

DRAFT UGANDA STANDARD

Second Edition
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Fortified wheat flour — Specification

DRAFT FOR PUBLIC REVIEW



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Draft Uganda Standards adopted by the Technical Committee are widely circulated to stakeholders and the general public for comments. The committee reviews the comments before recommending the draft standards for approval and declaration as Uganda Standards by the National Standards Council.

This Draft Uganda Standard, DUS DEAS 767:2017, *Fortified wheat flour — Specification*, is identical with and has been reproduced from an International Standard, ISO 767:2017, *Fortified wheat flour — Specification*, and is being proposed for adoption as a Uganda Standard.

This standard cancels and replaces the first edition US EAS 767: 2012, which has been technically revised.

This standard was developed by Food and agriculture Standards Technical Committee (UNBS/TC 2).

Wherever the words, "East African Standard" appear, they should be replaced by "Uganda Standard."



DRAFT EAST AFRICAN STANDARD

Fortified wheat flour — Specification

EAST AFRICAN COMMUNITY

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Foreword

Development of the East African Standards has been necessitated by the need for harmonizing requirements governing quality of products and services in the East African Community. It is envisaged that through harmonized standardization, trade barriers that are encountered when goods and services are exchanged within the Community will be removed.

The Community has established an East African Standards Committee (EASC) mandated to develop and issue East African Standards (EAS). The Committee is composed of representatives of the National Standards Bodies in Partner States, together with the representatives from the public and private sector organizations in the community.

East African Standards are developed through Technical Committees that are representative of key stakeholders including government, academia, consumer groups, private sector and other interested parties. Draft East African Standards are circulated to stakeholders through the National Standards Bodies in the Partner States. The comments received are discussed and incorporated before finalization of standards, in accordance with the Principles and procedures for development of East African Standards.

East African Standards are subject to review, to keep pace with technological advances. Users of the East African Standards are therefore expected to ensure that they always have the latest versions of the standards they are implementing.

DEAS 767 was prepared by Technical Committee EASC/TC 018, *Nutrition and Foods for Special Dietary Uses*.

Attention is drawn to the possibility that some of the elements of this document may be subject of patent rights. EAC shall not be held responsible for identifying any or all such patent rights.

This second edition cancels and replaces the first 2012 edition (EAS 767: 2012), which has been technically revised.

Introduction

The Health Ministers of the East, Central and Southern Africa (ECSA-HC) Health Community passed a resolution in 2002 directing the Secretariat to work with the countries to fortify commonly consumed foods in the region after recognizing that the high levels of malnutrition in the region. ECSA-HC is an intergovernmental organization that fosters cooperation in health among countries in the East, Central and Southern African Region. It has 10 active member states namely Kenya, Uganda, Tanzania, Malawi, Zambia, Zimbabwe, Lesotho, Swaziland, Mauritius and Seychelles. The mandate of the organization is to promote relevance and efficiency in health in the region.

Following initial promotion efforts, the countries identified staple foods suitable for fortification as oil, sugar, maize meal/ flour and wheat flour. These foods can be used as vehicles to deliver essential micronutrients to the populations. Based on scientific evidence and working with countries using country data, the Secretariat developed implementation focused guidelines on fortification of these foods to help countries start up programs and scale up the existing programs. These guidelines included fortification levels for addition of micronutrients at the factory, and levels for monitoring at commercial level.

Based on the guidelines and other available information, most of the countries in the East African Region and in the larger Africa have initiated national programs on oil fortification with vitamin A; and wheat and maize meal/flour fortification with iron, zinc, folic acid, niacin, vitamin B-1, B-2 and B-12, B-6 and vitamin A. Sugar fortification with vitamin A has also been considered as a way of supplementing other sources of the vitamin in order to prevent and reduce problems associated with the deficiency of this vitamin. Salt fortification with iodine continues to be implemented in all the countries.

With the increased trade of food commodities including these fortified foods within the region, it has become imperative to develop regional standards that over and above the other standards, stipulate minimum and maximum levels of the added nutrients, provide clauses on how to pack the fortified product and the use of health and nutrition claims. The guidelines developed through ECSA have now been incorporated into food standards to provide for specific fortified products.

It is envisaged that, the adoption of these standards and their utilization within the region will help countries adopt food fortification as a strategy to prevent, alleviate or eliminate micronutrient deficiency in the region. Standards will not only promote the health of the population but will also ensure safety of food products and enhance fair trade.

This standard was developed with support from the East, Central and Southern African Health community (ECSA-HC) Secretariat. This was possible through a grant by the A2Z Project of the United States Agency for International Development (USAID). The financial and technical support was used in the process of formulation of fortification levels, development of the draft standards and mobilization of stakeholders to review the standard in national and regional fora. This support is hereby acknowledged.

DRAFT FOR PUBLIC REVIEW

Fortified wheat flour — Specification

1 Scope

This Draft East African Standard specifies the requirements, sampling and test methods for fortified wheat flour prepared from common wheat (*Triticum aestivum* L.), club wheat (*T. compactum* Host.) or a mixtures thereof intended for human consumption.

It does not apply to wheat flour obtained from *Triticum durum*.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

AOAC 2001.13, *Determination of Vitamin A(Retinol)in Food*

AOAC 953.17, *Thiamine (vitamin B1) in grain products. Fluor*

AOAC 961.02, *Germicidal Spray Method*

AOAC 970.65, *Riboflavin(Vitamin B2) in Foods and Vitamin Pr*

AOAC 975.41, *Niacin and niacinamide in cereal products. Aut*

AOAC 2004.05, *Total Folates in Cereal*

AOAC 2011.14, *Calcium, Copper, Iron, Magnesium, Manganese, P*

CODEX STAN 193, *General standard for contaminants and toxins in food and feed*

EAS 1, *Wheat flour — Specification*

EAS 38, *Labelling of pre-packaged foods — Specification*

EAS 39, *Code of practice for hygiene in the food and drink manufacturing industry*

EAS 44, *Milled maize products — Specification*

EAS 51, *Wheat grains — Specification*

EAS 803, *Nutrition labelling — Requirements*

EAS 804, *Claims on food — General requirements*

EAS 805, *Use of nutrition and health claims — Requirements*

ISO 711, *Cereals and cereal products — Determination of moisture content (Basic reference method)*

ISO 712, *Cereals and cereal products — Determination of moisture content — Reference method*

ISO 2171, *Cereals, pulses and by-products — Determination of ash yield by incineration*

ISO 4832, *Microbiology of food and animal feeding stuffs — Horizontal method for the enumeration of coliforms — Colony-count technique*

ISO 5498, *Agricultural food products — Determination crude fibre Content-General method*

ISO 6579, *Microbiology of food and animal feeding stuffs — Horizontal method for the detection of Salmonella spp.*

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

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

ISO 7954, *Microbiology — General guidance for enumeration of yeasts and moulds — Colony count technique at 25 °C*

ISO 13690, *Cereals, pulses and milled products — Sampling*

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

ISO 16649-1, *Microbiology of food and animal feeding stuffs — Horizontal method for the enumeration of β -glucuronidase-positive Escherichia coli — Part 1: Colony-count technique at 44 °C using membranes and 5-bromo-4-chloro-3-indolyl β -D-glucuronide*

ISO 20483, *Cereals and pulses – Determination of the nitrogen content and calculation of the crude protein content — Kjeldahl method*

ISO 20633, *Infant formula and adult nutritionals -- Determination of vitamin E and vitamin A by normal phase high performance liquid chromatography*

ISO 20634, *Infant formula and adult nutritionals -- Determination of vitamin B12 by reversed phase high performance liquid chromatography (RP-HPLC)*

ISO 21527-2, *Microbiology of food and animal feedstuffs — 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*

ISO 24333, *Cereals and cereal products — Sampling*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1

diluent

suitable, inert, edible food-grade carrier for micronutrients

3.2

premix

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

3.3

fortified wheat flour

wheat flour to which nutrients have been added in accordance with this standard

3.4

fortificant

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

3.5

food fortification

practice of deliberately adding essential micronutrients in a food so as to improve the nutritional quality of the food and to provide a public health benefit with minimal risk to health

3.6

wheat flour

product prepared from common wheat grain, *Triticum aestivum* L. or club wheat, *Triticum compactum* Host, or mixtures thereof by grinding or milling process

3.7

white wheat flour

wheat flour obtained by milling wheat grains at extraction rates that leaves negligible amounts of bran

3.8

baker's flour

white wheat flour made from semi hard/hard wheat which has a medium to high protein content intended for bread making

3.9

home baking/all-purpose flour

white wheat flour obtained by milling either soft wheat grains or blends of hard and soft wheat grains used for making wide range of baked products

3.10

biscuit flour

white wheat flour obtained by milling soft wheat or a blend of hard and soft wheat with a high percentage of soft wheat for biscuit manufacture

3.11

cracker flour

white wheat flour obtained by milling medium protein wheat with no improvers

3.12

self-raising flour

white wheat flour obtained by milling soft or a blend of soft and hard wheat to which raising agents are added

3.13

standard flour

wheat flour obtained by milling wheat grains at a higher extraction than home baking flour

3.14

wholemeal flour

wheat flour obtained by milling the entire wheat grain to fine particle size without any separation

3.15

atta flour

wheat flour of high extraction rate or white wheat flour to which pollard and or bran are blended

3.16

food grade packaging material

material which will safeguard the hygienic, nutritional, technological, and organoleptic qualities of the product

3.17

foreign matter

organic or inorganic material other than wheat flour

4 Quality requirements

4.1 Raw materials

Fortified wheat flour shall be produced from wheat flour conforming to EAS 1 or wheat grains conforming to EAS 51.

4.2 General requirements

4.2.1 Edible salt, if used, shall comply with EAS 35.

4.2.2 Fortified wheat flour shall:

- a) have the characteristic colour of the wheat flour and shall be free from any objectionable flavours and odours;
- b) be free from insects, worms, fungal infestation, rodent contaminations and foreign matter;
- c) not contain flour from other cereals. However, the addition of malted barley flour not exceeding 1 % is permissible in the case of baker's flour.

4.3 Specific requirements

Fortified wheat flour shall comply with the requirements given in Table 1 when tested in accordance with the test methods specified therein.

Table 1 — Specific requirements for fortified wheat flour

S/N	Characteristic	Type of flour									Test method
		White wheat flour	Baker's flour	Home baking flour	Biscuit flour	Cracker flour	Self-raising flour	Standard flour	Atta flour	Whole meal flour	
i.	Moisture content, max., % m/m	14	14	14	14	14	14	14	14	14	ISO 712
ii.	Crude fibre content, max., % m/m	1.0	1.0	1.0	1.0	1.0	1.0	1.5	2.0	2.0	ISO 5498
iii.	Total ash content, max., % m/m	0.8	0.8	0.8	0.8	0.8	3.0	1.10	2.0	2.0	ISO 2171
iv.	Residue on sieving through 180-micron sieve, max., %	0.5	0.8	0.8	0.8	0.8	0.80	30.0	55.0	30.0	AOAC 965.22
v.	Crude protein content, min., % m/m	9.0	11.0	8.0	8.0	8.0	8.0	11.0	8.0	8.0	ISO 1871

4.4 Self-raising flour

In addition to the specific requirements in Table 1, self-raising fortified wheat flour shall contain the following:

- sodium bicarbonate in sufficient amounts to provide not less than 0.4 % of available carbon dioxide; and
- acid ingredients singly or in combination including sodium acid pyrophosphate, mono acid calcium phosphate and sodium aluminium phosphate.

5 Fortification requirements

5.1 Levels of micronutrients

The fortified wheat flour shall conform to the requirements and the levels of micronutrients provided in Table 2. These levels include the intrinsic amount of micronutrients in the unfortified wheat flour.

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

Nutrient	Fortificant compound	Limits mg/kg		Test method
		Min.	Max.	
Vitamin A ⁺	Vitamin A (Retinyl) palmitate, spray-dried or equivalent, 7.5 % retinol, min	0.5	1.4	ISO 20633 AOAC 2001.13
Vitamin B ₁ ⁺	Thiamin Mononitrate, 81 %, min.	4.6	NA	AOAC 953.17
Vitamin B ₂ ⁺	Riboflavin, 100 %,min.	3.3	NA	AOAC 970.65

Niacin [*]	Niacinamide, 99 %,min.	30	NA	AOAC 975.41
Vitamin B ₆	Pyridoxine, 82 %,min	3	NA	AOAC 961
Folate	Folic acid, 100 %,min.	1.1	3.2	AOAC 2004.05
Vitamin B ₁₂	Vitamin B ₁₂ (Water soluble), 0.1 %, min.	0.01	NA	ISO 20634:2015
Zinc	Zinc oxide, 80 %,min.	40	80	AOAC 2011.14
Total iron	Total iron	20	NA	AOAC 2011.14
Added Iron	NaFeEDTA ^{*,a} 12.5 % Fe, min.	20	40	
	Ferrous fumarate ^b , 32 %, min	30	50	
[*] The addition of these micronutrients is optional in Tanzania ^a NA-Not applicable. The maximum limits for these nutrients are not necessary because the upper tolerance limits of these nutrients are very high. ^b The use of one of these would be considered				

5.2 Stability of fortificants and premixes

The fortificants and premixes shall have storage stability such that no more than 20 % of their original activity will be lost when stored for 21 days at 45 °C in a well closed container at a level of 2.5 g per kg in milled maize products having the moisture content in the range of 13.5 % - 14 % for testing stability.

The supplier of the premix shall provide the stability data for the fortificants and premixes.

NOTE For stability of fortificants, manufacturers may refer to Annex A for detailed information.

5.3 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 FCC.

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 may be formulated to conform to the provisions given in Table A.2 or Table A.3 when Fumarate or NaFeEDTA is used respectively.

Where the premix is made in accordance with Table A.2 and Table A.3, the addition rate shall be 500 g of premix per metric tonne of wheat flour.

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

NOTE This premix formulation Table A.2 and A.3 is designed with minimum nutrient composition and does not take into consideration factory overages in the preparations of the premix.

6 Food additives

Fortified wheat flour may contain food additives in accordance with Codex Stan 192.

7 Hygiene

7.1 Fortified wheat flour shall be produced, prepared and handled in accordance with EAS 39.

7.2 The product shall comply with microbiological limits given in Table 5 when tested in accordance with the test methods specified therein.

Table 5 — Microbiological limits for fortified wheat flour

S/N	Micro-organism	Maximum limit	Test method
i.	Total aerobic count per g	10^5	ISO 4832
ii.	<i>Escherichia coli</i> per 1 g	Absent	ISO 16649-1
iii.	<i>Salmonella</i> per 25 g	Absent	ISO 6579
iv.	Yeast and moulds cfu/g	10^4	ISO 7954
v.	<i>Staphylococcus aureus</i> per 25 g	10^2	ISO 6888-1

8 Contaminants

8.1 Heavy metals

Fortified wheat flour shall conform to maximum limits for heavy metals as specified in Table 6 when tested in accordance with the test methods specified therein.

Table 6 — Heavy metals limits for wheat flour

S/N	Heavy metal	Limit mg/kg	Test method
i.	Arsenic (As)	0.1	AOAC 952.13
ii.	Lead (Pb)	0.2	ISO 6633
iii.	Cadmium (Cd)	0.1	ISO 6561-1/2

8.2 Pesticide residues

Fortified wheat flour shall conform to maximum pesticide residue limits established by the Codex Alimentarius Commission for this commodity.

Note Where the use of certain pesticides is prohibited by some Partner States, then it should be notified to all Partner States accordingly.

8.3 Mycotoxins

Fortified wheat flour shall comply with the mycotoxin limits established by the Codex Alimentarius Commission as given in Table 7 when tested in accordance with the test methods specified therein.

Table 7 — Mycotoxins limits for fortified wheat flour

S/N	Mycotoxin	Maximum limit $\mu\text{g/kg}$	Test method
i.	Total aflatoxins	10	ISO 16050
ii.	Aflatoxin B ₁	5	

iii.	Fumonisin	2 000	AOAC 2001.04
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9 Weights and measures

Wheat flour shall be packaged in accordance with the weights and measures regulations of the destination country.

NOTE EAC Partner States are signatory to the International Labour Organizations (ILO) for maximum package weight of 50 kg where human loading and offloading is involved.

10 Packaging

Fortified wheat flour shall be packaged in food grade packaging materials. When the product is packaged in sacks, these shall be clean, sturdy and strongly sewn or sealed.

10 Labelling

10.1 General labelling

In addition to the requirements in EAS 38, each package shall be legibly and indelibly marked with the following:

- a) product name as “fortified wheat flour”
- b) name, address and physical location of the manufacturer/ packer/importer;
- c) lot or batch number in code or in clear format;
- d) brand name or registered trade mark, 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;

NOTE Each product unit may also be marked with the national food fortification Logo, where the industry qualifies to use the mark.

10.2 Nutrition labelling

The names and the amount of the nutrients added in the fortified wheat flour shall be declared on the label in accordance with EAS 803.

10.3 Nutrition and health claims

Fortified wheat flour may have claims on the importance of the added nutrients in nutrition and health. Such claims when declared shall be consistent with EAS 804 and EAS 805.

11 Sampling

Sampling shall be done in accordance with ISO 24333.

Annex A (informative)

Fortificants compound

A.1 For fortificants compounds, the recommended factory levels should be as detailed in Table A.1.

Table A.1 Recommended levels for fortificants compounds

Nutrient	Fortificant compound	Factory limits mg/kg
Vitamin A	Vitamin A (Retinyl) palmitate, spray-dried or equivalent, 7.5 % retinol, min	1.0 ± 0.4
Vitamin B ₁	Thiamin Mononitrate, activity level, 81 %, min.	9.8 ± 4.4
Vitamin B ₂	Riboflavin, activity level, 100 %,min.	6.6 ± 3
Niacin*	Niacinamide, activity level, 99 %,min.	60 ± 30
Vitamin B ₆	Pyridoxine, activity level, 82 %,min	6.5 ± 3.5
Folate	Folic acid, activity level, 100 %,min.	2.3 ± 1
Vitamin B ₁₂	Vitamin B ₁₂ (Water soluble),activity level, 0.1 %, min.	0.02 ± 0.009
Zinc	Zinc oxide, activity level, 80 %,min.	60 ± 20
Total iron	Total iron	30 ± 10
Added Iron	NaFeEDTA 12.5 % Fe, min.	30 ± 10
	Ferrous fumarate activity level, 32 %, min	40 ± 10

Table A.2 — Formulation of fortification mix for addition of vitamins and minerals to wheat flour if using ferrous fumarate as source of iron

Nutrient	Fortificant compound	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 A	VitaminA (Retinyl) palmitate , spraydriedor equivalent, 0.075 % retinol,min.	1	13.3	26.6	2
Vitamin B ₁	Thiamin Mononitrate, activity level, 81%, min.	9	11.1	22.2	18
Vitamin B ₂	Riboflavin, activity level, 100 %, min	6	6.0	12.0	12

Vitamin B ₃ (Niacin)	Niacinamide, activity level, 99 %, min	50	50.5	101.0	100
Vitamin B ₆	Pyridoxine, activity level, 82 %, min	6	7.3	14.6	12
Vitamin B ₉ (Folate)	Folic acid, activity level, 100 %, min	2	2.2	4.4	4
Vitamin B ₁₂	Vitamin B12 (Water soluble form), activity level, 0.1 %)	0.02	20.0	40.0	0.04
Iron	Ferrous fumarate, activity level, 32 %Fe, min.	40	125.0	250.0	80
Zinc	Zinc oxide, activity level, 80 %, min	30	37.5	75	60
	Filling material (at least 25 %)	-	227.1	454.2	-
	TOTAL		500	1 000	

Table A.3 — Formulation of fortification mix for addition of vitamins and minerals to wheat flour if using NaFeEDTA as source of Iron

Nutrient	Fortificant compound	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 A	Vitamin A (Retinyl) palmitate, spray-dried or equivalent, 7.5 % retinol, min.	1	13.3	26.6	2
Vitamin B1	Thiamin Mononitrate, activity level, 81 %, min.	9	11.1	22.2	18
Vitamin B2	Riboflavin, activity level, 100 %, min.	6	6.0	12.0	12
Vitamin B ₃ (Niacin)	Niacinamide, activity level, 99 %, min.	50	50.5	101.0	100
Vitamin B6	Pyridoxine, activity level, 82 %, min.	6	7.3	14.6	12
Vitamin B9 (Folate)	Folic acid, activity level, 100 %, min.	2	2.2	4.4	4

Vitamin B12	Vitamin B12, (Water soluble form), activity level, 0.1 %, min.	0.02	20.0	40.0	0.04
Iron	NaFeEDTA, activity level, 13 % Fe, min.	30	240	480	60
Zinc	Zinc oxide, activity level, 80 %, min.	30	37.5	75	60
	Diluent (Filling material, at least 25 %)	-	112.1	224.2	-
		TOTAL	500	1 000.0	-

NOTE The following documents may help in formulation of compound:

- British Pharmacopoeia (BP);
- Food Chemical Codex (FCC);
- Merck Index (MI);
- United States National Formulary (NF);
- European Pharmacopoeia (Ph Eur);
- United States Pharmacopoeia (USP); and
- FAO/WHO Codex Alimentarius Commission (CAC)

Bibliography

- [1] CODEX STANDARD 152, *Codex standard for wheat flour*
- [2] ECSA-HC, *Guidelines of fortification levels for staples*

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