
Maize grains (Corn) — Specification

Public Review Draft for comments only — Not to be cited as African Standard



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Foreword

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This African Standard was prepared by the ARSO Technical Committee on Cereals, pulses and derived products (ARSO/TC 12).

This African Standard is a technical revision of the earlier ARS 461:2016 (E), *Standard for maize (corn)* which is hereby superseded and cancelled

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Introduction

Maize grain is produced in larger quantities in Africa more than any other crop. It is a major food security crop in Sub-Saharan Africa, being the staple food for an estimated 50 per cent of the population. Maize is an important source of carbohydrates, protein, iron, vitamin B, and minerals.

This standard has been revised to take into account:

- a) the needs of the market for the product;
- b) the need to facilitate fair domestic, regional and international trade and prevent technical barriers to trade by establishing a common trading language for buyers and sellers;
- c) the structure of the CODEX, UNECE, USA, ISO and other internationally significant standards;
- d) the needs of the producers in gaining knowledge of market standards, conformity assessment, commercial cultivars and crop production process;
- e) the need to transport the product in a manner that ensures keeping of quality until it reaches the consumer;
- f) the need for the plant protection authority to certify, through a simplified form, that the product is fit for cross-border and international trade without carrying plant disease vectors;
- g) the need to promote good agricultural practices that will enhance wider market access, involvement of small-scale traders and hence making farming a viable means of wealth creation; and
- h) the need to ensure a reliable production base of consistent and safe crops that meet customer requirements.

This edition has also incorporated several changes in order to align the standard to current requirements for quality and safety including but not limited to the following aspects:

- (i) Limits for mycotoxins
- (ii) Microbiological requirements
- (iii) Grading of grains

Maize grains (Corn) — Specification

1 Scope

This African Standard specifies the requirements and methods of sampling and test for maize grains (corn) of varieties grown from common maize *grains*, *Zea mays indentata* L., and/or *Zea mays indurata* L., or their hybrids intended for human consumption.

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.

ARS 53, *General principles of food hygiene — Code of practice*

ARS 56, *Prepackaged foods — Labelling*

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

ISO 605, *Pulses — Determination of impurities, size, foreign odours, insects, and species and variety — Test methods*

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

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

ISO 5223, *Test sieves for cereals*

ISO 6633, *Fruits, vegetables and derived products — Determination of lead content — Flameless atomic absorption spectrometric method*

ISO 6561-1, *Fruits, vegetables and derived products — Determination of cadmium content — Part 1: Method using graphite furnace atomic absorption spectrometry*

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

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

ISO 27085, *Animal feeding stuffs — Determination of calcium, sodium, phosphorus, magnesium, potassium, iron, zinc, copper, manganese, cobalt, molybdenum, arsenic, lead and cadmium by ICP-AES*

AOAC Official Method 2001.04, *Determination of Fumonisin B₁ and B₂ in corn and corn flakes — Liquid chromatography with immunoaffinity column cleanup*

ISO 24333, *Cereals and cereal products — Sampling*

3 Terms and Definitions

For the purpose of this standard the following terms and definitions apply.

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3.1

maize (corn)

shelled dried grains of the species *Zea mays indentata* L, (dent maize) and/or *Zea mays indurata* L, (flint maize), or their hybrids

3.2

flint maize (corn)-

form of corn whose mature kernel has a smooth, vitreous, appearance and a rather round shape

3.3

dent maize (corn)-

form of corn whose mature kernel has the shape of a horse's tooth with a depression in the crown

3.4

insect or pest damaged grains

grain which shows damage or owing attack by rodents, insects, mites or other pests .

3.5

stained kernels

kernels whose natural colour has been altered by external factors. This includes ground, soil or weather damaged kernels, which may have dark stains or discolourations with a rough external appearance

3.6

rotten and diseased grains

grains made unsafe for human consumption due to decay, moulding, or bacterial decomposition, or other causes that may be noticed without having to cut the grains to examine them

3.7

discoloured grain/kernel

kernel which is damaged by heat, frost or water

3.8

germinated kernel

kernels showing visible signs of sprouting

3.9

frost damaged kernel

kernels which appear bleached or blistered due to exposure of extremely low temperature and the seed coat may be peeling, germs may appear dead or discoloured

3.10

mouldy kernel

maize grains with visible mycelial growth on its tip or surface

3.11

immature/shriveled grains

maize grains which are underdeveloped, thin and papery in appearance

3.12

broken kernels

pieces of maize which shall pass through a 4.50 mm metal sieve

3.13

other edible grains

edible grain, whole or broken, other than maize, that is, cereals, pulses and other edible legumes

3.14

foreign matter/extraneous matter

all organic and inorganic materials other than maize

3.14.1

inorganic foreign matter

inorganic matter components, such as stone, sand and dust

3.14.2

organic foreign matter

any animal or plant matter (e.g. dead insects, seed coats, straws, weeds) other than grain of maize and damaged maize grain

3.15

filth

impurities of animal origin including dead insects

3.16

defective grains

pest damaged, discoloured, stained, rotten and diseased, immature and shrivelled grains and broken grain

3.17

food grade packaging material

packaging material, made of substances which are safe and suitable for their intended use and which will not impart any toxic substance or undesirable odour or flavour to the product

3.18

heat damaged maize grains

maize grains which are discoloured and damaged by excessive high temperature.

3.19

poisonous, toxic and/or harmful seeds

seed which if present in quantities above permissible limit may have damaging or dangerous effect on health, organoleptic properties or technological performance such as Jimson weed — *Datura* (*D. fastuosa* Linn and *D. stramonium* Linn.) corn cockle (*Agrostemma githago* L., *Machai Lallium remulenum* Linn.) Akra (*Vicia* species), *Argemone mexicana*, Khesari and other seeds that are commonly recognized as harmful to health

4 Classification

Maize kernels shall meet the following general requirements as determined using the relevant standards listed in Clause 2, kernels shall be

4.1 Colour

Maize may be presented as yellow, white, or red, or a mixture of these colours.

- a) Yellow maize shall contain not more than 5.0 % by weight of maize of other colours. Maize grains which are yellow and/or light red in colour are considered to be yellow maize. Yellow maize also means maize grains which are yellow and dark red in colour, provided the dark red colour covers less than 50 % of the surface of the grain.
- b) White maize shall contain not more than 2.0 % by weight of maize of other colours. Maize grains which are white and/or light pink in colour are considered to be white maize. White maize also means maize grains which are white and pink in colour, provided the pink colour covers less than 50 % of the surface of the grain.
- c) Red maize shall contain not more than 5.0 % by weight of maize of other colours. Maize grains which are pink and white, grey or dark red and yellow in colour are considered to be red maize, provided the pink or dark red or yellow colour covers 50 % or more of the surface of the grain.

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- d) Mixed maize includes maize not falling into the classes of white, yellow or red maize as defined in (a) to (d).

4.2 Shape

Maize also may be presented as flint or dent or their hybrids or mixtures thereof as follows.

- a) Flint maize have kernels with a hard outer layer enclosing the soft endosperm which consist of 95% or more by weight of flint maize and not more than 5% maize of other shapes by weight.
- b) Dent maize is maize with a concavity on the outermost face of the grain, consists of 95% or more by weight of grains of dent maize and not more than 5% maize of other shapes by weight.
- c) Flint and dent maize includes maize of any colour which consists of more than 5 % but less than 95.0 % of flint maize.

5 Quality requirements

5.1 General requirements

Maize shall be practically free from foreign odours, moulds, live pests, rat droppings, toxic or noxious weed seeds and other injurious contaminants as determined from samples representative of the lot. Maize shall be of a reasonably uniform colour according to type, be whole and clean.

5.2 Specific requirements

Maize grain shall comply with maximum limits given in Table 1 when tested in accordance with the test methods specified therein.

Table1 — Specific requirements

S/N	Characteristics,	Limits, max			Method of test
		Grade 1	Grade 2	Grade 3	
(1)	Foreign matter, % m/m	0.5	1.0	1.5	ISO 605
(2)	Inorganic matter, % m/m	0.25	0.5	0.75	
(3)	Broken kernels, % m/m	2.0	4.0	6.0	
(4)	Pest damaged grains, % m/m	1.0	3.0	5.0	
(5)	Rotten & diseased grains, % m/m	1	2	3	
(6)	Discoloured grains, % m/m	1.5	2	2.5	
(7)	Moisture, % m/m	13.5	13.5	13.5	ISO 711/712
(8)	Immature/shrivelled grains, % m/m	1.0	2.0	3.0	ISO 605
(9)	Filth, % m/m	0.1	0.1	0.1	
(10)	Total Aflatoxins, ppb, max	10			ISO 16050
(11)	Aflatoxin B1, ppb, max	5			
(12)	Fumonisin, ppm, max	2			AOAC Official Method 2001.04
(13)	Total ^a defectives grains, % m/m	5.1	10.2	15.3	ISO 605
^a The parameter, total defective grains is not the sum total of the individual defects. It is limited to 70% of the sum total of individual defects NOTE Maize grains destined for processing baby foods shall have total aflatoxin level of not more than 4 ppb.					

6 Contaminants

6.1 Heavy metals

Maize grains shall comply with those maximum limits for metal contaminants specified in CODEX STAN 193 and in particular those listed in Table 2.

Table 2 — Metal contaminants

S/N	Parameter	Limit (ppm max)	Test method
(1)	Lead (Pb)	1.0	ISO 6633 (AAS)
(2)	Cadmium (Cd)	0.1	ISO 6561-1 or 6561-2

6.2 Pesticide residues

Maize grains shall comply with those maximum pesticide residue limits established by the Codex Alimentarius Commission for this commodity.

7 Hygiene

Maize grains shall be produced and handled under hygienic conditions in accordance with ARS 53.

8 Weights and measures

Maize grains shall be packaged in accordance with the weights and measures regulations of the destination country.

NOTE Maximum package weight of 50 kg where human loading and offloading is involved'

9 Packaging

9.1 Maize grains shall be packed in suitable packages which shall be clean, sound, free from insect, fungal infestation and the packing material shall be of food grade quality and shall be securely closed and sealed.

9.2 Maize grains shall be packed in containers which will safeguard the hygienic, nutritional, and organoleptic qualities of the products.

9.3 Each package shall contain maize grains of the same type and of the same grade designation.

9.4 If maize grains are presented in bags, the bags shall also be free of pests and contaminants.

10 Labelling

10.1 The following specific labelling requirements shall apply and shall be legibly and indelibly marked in accordance with the requirements of ARS 56:

- i) product name as "White Maize Grains, Yellow Maize Grains, Red Maize Grains or Mixed Maize Grains";

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- ii) grade;
- iii) name, address and physical location of the producer/ packer/importer;
- iv) lot/batch/code number;
- v) net weight, in kg;
- vi) the declaration “Food for Human Consumption”
- vii) storage instruction as “Store in a cool dry place away from any contaminants”;
- viii) crop year;
- ix) packing date; and expiry date
- x) instructions on disposal of used package;
- xi) country of origin;
- xii) a declaration on whether the maize was genetically modified where applicable.

10.2 Labelling of non-retail containers

Information for non-retail containers shall either be given on the container or in accompanying documents, except that the name of the product, lot identification and the name and address of the manufacturer or packer shall appear on the container. However, lot identification and the name and address of the manufacturer or packer may be replaced by an identification mark, provided that such a mark is clearly identifiable with the accompanying documents.

11 Methods of sampling

Sampling shall be done in accordance with the ISO 24333.

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