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Maize (*Zea mays* L.) — Specification

*Maïs (*Zea mays *L.) — Spécifications*

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Foreword

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This document was prepared by Technical Committee ISO/TC 34, *Food Products*, Subcommittee SC 4, *Cereals and pulses*.

Maize (*Zea mays* L.) — Specification

1 Scope

This document specifies minimum specifications for maize (*Zea mays* L.) intended for human consumption and which is the subject of international trade.

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.

ISO 5223, *Test sieves for cereals*

ISO 6540, *Maize — Determination of moisture content (on milled grains and on whole grains)*

ISO 6639-3, *Cereals and pulses — Determination of hidden insect infestation — Part 3: Reference method*

ISO 6639-4, *Cereals and pulses — Determination of hidden insect infestation — Part 4: Rapid methods*

ISO 7971-1, *Cereals — Determination of bulk density, called mass per hectolitre — Part 1: Reference method*

ISO 7971-3, *Cereals — Determination of bulk density, called mass per hectolitre — Part 3: Routine method*

ISO 24333, *Cereals and cereal products — Sampling*

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

3.1
bulk density
test weight
cereals ratio of the mass of a cereal to the volume it occupies after being poured into a container under well-defined conditions

Note 1 to entry: Bulk density is expressed in kilograms per hectolitre of grains as received. Other units such as grams per litre or pound per bushel could also be used.

3.2
impurity
all matters of a sample of grain other than the basic cereal of unimpaired quality

Note 1 to entry: In maize, impurities comprise four main categories: *broken grains* (3.3), *damaged grains* (3.4), *other grains* (3.5) and *miscellaneous impurities* (3.6).

Note 2 to entry: Live pests are not considered as impurities. They are specified as separate criterion.

[SOURCE: EN 16378:2013, 3.1]

3.3
broken grain
grain or pieces of grain that can pass through a sieve with a circular mesh of 4,5 mm in diameter as specified in ISO 5223

3.4
damaged grain
whole kernel that is distinctly discoloured, sprouted, diseased or damaged by weather, pest, heat, or any other causes and that is not an *unsound grain* (3.6.2) but that is still fit for human and/or animal consumption

3.4.1
heat-damaged grain
grain with a chestnut to black coloration, resulting from the effect of heat, and of which a section of the endosperm is yellowish-grey or brownish black resulting from the effect of spontaneous heat generation or too extreme heating during drying

3.4.2
sprouted grain
grain in which the radicle or plumule is clearly visible to the naked eye

Note 1 to entry: Account should be taken of the general appearance of the sample when its content of sprouted grains is assessed.

Note 2 to entry: Sprouted grains are those were the germ has undergone clearly visible changes which makes it easy to distinguish the sprouted grain from the normal grain.

3.4.3
grain attacked by pests
grain that shows visible damage owing to attack by insects, rodents, mites or other pests

3.5
other grain
grain other than maize, in any condition

3.6
miscellaneous impurity
element that can consist of *extraneous seeds* (3.6.1), *unsound grains* (3.6.2), *extraneous matter* (3.6.3) and *impurities of animal origin* (3.6.4)

3.6.1
extraneous seed
seed of a plant, whether or not cultivated, other than cereal

Note 1 to entry: “Noxious seeds” means seeds that are toxic to humans and animals, seeds hampering or complicating the cleaning and milling of cereals and seeds affecting the quality of products processed from cereals.

Note 2 to entry: For information on noxious seeds, see Annex A.

3.6.2
unsound grain
grain rendered unfit for human and/or animal consumption, owing to putrefaction, mildew, grain affected with fusariosis, or bacterial or other causes

Note 1 to entry: Unsound grains also include grains damaged by spontaneous heat generation or too extreme heating during drying which are fully grown grains in which the tegument is coloured greyish-brown to black while the cross-section of the kernel is coloured-yellowish grey to brownish-black.

3.6.3
extraneous matter
matter in a sample that can pass through a sieve with apertures of 1,0 mm as specified in ISO 5223, and that also includes stones, sand, fragments of straw, cob and similar impurities in the a sample that are retained by a sieve with apertures of 1,0 mm

3.6.4
impurity of animal origin
matter of animal origin (eggs, larvae, nymphs or adults of insects and their fragments, rodent hairs and their fragments, mites and their fragments) separated from the product under specified conditions

4 Specifications

4.1 General characteristics and sensory properties

Maize shall be sound, clean and have no foreign odours or odours denoting any deterioration.

4.2 Health characteristics

Maize grains shall be free from intentionally added substances and heavy metals in amounts which can represent a hazard to human and/or animal health. Maize shall not contain mycotoxins, pesticides residues or other contaminants at levels (or concentration) which can affect human and/or animal health. The maximum levels authorized are laid down by the national or regional regulation, or the joint FAO/WHO Codex Alimentarius Commission (see References [4] to [7]).

Maize shall be free from the living insects (listed in Annex B), when determined according to ISO 6639-3 or ISO 6639-4, and of mites, when determined by the sieving method, which are clearly visible to the naked eye.

4.3 Physical and chemical characteristics

4.3.1 Moisture content

The moisture content of maize, determined in accordance with ISO 6540, shall not be greater than 14,5 % (mass fraction).

NOTE Different moisture contents are required for certain destinations, in relation to the climate, and duration of transport and storage. For further information, see ISO 6322-1, ISO 6322-2 and ISO 6322-3.

4.3.2 Bulk density

The bulk density, called "mass per hectolitre", of maize shall be determined using instruments calibrated according to the reference method given in ISO 7971-1 or, by default, according to the routine method given in ISO 7971-3, and shall not be less than 60 kg/hl.

4.3.3 Impurities

The maximum impurities content, determined using the method described in Annexes C and D, shall not exceed the value given in Table 1.

The maximum content of the impurities (broken grains, damaged grains, other grains and miscellaneous impurities), shall not exceed 15 % (mass fraction) in total.

Table 1 — Maximum levels of impurities

Impurities	Definition given in	Maximum permissible level % (mass fraction)
Broken grains	3.3	6,0
Damaged grains	3.4	10,0
Miscellaneous impurities	3.6	1,0
Extraneous matter	3.6.3	1,0
Impurities of animal origin	3.6.4	0,1
NOTE The maximum content of the impurities (broken grains, damaged grains, other cereals and miscellaneous impurities), shall not exceed 15 % (mass fraction) in total.		

5 Sampling

Sampling shall be carried out in accordance with ISO 24333.

6 Test methods

The test methods shall be carried out using the methods specified in 4.3, Annexes C and D.

7 Transportation

Maize shall be transported in a manner that is free of living pests. It shall be protected from water and from being contaminated by toxic or harmful substances.

Annex A
(informative)

Indicative list of noxious seeds

WARNING — This is a non-exhaustive list which could be completed if the necessity arose.

A.1 Toxic seeds

Botanical name	Common name
Acroptilon repens (L.) DC.	
Agrostemma githago L.	Corn-cockle
Coronilla varia L.	Coronilla, Crown vetch
Crotalaria spp.	Crotalaria
Datura fastuosa L.	Jimson weed
Datura stramonium L.	Stramony, thorn apple
Heliotropium lasiocarpum Fisher et C.A.	Meyer Heliotrope
Lolium temulentum L.	Darnel
Ricinus communis L.	Castor-oil plant
Sophora alopecuroides L.	Stagger bush, Russian centaury
Sophora pachycarpa Schrank ex C.A. Meyer	
Thermopsis montana	Buffalo pen
Thermopsis lanceolata R. Br. in Aiton	
Trichoderma incanum	

A.2 Harmful seeds

Botanical name	Common name
Allium sativum L.	Garlic
Cephalaria syriaca (L.)	Roemer et Shultes Teasel
Melampyrum arvense L.	Cow-cockle
Melilotus spp.	Melilot
Sorghum halepense (L.)	Pers. Johnson grass
Trogonella foenum-graecum L.	Fenugreek

Annex B
(normative)

Unacceptable mites and insect pests of stored cereals

The following are unacceptable in stored cereals:

— *Ahasverus advena* (Waltl);

— *Attagenus brunneus* (Faldermann);

— *Attagenus unicolor japonicus* (Reitter);

— *Corcyra cephalonica* (Stainton);

— *Cryptolestes ferrugineus* (Stephens);

— *Cryptolestes pusillus* (Schênherr);

— *Cryptolestes turcicus* (Grouville);

— *Ephestia cautella* (Walker);

— *Ephestia kiihniella* (Zeller);

— *Latheticus oryzae* (Waterhouse);

— *Liposcelis bostrychophila* (Badonnel);

— *Nemapogon granella* (*L.*);

— *Oryzaephilus mercator* (Fauvel);

— *Oryzaephilus surinamensis* (Linnaeus);

— *Plodia interpunctella* (Hübner);

— *Prostephanus trurtcatus* (Hom);

— *Rhizopertha dominica* (Fabricius);

— *Sitotroga cerealella* (Olivier);

— *Sitophilus granarius* (Linnaeus);

— *Sitophilus oryzae* (Linnaeus);

— *Sitophilus zeamais* (Motschulsky);

— *Tenebroides mauritanicus* (Linnaeus);

— *Tribolium castaneum* (Herbst);

— *Tribolium confusum* (Jacquelin du Val);

— *Trogoderma granarium* (Everts);

— *Trogoderma variabile* (Ballion);

— *Tyroglyphus ovatus* (Troupeau);

— *Tyrophagus putrescentiae* (Schrank).