
Dehydrated vegetables – Specification

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Foreword

This Ethiopian Standard has been prepared under the direction of the Technical committee for fruit and vegetable (TC-13) and published by Ethiopian Standard Agency (ESA).

The standard has been developed to address observed needs and to support the local industry in order to make progress through upraising competitiveness and maintain comparative market advantage both domestically and internationally.

In the preparation of this standard reference has been made to the following:

KS 435, *Dehydrated vegetables- Specification.*

CXC 5, *Code of Hygienic Practice for Dehydrated Fruits and Vegetables including Edible Fungi.*

Codex Stan 192, *General standard for food additives.*

Codex Stan 193, *General standard for contaminants and toxins in food and feed.*

Acknowledgment has been made for the use of information from the above publications.

Dehydrated vegetables- Specification

1. Scope

This Ethiopian Standard specifies requirements and methods of test and sampling for dehydrated vegetables and which are offered for direct consumption or further processing, including for catering purposes or for repackaging if required.

2. Normative references

The following referenced documents are indispensable for the application 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.

CES 73, General standard for prepackaged foods - Labeling.

ES 577, Recommended code of practice - General principle of food hygiene.

ES ISO 763, Fruit and vegetable products - Determination of ash insoluble in hydrochloric acid.

ES ISO 874, Fresh fruits and vegetables - Sampling.

ES 929, Code of practice-food hygiene management.

ES ISO 1026, Fruit and vegetable products - Determination of dry matter content by drying under reduced pressure and of water content by azeotropic distillation.

ES ISO 2447, Fruits, vegetables and derived products - Determination of tin content.

ES 3425, Edible maize, rice, wheat and potato starches- Specification.

ES 3427, Edible cassava starch- Specification.

ES ISO 4832, Microbiology of food and animal feeding stuffs - Horizontal method for the enumeration of Coliforms - Colony-count technique.

ES ISO 4833-1, Microbiology of the food chain - Horizontal method for the enumeration of microorganisms - Part 1: Colony count at 30 °C by the pour plate technique.

ES ISO 5522, Fruits, vegetables and derived products - Determination of total sulphur dioxide content.

ES ISO 6561-2, Fruits, vegetables and derived products - Determination of cadmium content - Part 2: Method using flame atomic absorption spectrometry.

ES ISO 6579-3, Microbiology of the food chain - Horizontal method for the detection, Enumeration and serotyping of Salmonella - Part 3 Guidelines for serotyping of Salmonella spp.

ES ISO 6633, Fruits, vegetables and derived products - Determination of lead content - Flameless atomic absorption spectrometric method.

ES ISO 6637, Fruits, vegetables and derived products - Determination of mercury content - Flameless atomic absorption method.

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

ES ISO 6888-2, Microbiology of food and animal feeding stuffs - Horizontal method for the enumeration of coagulase-p-staphylococci (*Staphylococcus aureus* and other species) - Part 2: Technique using rabbit plasma fibrinogen agar medium.

ES ISO 7251, Microbiology of food and animal feeding stuffs - Horizontal method for the detection and enumeration of presumptive *Escherichia coli* - Most probable number technique.

ES ISO 7558, Guide to the prepacking of fruits and vegetables.

ES ISO 17239, Fruits, vegetables and derived products - Determination of arsenic content - Method using hydride generation atomic absorption spectrometry.

ES 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.

ES 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.

ES ISO 21872-1, Microbiology of the food chain - Horizontal method for the determination of *Vibrio* spp. - Part 1: Detection of potentially enteropathogenic *Vibrio parahaemolyticus*, *Vibrio cholerae* and *Vibrio vulnificus*.

ES ISO 22002-1, Prerequisite programmes on food safety -Part 1 Food manufacturing.

3. DESCRIPTION

3.1 Product definition

3.1.1 Dehydrated/Dried vegetables are products:

- a) Prepared from edible portion of clean, sound, mature named vegetables and dried under natural or artificially induced conditions and they can undergo operations such as washing, peeling, grading, cutting, blanching or dipping etc., depending on the type of product.
- b) Obtained by drying pieces of one or more of named vegetables.

4. Ingredients

4.1 Basic Ingredients

Vegetables as defined in clause 3.

Examples of the Vegetables suitable for Drying are but not limited to those listed in Annex A.

5. Requirements

5.1 General Requirements

- 5.1.1 Dehydrated vegetables shall have characteristic colour, flavour and odour of dried vegetables, corresponding to the variety and type of the named vegetable and shall possess and maintain the product's essential texture, physical, chemical, organoleptic, and nutritional characteristics of the vegetable(s).
- 5.1.2 The product shall be prepared from wholesome vegetables free from blight, discolouration or fungi.
- 5.1.3 Only the edible portion of the vegetable shall be used and it shall be free from stalks, peel stems and extraneous leaves.
- 5.1.4 The dried or dehydrated vegetables may contain permitted preservatives.
- 5.1.5 The finished product shall be of good edible quality and shall reasonably reconstitute to its original shape and quality on boiling from fifteen minutes to an hour.
- 5.1.6 The finished product should be free from visible mould, insects or larvae.

5.2 Specific requirements

Table 1. Physio-chemical requirements

Characteristic	Requirement	Test Methods
Moisture Content, % m/m, Max.	8.0	Annex B
Total ash on dry basis, % m/m, Max.	5.0	ES ISO 1026
Acid Insoluble Ash, % m/m, Max.	0.5	ES ISO 763
Sulphur Dioxide Content		ES ISO 5522

a) cabbage and cauliflower, ppm, Max.	2500	
b) potatoes, ppm, Max.	550	
c) other vegetables, ppm, Max.	1000	
Peroxide Activity (Vegetables which have undergone the blanching process)*	negative reaction	Annex C
Defects and Allowances** (Certain common defects), %, Max.	1.0	Annex D

* This requirement is not applicable to vegetables which have not been blanched.

** Dehydrated vegetables should be substantially free from defects.

6. Food Additives

6.1 Only those food additive listed below may be used in products covered by this Standard.

- Citric acid
- Sodium (or potassium) di-hydrogen pyrophosphate.
- Calcium (or magnesium) stearate.
- Sodium carbonate
- Ascorbic acid or erythrosascorbic acid.
- Sulphur dioxide, or sodium (or potassium) hydrogen sulphate or m-hydrogen sulphite.
- For carrots only starch, complying with the Ethiopian Standard specification for edible starch (ES 3425, ES 3427).
- Pectin.
- Vegetable flavours such as garlic, onion, petter, etc.

6.2 Acidity regulators, colours, colour retention agents, antioxidants, and firming agents used shall be in accordance to the *General Standard for Food Additives* (Codex Stan 192-1995).

7. 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 (Codex Stan 193-1995).

7.1 Pesticide residues

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

7.2 Heavy Metal Contaminants

The products covered by the provisions of this standard shall conform to those maximum limits for Heavy metals contaminants established by the Codex Alimentarius Commission for these products in Table 2 below.

Table 2 – Heavy metal contaminants limit

Contaminants	Limit (mg/kg, Max.)	Test Methods
Arsenic (as As)	0.2	ES ISO 17239
Lead (as Pb)	0.3	ES ISO 6633
Tin (as Sn)	250	ES ISO 2447
Mercury (as Hg)	0.01	ES ISO 6637
Cadmium (as Cd)	0.05	ES ISO 6561-2

8. Hygiene

8.1 Dehydrated vegetables shall be manufactured and handled in a hygienic manner in accordance with ES 577, ES 929, ES ISO 22002-1 and CAC RCP 5:1971.

8.2 Dehydrated vegetables shall be free of pathogenic microorganisms and shall conform to the microbiological requirements in Table 3.

Table 3 - Microbiological limits for dried vegetables

Characteristic	Limits	Test Methods
Total plate count, cfu/g, Max.	2×10^4	ES ISO 4833-1

Escherichia coli, cfu/g	Absent	ES ISO 7251
Staphylococcus aureas, cfu/25g	Absent	ES ISO 6888-1, ES ISO 6888-2
Salmonella, cfu/25g	Absent	ES ISO 6579-3
Coliforms, cfu/g	Absent	ES ISO 4832
Vibrio cholera, cfu/25g	Absent	ES ISO 21872-1
Yeast and Moulds, cfu/25g	Absent	ES ISO 21527-1, ES ISO 21527- 2

9. Packaging and Labeling

9.1 Packaging

The packaging shall comply with the requirements of ES ISO 7558 and shall consider the following:

- 9.1.1** Dehydrated vegetables shall be clean, sound, free from insects and fungi infection and the packing material shall be of food grade quality.
- 9.1.2** The containers, including packaging material, shall be made of substances which are safe and suitable for their intended use. They shall not impart any toxic substance or undesirable odor or flavor to the product.

NOTE 1 Packaging materials may be required to meet different regulations in Ethiopia.

9.2 Labelling

The labeling shall comply with the requirements of CES 73, and shall be legibly and indelibly marked with the following:

- a)** Name of the product:
 - The name of the product as declared on the label shall be (X) Dehydrated vegetables or Dehydrated (X) Vegetables where X is the name of the dried vegetable;
 - In the case of mixed dried vegetables; List of the names of the various vegetables species used in the mix, shall be listed in descending order of the proportions;
- b)** Name and physical and postal address of manufacturer, exporter/importer;
- c)** Batch or identification code;
- d)** Net weight in Kgs;
- e)** Expiry date;
- f)** List of ingredients;
- g)** Storage instruction;
- h)** Country of origin;
- i)** Date of manufacture;
- j)** Any other information required by the purchaser.

10. Method of sampling

Sampling of dehydrated vegetables shall be done in accordance with ES ISO 874.

ANNEX A

Examples of Vegetables Suitable for Drying:

Asparagus
Beets
Brussels Sprout
Broccoli
Cabbage
Carrots
Cauliflower
Celery
Sweet corn
Chard
Cucumber
Garlic
spinach,
cow peas leaves (Kunde)
beet,
mustard,
turnip
greens
kale
African egg plant
African indigenous vegetables (amaranth, night shade, slender leaf, spider plant, jute mallow etc)
Onions
Peas
Pepper and pimientos
Potatoes (Irish and white)
Pumpkin and squash
Rutabagas
Sweet potatoes
Sauer kraut
Chayote and chirabi
Tomatoes
Horsedish
Okra
Mushrooms
Parsnips
Parsley
Peppers (red, green and chilli)

ANNEX B

DETERMINATION OF MOISTURE CONTENT

- B1.** Weigh out 25 g of the specimen, grind it thoroughly, and sieve through a No. 20 sieve weigh out, to an accuracy of $1 \text{ mg} \times x \text{ g}$ (approximately 2 g) of the sieved specimen into a weighed drying dish. Place the open dish in a vacuum oven at a temperature of 70°C , 6 h pressure of $55 \pm 10 \text{ mm Hg}$. During drying admit air to the oven at the rate of 2 bubbles per second through concentrated H_2SO_4 bubbler. After 6 h stop vacuum pump and introduce air at such rate that the oven is at atmospheric pressure within 5 min. remove the dish, replace cover, cool in a desiccator and weigh within 30 min.
- B2.** When the pressure in the oven drops to 100 mm of mercury, pass a slow current of dry air into the oven, at the rate of 2 bubbles per second.
- B3.** After drying for 6 h relieve the vacuum. Close the mouth of the dish, and allow it to cool to room temperature, whilst in a desiccator.
- B4.** Repeat the weighing and determine the loss in mass ($N \text{ g}$) and then calculate the moisture content (A per cent) by using the formula:

$$A = \frac{N}{x} \times 100$$

ANNEX C

TEST FOR PEROXIDE ACTIVITY

C1. REAGENTS

C1.1 Guaiacol Solution — A solution containing 1g guaiacol per 100 ml. This may be prepared by an alcohol solution containing 1g guaiacol per 10 ml with distilled water.

C1.2 Hydrogen Peroxide Solution — 15 per cent.

C1.3 Mixed Solution — Containing equal parts by volume of the solutions in **D1.1** and **D1.2**.

C2. PROCEDURE

Pour the dried vegetable sample into a 200 ml wide-mouth flask until the flask is approximately one-quarter full. Add 20 ml of this mixed solution (reagent 3), close the flask and shake well for a few seconds. Open the flask, and pour the contents into a wide porcelain dish, and see whether any reddish- brown colour is present.

3. CONCLUSION

If this colour does not appear clearly in an appreciable part of the specimen, within one minute, then the reaction is negative.

ANNEX D

DETERMINATION OF DEFECTS

D1. Spread 20 g of the specimen on a sheet of white paper or white ceramic tile, and collect the pieces of vegetables which appear defective. Compare these pieces with the standard established pieces, and determine the seriousness of the defect.

D2. Collect the pieces which have serious defects, those which have moderate defects, and those which have moderate defects, and those which have minor defects and weigh each group separately.

DRAFT

Organization and Objectives

The Ethiopian Standards Agency (ESA) is the national standards body of Ethiopia established in 2010 based on regulation No. 193/2010. ESA is established due to the restructuring of Quality and Standards Authority of Ethiopia (QSAE) which was established in 1998.

ESA's objectives are:-

- ❖ Develop Ethiopian standards and establish a system that enable to check whether goods and services are in compliance with the required standards,
- ❖ Facilitate the country's technology transfer through the use of standards,
- ❖ Develop national standards for local products and services so as to make them competitive in the international market.

Ethiopian Standards

The Ethiopian Standards are developed by national technical committees which are composed of different stakeholders consisting of educational institutions, research institutes, government organizations, certification, inspection, and testing organizations, regulatory bodies, consumer association etc. The requirements and/or recommendations contained in Ethiopian Standards are consensus based that reflects the interest of the TC representatives and also of comments received from the public and other sources. Ethiopian Standards are approved by the National Standardization Council and are kept under continuous review after publication and updated regularly to take account of latest scientific and technological changes.

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International Involvement

ESA, representing Ethiopia, is a member of the International Organization for Standardization (ISO), and Codex Alimentarius Commission (CODEX). It also maintains close working relations with the International Electro-technical Commission (IEC) and American Society for Testing and Materials (ASTM). It is a founding member of the African Regional Organization for standardization (ARSO).

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