containers should be in accordance with the *General Standard for the Labelling of Non-Retail Containers of Foods* (CXS 346-2021).⁶

9. METHODS OF ANALYSIS AND SAMPLING

For checking the compliance with this standard, the methods of analysis and sampling contained in the *Recommended Methods of Analysis and Sampling* (CXS 234-1999)⁷ relevant to the provisions in this standard, shall be used.

NOTES

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

² FAO and WHO. 1971. *Code of Hygienic Practice for Dehydrated Fruits and Vegetables including Edible Fungi*. Codex Alimentarius Code of Practice, No. CXC 5-1971. Codex Alimentarius Commission. Rome.

³ FAO and WHO. 1969. *Code of Hygienic Practice for Canned Fruit and Vegetable Products*. Codex Alimentarius Code of Practice, No. CXC 2-1969. Codex Alimentarius Commission. Rome.

⁴ FAO and WHO. 1976. *Code of Hygienic Practice for the Processing and Handling of Quick-Frozen Foods*. Codex Alimentarius Code of Practice, No. CXC 8-1976. Codex Alimentarius Commission. Rome.

⁵ FAO and WHO. 1985. *General Standard for the Labelling of Pre-packaged Foods*. Codex Alimentarius Standard, No. CXS 1-1985. Codex Alimentarius Commission. Rome.

⁶ FAO and WHO. 2021. *General Standard for the Labelling of Non-Retail Containers of Foods*. Codex Alimentarius Standard, No. CXS 346-2021. Codex Alimentarius Commission. Rome.

⁷ FAO and WHO. 1999. *Recommended Methods of Analysis and Sampling*. Codex Alimentarius Standard, No. CXS 234-1999. Codex Alimentarius Commission. Rome.