CES 309

Compulsory Ethiopian Standard

First Edition
2022

Fortified Wheat Flour - Specification

ICS: 67.060
Published by Ethiopian Standards Agency

Foreword

This Ethiopian Standard has been prepared under the direction of Technical Committee for Starch and derived products (TC 24) and published by the Ethiopian Standards Agency (ESA).

This Compulsory Ethiopian Standard cancels and replaces second edition of ES 6132:2021, Wheat flour - Specification.

Application of this standard is COMPULSORY with respect to clauses 5, 8 and 9.

A Compulsory Ethiopian Standard shall have the same meaning, interpretation and application of a "Technical Regulation" as implied in the WTO -TBT Agreement.

Implementation of this standard shall be compulsory as of 10 July, 2022.

Fortified Wheat Flour - Specification

1. Scope

This Ethiopian Standard specifies the requirements for wheat flour prepared by milling cleaned hard wheat or soft wheat or blends thereof intended for the baking of bread, biscuits and other bakery products and for the manufacture of pasta products.

2. Normative references

The following referenced documents are indispensable for the application of this document. For the 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 the Labeling of Prepackaged Foods.

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

ES ISO 712, Cereals and cereal products – Determination of moisture content – Reference mthod.

ES 921, Open mouth sacks and Hessian type polyolefin tape yarn.

ES 929, Code of practice-food hygiene management.

ES 1052, Standard for wheat flour - Specification

ES 1053, Durum wheat semolina, Whole durum wheat semolina and Durum wheat flour – Specification

ES 1060, Wheat flour - Determination of pH value.

ES 1062, Self-rising wheat flour Determination of available carbon dioxide

ES ISO 1063, Plain semi- sweet biscuits and cream crackers - Determination of free fatty acids and peroxide value of extracted oil

ES 1066, Wheat flour - Determination of acid insoluble ash.

ES 1071, Self-rising wheat flour Determination of sulphates (Gravimetric methods)

ES ISO 1871, Wheat flour - Determination of protein.

ES ISO 2171, Wheat flour - Determination of total ash.

ES ISO 4831, Microbiology of food and animal feeding stuffs - Horizontal method for the detection and enumeration of coliforms – Most probable number technique

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 ^{0}C by the pour plate technique

ES ISO 4833-2, Microbiology of the food chain – Horizontal method for the enumeration on microorganisms - Part 2: Colony count at 30 ^{0}C by the surface plating technique

ES ISO 5223, Test sieves for cereals

ES ISO 5498, Agricultural and food products - Determination of crude fiber content (General method).

ES ISO 5530-1, Wheat flour - Physical characteristics of doughs - Part 1: Determination of water absorption and rheological properties using a farinograph.

ES ISO 5530-3, Wheat flour - physical characteristics of doughs - Part 3: Physical characteristics of doughs - Determination of water absorption and theological properties using a valorigraph.

ES ISO 5531, Wheat flour- Determination of wet gluten.

ES ISO 6541, Agricultural food products - Determination of crude fiber content - General method content (milled grain and whole grain.

ES I SO 6 579-2, M icrobiology of f ood and ani mal f eed - Horizontal m ethod f or t he detection, enumeration an d serotyping of Salmonella - Part 2: Enumeration by a miniaturized most probable number technique

ES ISO 6888-1, Microbiology of food and animal feeding stuffs – Horizontal method for the enumeration of coagulase positive staphylococci (Staphylococci 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 a ureus and ot her s pecies) - Part 2: T echnique us ing r abbit pl asma 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 7495, Wheat flour - Determination of wet gluten by mechanical means.

ES ISO 11050, Wheat flour - Determination of impurities of animal origins.

ES ISO 11212-1, Starch and derived products — Heavy metals content — Part 1: Determination of arsenic content by atomic absorption spectrometry.

ES ISO 11212-3, Starch and derived products — Heavy metals content — Part 3: Determination of lead content by atomic absorption spectrometry with electrothermal atomization.

ES ISO 11212-4, Starch and derived products — Heavy metals content — Part 4: Determination of cadmium content by atomic absorption spectrometry with electrothermal atomization.

ES ISO 16050, Foodstuffs — Determination of aflatoxin B1, and the total content of aflatoxins B1, B2, G1 and G2 in cereeals, nuts and derived products — High- performance liquid chromatographic method.

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

ES ISO 24333, Cereals and cereal products sampling.

3. Terms and Definitions

For the purpose of this standard, besides to the definitions given in ES 1052 the following definitions shall apply.

3.2

fortificants

compound which contains the specified micronutrient intended to be added to a food.

3.3

premix

blend of fortificants and diluents formulated to provide specified and determinable amounts of micronutrients.

3.4

food fortification

practice of d eliberately ad ding m icronutrients i n a f ood so a s t o i mprove t he nut ritional q uality of t he food a nd t o provide a public health benefit with minimal risk to health.

3.5

NaFeEDTA

sodium iron ethylenediamine tetraacetic acid

3.6

fortified wheat flour

flour to which nutrients (such as iron, folic acid, zinc and B vitamins) have been added in accordance with this standard.

3.7

fortified white wheat flour

flour obtained from clean and sound hard, soft or blended wheat in the commercial milling with a minimum extraction rate of 78 % by mass.

3.8

fortified whole meal or fortified wheat meal flour

flour obtained by grinding and milling of clean and sound wheat containing all the constituents of such wheat with a 100% extraction rate, by mass.

3.9

self - rising fortified flour

flour to which acid ingredients (of the following) and sodium bicarbonate have been added. It may also contain common salt.

3.10

acid ingredients

shall be one or any combination of the following:

3.10.1 Sodium acid pyrophosphate

3.10.2 Mono-acid calcium phosphate

3.10.3 Sodium aluminium phosphate

3.10.4 Sodium bicarbonate in sufficient amounts to provide not less than 0.5% available carbondioxide

3.10.5 Cream of tartaric acid.

3.11

starch reduced or protein increased fortified flour

flour with low starch or increased protein

3.12

atta /soft / fortified wheat flour

flour milled from clean and sound soft wheat with a minimum extraction rate of 76% by mass

3.13

bleached fortified wheat flour

flour milled from clean and sound hard or soft or a blended wheat whitened with bleaching or oxidizing agents as specified in clause 6.

4. Types of fortified wheat flour

Fortified wheat flours may be one of the following types:

4.1 Fortified white flour;

4.2 Fortified whole meal flour;

4.3 Self raising flour;

4.4 Starch reduced or protein increased fortified wheat flour;

4.5 Atta fortified wheat flour; and

4.6 Bleached fortified wheat flour.

5. Requirements

5.1 General Requirements

5.1.1 Fortified wheat flour shall be free from rancidity, insect and fungal infestation and rodent contamination. It shall also be free from fermented, musts or other objectionable odor. It shall not have adulterants and any other extraneous matter.

5.1.2 Wet gluten content (on wet basis) of hard or mixed fortified wheat flour for the baking of bread shall be between 24 to 35%, by mass, when determined in accordance with the method of test specified in ES ISO 5531 and/or ES ISO 7495

5.1.3 Wet gluten content (on wet basis) of soft wheat for the baking of biscuits and cake shall not exceed more than 23% by mass, when determined in a accordance with the method of test specified in ES ISO 5531 and/or ES ISO 7495

5.1.4 Wet gluten content (on wet basis) of hard, soft or mixed fortified wheat flour for the manufacture of pasta products shall be 30 to 40 % by mass, when determined in accordance with the method of test specified in ES ISO 5531 and/or ES ISO 7495.

5.1.5 Any added ingredient to fortified wheat flour shall be safe and suitable for human consumption.

5.1.6 Fortified wheat flour shall be free from any filth/Impurities.

5.1.7 Fortified whole meal/ fortified wheat meal shall not contain any added substances. The mixture of flour and bran shall not be sold as whole meal or wheat meal

5.1.8 Self-rising fortified flour shall liberate not less than 0.5 parts/centum of carbon dioxide

5.1.9 Fortified wheat flour shall not contain weed flour in amounts that deteriorate the quality of flour.

5.1.10 Fortified wheat flour shall not contain flour from the other cereals such as maize, sorghum, etc. However, the addition of malted barley flour shall not exceed 1 % in the case of bakers' flour.

5.1.11 Fortified wheat flour shall be free from filth (impurities of animal origin), including dead insects in amounts, which may represent a hazard to human health when determined in accordance with the method of test specified in ES ISO 11050

5.2 Specific Requirements

Fortified Wheat flour shall comply with the chemical requirements specified in Table 1 below.

Table 1. Chemical requirements for fortified wheat flour

Characteristics	Fortified white flour	Self- rising fortified flour	Fortified whole and fortified wheat meal flour	Protein Increased fortified flour	Atta fortified wheat flour	Bleached fortified wheat flour	Semolina*	Test Methods
Moisture, % by mass, Max.	14.0	14.0	14.0	14.0	14.0	14.0	14.5	ES ISO 712
Protein (Nx5.7), (on dry basis), % by mass	8 - 16	9 - 10	12 - 14.5	8 - 16	8 -16	8-16	10.5-11.5	ES ISO 1871
Total ash (on dry basis), % by mass, Max.	0.7	2.0	2.0	0.6	2.0	0.6	1.3-2.1	ES ISO 2171
Acid insoluble (on dry basis) ash, % by mass, Max.	0.05	0.05	0.05		0.05	0.05	–	ES 1066
Fat acidity on (a dry basis) % by mass, Max.	0.07	0.07	0.07	0.07	0.07	0.07	–	ES ISO 1063
Crude f ibre (on dr y basis), % by m ass, Max.	1.0	1.0	2.0	1.0	2.0	1.0	–	ES ISO 5498 ES ISO 6541
Sulphates as $CaSo_4$ (or dry b asis), % b y m ass Max.	–	0.6	–	–	–	–	–	ES 1071
pH value	4.8 - 6.5	4.8 - 6.5	4.8 - 6.5	4.8 - 6.5	4.8 - 6.5	4.8 - 6.5	–	ES 1060
Available carbon dioxide, % by mass, Min	–	0.5	–	–	–	–	–	ES 1062
Particle s ize (granularity), on 180 micron sieve size %, by mass, Min.	99.5	99.5	70 - 80	70 - 80	80 - 85	99.5	–	ES ISO 5223
Particle s ize o f f lour passing through 315 micron s ieve, % by mass, Min.	–	–	–	–	–	–	79-80	ES ISO 5223
Water absorption, % by mass, Min.	60	60	60	60	60	60	–	ES ISO 5530-1 ES ISO 5530-3

* Durum wheat semolina, Whole durum wheat semolina and Durum wheat flour (ES 1053)

5.3 Fortification requirements

5.3.1 Levels of micronutrients

The wheat flour shall be fortified with all the micronutrients indicated using the fortificants shown, in such a way that the product conforms to the limits set in Table 2 below.

Factories should aim at fortifying the products at the recommended factory level to ensure the product conforms to the regulatory levels throughout the distribution chain.

Table 2. Requirements for levels of micronutrients in fortified wheat flour

Nutrient	Fortificant compound, min.	Recommended factory level, mg/kg	Regulatory levels, mg/kg	
			Minimum	Maximum
Vitamin B1	Thiamin Mononitrate, activity level, 81 %	9	4.6	NA[1]
Vitamin B2	Riboflavin, activity level, 100 %	6	3.3	NA[1]
Niacin	Niacinamide, activity level, 99 %	50	30	NA[1]
Vitamin B6	Pyridoxine, activity level, 82 %	6	3	NA[1]
Folate	Folic acid, activity level, 100 %	2	1.1	3.2
Vitamin B12	Vitamin B 12 (water soluble), activity level, 0.1 %	0.02	0.01	NA[1]
Zinc	Zinc oxide, activity level, 80 %	80 ±10	70	

[1] - Not applicable. The maximum limits for these nutrients are not necessary because the upper tolerance limits of these nutrients are very high.

5.3.2 Fortificants

Fortificants for use shall be stable compounds conforming to specifications in any of the following documents:

a) British Pharmacopoeia (BP),

b) Food Chemical Codex (FCC),

c) Merck Index (MI),

d) United States National Formulary (NF),

e) European Pharmacopoeia (Ph. Eur),

f) United States Pharmacopoeia (USP);

g) FAO/WHO Codex Alimentarius Commission (CAC) and other internationally recognized specifications.

NOTE: For the addition of iron, premix producers may either use NaFeEDTA at the levels provided, which should be tried first to test for compatibility with the flour and if low levels are needed, or the producer may use ferrous fumarate

5.3.3 Formulation of fortification mix for addition of vitamins and minerals to wheat flour shall fulfill the requirement specified in Table 3 below.

Table 3. Formulation of fortification mix for addition of vitamins and minerals to wheat flour

Nutrient	Fortificant compound, Min.	Amount of micronutrient to be added to wheat flour, mg/kg	Amount of fortificant to be added to wheat flour, mg/kg	Amount of fortificant in premix, g/kg premix	Amount of nutrient in premix, g/kg premix
Vitamin B1	Thiamin Mononitrate, activity level, 81%	9	11.1	18.5	15
Vitamin B2	Riboflavin, activity level, 100 %	6	6.0	10	10
Vitamin B3 (Niacin)	Niacinamide, activity level, 99 %	50	50.5	84.2	83.3
Vitamin B6	Pyridoxine, activity level, 82 %	6	7.3	12.2	10
Vitamin B9 (Folate)	Folic acid, activity level, 90 %	2	2.0	3.3	3.3
Vitamin B12	Vitamin B12 (Water soluble form), activity level, 0.1 %)	0.02	20.0	33.3	0.033
Zinc	Zinc oxide, activity level, 80 %	80	100	166.7	133.3
		TOTAL	196.9	328.2	255

6. Permissible additives (Optional ingredients)

For improving the quality of flour, except for Atta / Soft/ wheat flour, the following ingredients may be added in a harmless carrier form. The quantity of the carrier shall not exceed the maximum quantity needed to obtain a uniform mixture of the ingredients within the flour.

6.1 Diastatically active additives

6.1.1 Malted flour with enzymatic activity made from wheat, rye or barley.

6.1.2 Vital wheat gluten

6.1.3 Soybean flour and legume flour

6.2 Enzymes

6.2.1 Fungal amylase from Aspergillus oryzae

6.2.2 Proleolytic enzyme from Bacillius subtilis

6.2.3 Proleolytic enzyme from *Aspergillus oryzae*

6.3 Flour treatment agents (Improvers)

The following flour treatment agents (improvers) may be added singly or in combination:

6.3.1 L. Ascorbic acid and its sodium and potassium salt 300 mg/kg.

6.3.2 Cystelne hydrochloride 90 mg/kg.

6.3.3 Sulphur dioxide in flours for making biscuits and manufacturing use only 200 mg/kg.

6.3.4 Mon-calcium phosphate 2500 mg/kg

6.3.5 Lecithin 2000 mg/kg

6.3.6 Chlorine dioxide for yeast -raiser baking products 30 mg/kg

6.4 Bleachers (added singly)

6.4.1 Benzol peroxide 60mg/kg

6.4.2 Nitrogen peroxide 10-50 ppm

6.4.3 Azodicarbonamide for leaven bread 45 mg/kg

7. Food additives

The product shall contain only permitted additives complying with CODEX.STAN.192

7.1 Improvers

Improvers may be added singly or in combination including but not limited to maximum permitted level.

7.1.1 Ascorbic.acid.....200 ppm;

7.1.2 Potassium persulphate.....100 ppm;

7.1.3 Ammonium persulphate.....250 ppm;

7.1.4 Mono.calcium phosphate.....2500 ppm;

7.1.5 Chlorine.dioxide.....30 ppm.

8. Contaminants

8.1 Heavy metals

Table 4. Heavy metals

Characteristics	Limit (mg/kg, Max.)	Test Method
Arsenic (As)	0.1	ES ISO 11212-1
Lead (Pb)	0.1	ES ISO 11212-3
Cadmium (Cd)	0.1	ES ISO 11212-4

8.2 Pesticide residue

8.2.1 Fortified Wheat flour shall comply with those maximum residue limits established by the Codex Alimentarius Commission for food commodity, CAC/MRL 2-2015, Maximum Residue Limits for Veterinary Drugs in Food.

NB: Limits set by the Codex Alimentarius Commission shall apply for pesticide residues as periodically amended.

8.2.2 The product shall be prepared with special care under good manufacturing practices, so that residues of those pesticides which may be required in the production, storage or processing of the raw materials or the finished food ingredient do not remain or if technically unavoidable, are reduced to the maximum extent possible.

8.3 Mycotoxin

Fortified wheat flour shall comply with those maximum mycotoxin limits es tablished by the Codex Alimentarius Commission for this commodity In particular total aflatoxin in fortified wheat flour shall not exceed 10 µg/kg (ppb) and 5µg/kg (ppb) for aflatoxin B1 when tested in accordance with ES ISO 16050.

9. Hygienic

9.1 Fortified wheat flour shall be produced, prepared and handled in accordance with ES 577, ES 929 and ES ISO

9.2 The product shall be free from pathogenic microorganisms and shall comply with microbiological limits in Table 5 below.

Table 5. Microbiological limits

Characteristics	Requirements	Test Method
Total plate count, cfu/g, Max.	10^5	ES ISO 4833-1 ES ISO 4833-2
Staphylococcus aureus, cfu/g, Max.	10^2	ES ISO 6888-1 ES ISO 6888-2
Escherichia coli, cfu/g.	absent	ES ISO 7251
Salmonella, per 25g.	absent	ES ISO 6579-2
Coli forms, per 100 g.	absent	ES ISO 4831 ES ISO 4832
Yeasts and moulds, Cfu/g, Max.	10^4	ES ISO 21527-1 ES ISO 21527-2

10. Packaging and Labelling

11.1 Packaging

11.1.1 Fortified wheat flour shall be packed in suitable packages which shall be clean, sound, free from insects and fungal infestation, and the packing material shall be of food grade quality.

11.1.2 Fortified wheat flours hall be packed in containers which will safeguard the hygienic, nutritional, technological and organoleptic qualities of the products.

11.1.3 The containers, including packaging material, shall be made of materials which are safe and suitable for their intended use. They shall not impart any toxic substance or undesirable odour or flavour to the product as specified in ES 921.

11.1.4 Each package shall be securely closed and sealed.

The inner liner shall conform to the size thickness, density and weight specified below

11.1.4.1 Size fit to outer pp bag

11.1.4.2 Thickness 100 micron

11.1.4.3 Density 92 gsm

11.1.4.4 Weight 83-95g (viable with size of inner liner)

11.1.5 Laminated paper packaging should be used.

11.2 Labelling

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

a) Product name as "fortified wheat flour or products derived from it"
b) Name, address and physical location of the manufacturer/ packer/importer;
c) Lot or batch number;
d) Brand name or registered trade mark, fortification logo if any;
e) Net weight, in metric units;
f) The declaration "Human Food";
g) Storage instruction as "Store in a cool dry place away from any contaminants";
h) Date of manufacture;
i) Best before date;
j) Instructions on disposal of used package; and
k) Country of origin.

11. Methods of sampling

Sampling shall be done in accordance with ES ISO 24333.

Annex A
(Informative)

Premix

The fortificants may be mixed with diluents or carrier as appropriate to form a premix. Diluents or carriers shall conform to USP, BP, Ph. Eur, NF, MI, FAO/WHO CAC or FFC. The diluants may include, Tricalcium Phosphate, corn or wheat starch, maltodextrin and Silicon Dioxide (as free flowing agent).

The premix shall be made in such a way that at a given rate of addition to the product, the product shall conform to the requirements in Table 2. The premix shall be formulated to conform to the provisions given in Table 3.

Where the premix is made in accordance with Table 3, the addition rate shall be 600 g of premix per metric ton of wheat flour.

The premix shall be labeled with the addition rate (that is the amount of premix to be added to the wheat flour) in grams of premix per metric ton of wheat flour and dilution factor.

NOTE: This premix formulation in Tables 3 is designed with minimum nutrient composition and does not take into consideration factory overages in the preparations of the premix.

የኢትዮጵያ የደረጃዎች ኤጀንሲ
Ethiopian Standards Agency

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 or ganizations, 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.
Orders for all Ethiopian Standards, International Standard and ASTM standards, including electronic versions, should be addressed to the Documentation and Publication Team at the Head office and Branch (Liaisons) offices. A catalogue of Ethiopian Standards is also available freely and can be accessed in from our website.

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).

More Information?
Contact us at the following address.
The Head Office of ESA is at Addis Ababa.

☎ *011- 646 06 85, 011- 646 05 65*
011-646 08 80
2310 Addis Ababa, Ethiopia
E-mail: info@ethiostandards.org,
Website: www.ethiostandards.org

Standard Mark