TANZANIA STANDARD

Fortified milled maize (corn) products — Specification

This Tanzania Standard was published under the authority of the Board of Directors of Tanzania Bureau of Standards on 2014-12-18.

Tanzania Bureau of Standards (TBS) is the statutory national standards body for Tanzania established under the Standards Act No. 3 of 1975, repealed and replaced by the Standards Act No. 2 of 2009.

The Agriculture and Food Divisional Standards Committee, under whose supervision this Tanzania Standard was prepared, consists of representatives from the following organizations:

- Sokkone University, Faculty of Food Science and Technology *
- Ministry of Agriculture and Food Security (MAFSC)
- Tanzania Food and Drugs Authority (TFDA)*
- Tanzania Food and Nutrition Center (TFNC)*
- United Nations Industrial Development Organization (UNIDO) / Small Industries Development Organization (SIDO)
- Tanzania Revenue Authority – Customs Department
- Biashara Consumers Service Limited
- Government Chemist Laboratory Agency (GCLA)

The organizations marked with an asterisk (*) in the above list, together with the following were directly represented on the Technical Committee entrusted with the preparation of this Tanzania Standard:

- National Grain Reserve Agency
- Bakhresa Group of Companies
- Tanzania Industrial Research and Development Organization (TIRDO)

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ISBN: 9976-64-258-x
National foreword

This Tanzania Standard is identical to EAS 768: 2013, Fortified milled maize (corn) products — Specification, published by the East African Community (EAC).

This third edition cancels and replaces the second edition (TZS 328: 2010) which has been technically revised.

Terminology and conventions

Some terminology and certain conventions in the EA Standards are not identical with those used in Tanzania Standards and attention is drawn to the following:

Wherever the words “East African Standard” appear in this Tanzania Standard, they should be interpreted as “Tanzania Standard”.

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Fortified milled maize (corn) products — Specification

1 Scope

This East African standard specifies the requirements and methods of sampling and test for fortified milled maize (corn) products namely: maize meal and maize flour from the grains of common maize (Zea mays L.) intended for human consumption.

2 Normative references

The following normative documents contain provisions which, through reference in this text constitute provisions of this East African Standard:

EAS 2, Maize (grains) — 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 103, General standard for food additives
CAC/GL 1, General guidelines on claims
CAC/GL 2, Guidelines on nutrition labelling
CAC/GL 23, Guidelines for use of nutrition and health claims
CODEXSTAN 193, Codex general standards for contaminants and toxins in food and feed
ISO 711, Cereals and cereal products — Determination of moisture content (Basic reference method)
ISO 6540, Maize — Determination of moisture content (on milled grains and on whole grains)
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 7251, Microbiology of food and animal feeding stuffs — Horizontal method for the detection and enumeration of presumptive Escherichia coli — Most probable number technique
ISO 7395, Milled cereal products — Determination of fat acidity
ISO 11085, Cereals, cereals-based products and animal feeding stuffs — Determination of crude fat and total fat content by the Randall extraction method
ISO 13690, Cereals, pulses and milled products — Sampling of static batches
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 20483, Cereals and pulses — Determination of the nitrogen content and calculation of the crude protein content — Kjeldahl method
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

3 Terms and definitions

For the purposes of this standard the definitions in EAS 44 and the following shall 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 milled maize products
maize meal, maize flour or sifted maize meal to which micronutrients have been added in accordance
with this standard

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

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

4. Quality requirements

4.1 Raw materials
Fortified milled maize products shall be produced from shelled maize conforming to the requirements
of EAS 2.

4.2 General quality requirements
Fortified milled maize products shall be
a) of natural colour conforming to the colour of maize from which it was prepared.
b) practically free from foreign matter such as insects, fungi and dirt.
c) free from fermented musty or other objectionable colours.
d) free from rancidity and foreign odours.
e) safe and suitable for human consumption.

4.3 Specific quality requirements
Fortified milled maize products shall conform to the requirements given in Table 1.
Table 1 — Specific quality requirements for fortified milled maize products

<table>
<thead>
<tr>
<th>Sl No.</th>
<th>Characteristic</th>
<th>Type of product</th>
<th>Sifted maize meal</th>
<th>Granulated maize meal</th>
<th>Whole maize meal</th>
<th>Maize flour</th>
<th>Test method</th>
</tr>
</thead>
<tbody>
<tr>
<td>i)</td>
<td>Crude fibre content, % by mass, max.</td>
<td></td>
<td>0.7</td>
<td>1.0</td>
<td>3.0</td>
<td>0.7</td>
<td>ISO 5498</td>
</tr>
<tr>
<td>ii)</td>
<td>Crude fat on a moisture free basis, % by mass, max.</td>
<td></td>
<td>2.25</td>
<td>2.25</td>
<td>3.1</td>
<td>2.25</td>
<td>ISO 11085</td>
</tr>
<tr>
<td>iii)</td>
<td>Moisture content, % by mass, max.</td>
<td></td>
<td>13</td>
<td>13</td>
<td>13</td>
<td>13</td>
<td>ISO 5640</td>
</tr>
<tr>
<td>iv)</td>
<td>Total ash, % by mass, max.</td>
<td></td>
<td>1.0</td>
<td>1.0</td>
<td>3.0</td>
<td>1.0</td>
<td>ISO 2171</td>
</tr>
<tr>
<td>v)</td>
<td>Acid insoluble ash, % by mass, max.</td>
<td></td>
<td>0.15</td>
<td>0.35</td>
<td>0.40</td>
<td>0.15</td>
<td>Annex A</td>
</tr>
<tr>
<td>vi)</td>
<td>Crude protein (N x 6.25) % by mass, min.</td>
<td></td>
<td>7.0</td>
<td>7.0</td>
<td>8.0</td>
<td>7.0</td>
<td>ISO 20483</td>
</tr>
<tr>
<td>vii)</td>
<td>Fat acidity, mg KOH per 100g of product, on dry matter basis, max.</td>
<td></td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>ISO 7305</td>
</tr>
</tbody>
</table>

5 Fortification requirements

5.1 Levels of micronutrients

The fortified milled maize products 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 milled maize products.

Table 2 — Requirements for micronutrients in fortified milled maize products

<table>
<thead>
<tr>
<th>Sl No.</th>
<th>Nutrient</th>
<th>Fortificant compound</th>
<th>Recommended factory level, mg/kg</th>
<th>Regulatory levels, mg/kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>i)</td>
<td>Vitamin A¹</td>
<td>Vitamin A (Retinyl) palmitate</td>
<td>1±0.4</td>
<td>Minimum</td>
</tr>
<tr>
<td>ii)</td>
<td>Vitamin B₁</td>
<td>Thiamin Mononitrate</td>
<td>6.5±2.9</td>
<td>0.5</td>
</tr>
<tr>
<td>iii)</td>
<td>Vitamin B₂¹</td>
<td>Riboflavin</td>
<td>2±1.8</td>
<td>3.0</td>
</tr>
<tr>
<td>iv)</td>
<td>Niacin¹</td>
<td>Niacinamide</td>
<td>30±13.4</td>
<td>2</td>
</tr>
<tr>
<td>v)</td>
<td>Vitamin B₆</td>
<td>Pyridoxine</td>
<td>5±2.5</td>
<td>14.9</td>
</tr>
<tr>
<td>vi)</td>
<td>Folate</td>
<td>Folic acid</td>
<td>1.2±0.5</td>
<td>0.6</td>
</tr>
<tr>
<td>vii)</td>
<td>Vitamin B₁₂</td>
<td>Vitamin B₁₂, WS, 0.1%</td>
<td>0.015±0.007</td>
<td>0.007</td>
</tr>
<tr>
<td>viii)</td>
<td>Zinc</td>
<td>Zinc oxide</td>
<td>49±16</td>
<td>33</td>
</tr>
<tr>
<td>ix)</td>
<td>Total iron</td>
<td>Total iron</td>
<td>31±10</td>
<td>21</td>
</tr>
<tr>
<td>x)</td>
<td>Added iron</td>
<td>NaFeEDTA</td>
<td>20±10</td>
<td>10</td>
</tr>
</tbody>
</table>

*N/A — Not applicable. Setting the maximum level for these nutrients is not necessary because the upper tolerable limit for these nutrients is very high. The addition of these micronutrients is optional in Tanzania.
5.2 Fortificants

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

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

5.3 Premix

The fortificants shall be mixed with diluents or carriers as appropriate to form a premix. Diluents or carriers shall conform to USP, BP, Ph Eur, NF, MI, FAO/WHO, or FFC.

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 3.

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

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

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

5.4 Stability of fortificants and premixes

The fortificants and premixes shall have storage stability such that no more than 20 % of its 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 % - 14.5 %.

The supplier of the premix shall provide the stability data for the fortificants and premixes.
Table 3 – Formulation of premix for addition of micronutrients to milled maize products

<table>
<thead>
<tr>
<th>Micronutrient</th>
<th>Fortificant compound</th>
<th>Amount of micronutrient to be added to food, mg/kg</th>
<th>Amount of fortificant to be added to food, mg/kg</th>
<th>Amount of fortificant in premix, g/kg</th>
<th>Amount of nutrient in premix, g/kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vitamin A</td>
<td>Retinyl palmitate, spray-dried or equivalent, 0.075% retinol, min.</td>
<td>1.0</td>
<td>13.3</td>
<td>28.7</td>
<td>2</td>
</tr>
<tr>
<td>Vitamin B₁</td>
<td>Thiamin mononitrate, 81%, min.</td>
<td>4.5</td>
<td>5.6</td>
<td>11.1</td>
<td>9</td>
</tr>
<tr>
<td>Vitamin B₂ (Riboflavin)</td>
<td>Riboflavin, 100%, min.</td>
<td>3.0</td>
<td>3.0</td>
<td>6.0</td>
<td>6</td>
</tr>
<tr>
<td>Vitamin B₃ (Niacin)</td>
<td>Niacinamide, 99%, min.</td>
<td>25.0</td>
<td>25.3</td>
<td>50.5</td>
<td>50</td>
</tr>
<tr>
<td>Vitamin B₆ (Pyridoxine)</td>
<td>Pyridoxine, 82%, min.</td>
<td>5.0</td>
<td>6.1</td>
<td>12.2</td>
<td>10</td>
</tr>
<tr>
<td>Vitamin B₉ (Folate)</td>
<td>Folic Acid, 100%, min.</td>
<td>1.0</td>
<td>1.1</td>
<td>2.2</td>
<td>2</td>
</tr>
<tr>
<td>Vitamin B₁₂</td>
<td>Vitamin B₁₂, water-soluble form 0.1%)</td>
<td>0.015</td>
<td>15.0</td>
<td>30.0</td>
<td>0.03</td>
</tr>
<tr>
<td>Iron</td>
<td>NaFeEDTA, 13 % Fe, min.</td>
<td>20</td>
<td>153.8</td>
<td>307.7</td>
<td>37</td>
</tr>
<tr>
<td>Zinc</td>
<td>Zinc oxide, 80%, min.</td>
<td>40</td>
<td>50.0</td>
<td>100.0</td>
<td>80</td>
</tr>
<tr>
<td>Filling material (at least 25 %)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>341.5</td>
<td>1000.0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6 Food additives

The product shall contain food additives in accordance with EAS 103.

7 Hygiene

7.1 Fortified milled maize products shall be produced, prepared and handled in accordance with the provisions of appropriate sections of EAS 39.

7.2 The product shall be free from pathogenic micro-organisms and shall comply with microbiological limits in Table 4.

Table 4 — Microbiological limits for milled maize products

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Micro-organism</th>
<th>Maximum limit</th>
<th>Methods of test</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i)</td>
<td><em>Escherichia coli</em>, MPN, per g</td>
<td>Not detected</td>
<td>ISO 7251</td>
</tr>
<tr>
<td>(ii)</td>
<td><em>Salmonella</em> per 25 g</td>
<td>Absent</td>
<td>ISO 6579</td>
</tr>
<tr>
<td>(iii)</td>
<td>Yeast and moulds, cfu/g, max.</td>
<td>$10^4$</td>
<td>ISO 21527-2</td>
</tr>
</tbody>
</table>

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8 Contaminants

8.1 Heavy metals

Fortified milled maize products shall conform to those maximum limits for heavy metals established in Codexstan 193.

8.2 Pesticide residues

Fortified milled maize products shall conform to those maximum residue limits established by the Codex Alimentarius Commission for these products.

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

8.3 Mycotoxins

Fortified milled maize products shall conform to those maximum mycotoxin limits established by the Codex Alimentarius Commission for these products. In particular, aflatoxin levels in milled maize products for human consumption shall not exceed 10 µg/kg for total aflatoxins; and 5 µg/kg for aflatoxin B1 when tested in accordance with ISO 16050.

9 Packaging

9.1 Fortified milled maize products shall be packed in suitable packages which shall be clean, sound, free from insects, fungal infestation and the packing material shall be of food grade quality.

9.2 Fortified milled maize products shall be packed in containers which will safeguard the hygienic, nutritional, technological and organoleptic qualities of the products.

9.3 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.

9.4 Each package shall be securely closed and sealed.

NOTE 1 Packaging materials may be required to meet different regulations in the different destination countries.

NOTE 2 The package fill should conform to the requirements of the legal metrology of the destination country.

NOTE 3 East African Community Partner States are signatory to the International Labour Organization (ILO) recommendation for maximum package weight of 50 kg per load where human loading and offloading is involved.

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:

i) name of product such as "Whole Maize Meal, Sifted Maize meal, Maize flour or Granulated Maize meal";

ii) the word -Fortified- shall be declared before the name of the product;
iii) name and address of the manufacturer/packer/importer;
iv) brand name/registered trade mark, if any;
v) lot or batch number in code or in clear format;
vi) net weight in metric units;

vii) the statement—Store in a cool dry place and away from contaminants;
viii) the statement "Human food”;
ix) Country of origin;
x) date of manufacture;
xii) best before date; and

and instructions for disposal of used package.

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 amount of micronutrients in the maize flour shall be declared on the label in accordance with CAC/GL 2.

10.3 Nutrition and health claims

Fortified milled maize products may have claims on the importance of the micronutrients in nutrition and health. Such claims when declared shall be consistent with CAC/GL 1 and CAC/GL 23.

11 Methods of sampling

Sampling shall be done in accordance with the ISO 13690.

12 Methods of test

Testing for micronutrients may be conducted using any ECSA¹ or any other internationally recognized test methods

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Annex A  
(normative)

Determination of acid insoluble ash

A.1 Reagent

Dilute hydrochloric acid — Approximately 5 N, prepared from concentrated hydrochloric acid.

A.2 Procedure

Weigh accurately about 5 g of the product in a tared, clean and dry porcelain dish. Ignite the material in the dish with the flame of a suitable burner for about one hour. Complete the ignition by keeping in a muffle furnace at 500°C to 600°C until grey ash results. Cool in a desiccator and weigh. Repeat the process of igniting, cooling and weighing at half-hour intervals until the difference between two successive weighings is less than one milligram. Note the lowest mass.

To the ash contained in the porcelain dish add 25 mL of dilute hydrochloric acid, cover with a watch glass and heat on a water bath for 10 minutes. Allow to cool and filter the contents of the dish through Whatman filter paper No. 42 or its equivalent. Wash the filter with water until the washings are free from the acid. Return the filter and the residue to the dish. Keep it in an electric oven maintained at 135 ± 2 °C for about 3 hours. Ignite in a muffle furnace at about 550°C to 600 °C for one hour. Cool the dish in a desiccator and weigh. Repeat the process of igniting in the muffle furnace, cooling and weighing at half-hour intervals until the difference between two successive weighings is less than one milligram. Note the lowest mass.

A.3 Calculation

Acid insoluble ash (on dry basis), per cent by mass

\[ = 100 \left( \frac{m_2 - m}{m_1 - m} \right) \]

where

\( m_2 = \) mass in g of the porcelain dish with the acid insoluble ash,

\( m = \) mass in g of the empty porcelain dish, and

\( m_1 = \) mass in g of the porcelain dish with the dried material taken for the determination of total ash
Bibliography


[3] ECSA-HC Guidelines of fortification levels for staples