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Wheat (*Triticum aestivum* L.) — Specification

*Blé tendre (*Triticum aestivum *L.) — Spécifications*

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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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Foreword

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The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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ISO 7970 was prepared by Technical Committee ISO/TC 34, *Food products*, Subcommittee SC 4, *Cereals and pulses*.

This third edition cancels and replaces the second edition (ISO 7970:2000), which has been technically revised.

Wheat (*Triticum aestivum* L.) — Specification

1 Scope

This International Standard establishes minimum specifications for wheat (*Triticum aestivum* L.) intended for human consumption and which is the subject of international trade.

2 Normative references

The following normative documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of referenced document (including any amendments) applies.

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

ISO 3093, *Wheat, rye and their flours, durum wheat and durum wheat semolina — Determination of the falling number according to Hagberg-Perten*

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 International Standard, the following terms and definitions apply.

3.1
impurities
all the elements which are conventionally considered as undesirable in a sample or batch of cereals

[ISO 5527:1995[5], 1.4]

NOTE In wheat, impurities comprise four main categories: damaged wheat grains (3.1.1), other cereals (3.1.2), extraneous matter (3.1.3), and harmful and/or toxic matter (3.1.4). (See also Table C.1.)

3.1.1
damaged wheat grains
all the matter of a sample of grain other than the basic cereal which comprises the following fractions: broken grains, wheat of decreased value, grains attacked by pests, unsound grains and sprouted grains

3.1.1.1
broken grains
grains in which part of the endosperm is exposed, or grains without germ

[ISO 5527:1995[5], 1.4.9]

3.1.1.2
wheat of decreased value
grains, not fully developed or with discoloration in germ and its surrounding area, which are less valuable in end-use performance due to external factors

3.1.1.2.1
shrivelled grains
shrunken grains
grains which are poorly filled, light and thin, whose build-up of reserves has been halted due to physiological or pathological factors

[ISO 5527:1995[5], 1.4.7]

3.1.1.2.2
immature grains
grains which are unripe and/or badly developed

3.1.1.2.3
black point grains
grains have a distinct dark brown or black discoloration of the whole germ and surrounding area

3.1.1.3
grains attacked by pests
grains which show damage owing to attack by rodents, insects, mites or other pests

NOTE Adapted from ISO 11051:1994[6], 3.2.4.

3.1.1.4
unsound grains
grains with certain degree of discoloration on surface of the kernel which may be caused by microorganisms or abnormal heating

3.1.1.4.1
mouldy grains
grains which have moulds visible to the naked eye on 50 % of the surface and/or in the kernel

[ISO 11051:1994[6], 3.2.3.1]

3.1.1.4.2
heat-damaged grains
grain whose external appearance has been changed or which have undergone modifications of functional properties due to spontaneous heating or drying at an excessively high temperature

[ISO 5527:1995[5], 1.4.10]

3.1.1.5
sprouted grains
grains in which the radicle or plumule is clearly visible to the naked eye

NOTE Sprouted grains are not taken into account as such, but according to the α-amylase activity which results from their presence and which is expressed as the falling number (see 4.3.4).

3.1.2
other cereals
grains belonging to cereal species other than the main cereal in the sample or batch under consideration

[ISO 5527:1995[5], 1.4.1]

NOTE For the purposes of this International Standard, the “main cereal” is wheat (*Triticum aestivum* L.)

3.1.3
extraneous matter
fraction consisting of inorganic extraneous matter and organic extraneous matter

3.1.3.1
inorganic extraneous matter
stones, glass, pieces of soil and other mineral matter from the fraction retained by a sieve with long rounded apertures 3,55 mm wide and from the fraction retained by a sieve with long rounded apertures 1,00 mm wide and all the components which pass through a sieve with long rounded apertures 1,00 mm wide (by convention, the latter are considered to be inorganic)

3.1.3.2
organic extraneous matter
any animal or plant matter other than grains of wheat, damaged wheat grains (3.1.1), other grains (3.1.2), inorganic extraneous matter (3.1.3.1) and harmful and/or toxic matter (3.1.4)

3.1.4
harmful matter
toxic matter
any substances in wheat bulk that can have a damaging or dangerous effect on health

3.1.4.1
harmful seeds
seeds which, if present in quantities above a certain limit, can have a damaging or dangerous effect on health, sensory properties or technological performance

NOTE An indicative list of these seeds is given in Annex A.

3.1.4.2
bunted grains
fungal structures which approximate the shape of normal grain, filled with fetid-smelling spores of the bunts *Tilletia caries, Tilletia controversa, Tilletia foetida, Tilletia intermedia, Tilletia triticoides*, *Neovossia indica*

NOTE Adapted from ISO 5527:1995[5], 1.4.12.

3.1.4.3
***Fusarium* damaged grains**
grains typically characterized by thin or shrunken chalk-like kernels caused by *Fusarium* head blight

3.1.4.4
rotten grains
grains which are discolored, swollen and soft as a result of decomposition by fungi or bacteria

3.1.4.5
ergot
sclerotium of the fungus *Claviceps purpurea*

[ISO 11051:1994[6], 3.7]

4 Requirements

4.1 General characteristics and sensory properties

Wheat grains shall be sound, clean, and have no foreign odours or odours indicating any deterioration.

4.2 Health characteristics

4.2.1 Wheat grains shall not contain added compounds, heavy metals, mycotoxins, pesticides residues or other contaminants which can affect human health. The maximum levels authorized are laid down by national regulation, or the joint FAO/WHO Codex Alimentarius Commission (see References [7] to [14]).

4.2.2 Wheat shall be free from the living insects listed in Annex B, when determined in accordance with ISO 6639-3 or ISO 6639-4, and of mites when determined by the sieving method.

4.3 Physical and chemical characteristics

4.3.1 Moisture content

The moisture content of wheat, determined in accordance with ISO 712, shall not be greater than 14,5 % mass fraction.

NOTE It is possible that different water contents are required for certain destinations, in relation to the climate, and duration of transport and storage. For further information, see ISO 6322[3].

4.3.2 Bulk density

The bulk density, called mass per hectolitre, of wheat shall be determined using instruments calibrated in accordance with the reference method specified in ISO 7971-1 or, by default, in accordance with the routine method specified in ISO 7971-3. It shall not be less than 70 kg/hl.

4.3.3 Impurities

The maximum impurities content, determined using the method specified in Annex C, shall not exceed the value given in Table 1.

The maximum content of damaged wheat grains (broken grains, wheat of decreased value, unsound grains, grains attacked by pests) and other cereals, determined in accordance with the method described in Annex C, shall not exceed 15 % mass fraction in total.

4.3.4 α-Amylase activity

The α-amylase activity (see 3.1.1.5), determined in accordance with ISO 3093, and expressed as the falling number, shall be not less than 180 s.

5 Sampling

Sampling shall be carried out in accordance with ISO 24333.

6 Test methods

The tests shall be carried out using the methods specified in 4.3 and Annex C.

Table 1 — Maximum levels of impurities

Impurities	Definition	Maximum permissible level % mass fraction
Broken grains	3.1.1.1	7[a]
Wheat of decreased value	3.1.1.2	12[ab]
Grains attacked by pests	3.1.1.3	2[a]
Unsound grains	3.1.1.4	1[a]
Other cereals	3.1.2	3[a]
Extraneous matter	3.1.3	2
Inorganic extraneous matter	3.1.3.1	0,5
Harmful and/or toxic matter	3.1.4	0,5
Each of any toxic matter	3.1.4.1 to 3.1.4.5	0,05

[a] The maximum content of broken grains, wheat of decreased value, unsound grains, grains attacked by pests, and other cereals shall not exceed 15 % mass fraction in total.

[b] For soft wheat, the colored grains of germ are accounted above 8 % mass fraction.

Annex A
(informative)

Indicative list of harmful and toxic seeds

WARNING — This is a non-exhaustive list which can be augmented as necessary.

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.	
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
(informative)

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 (Schönherr)

Cryptolestes turcicus (Grouville)

Ephestia cautella (Walker)

Ephestia kiihniella Zeller

Latheticus oryzae Waterhouse

Liposcelis bostrychophila Badonnel

Nemapogon granella (L.)

Oryzaephilus mercator (Fauvel)

Oryzaephilus surinamensis (L.)

Plodia interpunctella (Hübner)

Prostephanus trurtcatus (Hom)

Rhizopertha dominica (Fabricius)

Sitotroga cerealella (Olivier)

Sitophilus granarius (L.)

Sitophilus oryzae (L.)

Sitophilus zeamais Motschulsky

Tenebroides mauritanicus (L.)

Tribolium castaneum (Herbst)

Tribolium confusum Jacquelin du Val

Trogoderma granarium Everts

Trogoderma variabile (Ballion)

Tyroglyphus ovatus Troupeau

Tyrophagus putrescentiae (Schrank)

Annex C
(normative)

Determination of impurities

C.1 Principle

The impurities are separated by sieving and are graded into the categories shown in Table C.1.

Table C.1 — Categories of impurities

Category of impurity	Corresponding main category
Broken grains Wheat of decreased value Unsound grains Grains attacked by pests	Damaged wheat grains
Other cereals	Other cereals
Organic extraneous matter Inorganic extraneous matter	Extraneous matter
Harmful and/or toxic seeds, bunted grains, *Fusarium* damaged grains, rotten grains and ergot	Harmful and/or toxic matter

C.2 Apparatus

C.2.1 Set of test sieves, with long rounded apertures, comprising sieves of 1,00 mm × 20,0 mm, 1,70 mm × 20,0 mm and 3,55 mm × 20,0 mm, ISO 5223[1], a receiver and a lid.

C.2.2 Sample divider, i.e. conical sampler or multiple-slot sampler with a distribution system.

C.2.3 Tweezers, **scalpel**, and **paintbrush**.

C.2.4 Dishes.

C.2.5 Shallow container, having a surface area of at least 200 cm^2.

C.2.6 Balance, capable of being read to the nearest 0,01 g.

C.3 Sampling

See Clause 5.

C.4 Procedure

C.4.1 General

See Figure C.1.

If a grain exhibits several defects, it shall be classified in the category with the lowest maximum permissible level (see Table 1).

Any components which become stuck in the apertures of a sieve shall be considered as being retained by the sieve.

C.4.2 Preparation of test sample

Carefully mix the laboratory sample to make it as uniform as possible, then proceed to reduce it, if necessary, using a divider (C.2.2) until a quantity of approximately 1 000 g is obtained.

Weigh, to the nearest 1 g, the test sample so obtained and place it in the container (C.2.5).

During the preparation of the test sample, note whether any particular odour foreign to that of wheat is detected, whether any living insects (specified in Annex B) are present or other anomalies.

C.4.3 Determination of ergot

Separate ergot (3.1.4.5) from the test sample (C.4.2), put it in a dish (C.2.4) and weigh it to the nearest 0, 01 g.

C.4.4 First division

Thoroughly mix the sample from which the ergot has been removed and divide it using the divider (C.2.2) until a quantity of approximately 250 g is obtained.

Weigh, to the nearest 0,01 g, the test portion so obtained. If any husked grains are observed, separate them from their envelopes before the first sieving.

C.4.5 First sieving

Fit together the 3,55 mm sieve, the 1,00 mm sieve and the receiver, so that the sieve apertures are positioned parallel to each other.

Place the test portion (C.4.4) on the 3,55 mm sieve and put on the lid.

Shake manually for 45 s with a forwards-and-backwards motion in the direction of the apertures of the sieve, keeping the sieve in a horizontal plane.

From the material which did not pass through the 3,55 mm sieve, separate, by placing in separate dishes (C.2.4), the other cereals (3.1.2), the organic and inorganic components of the extraneous matter (3.1.3), harmful and/or toxic seeds (3.1.4.1), *Fusarium* damaged grains (3.1.4.3), rotten grains (3.1.4.4), bunted grains (3.1.4.2), and black point grains (3.1.1.2.3), and any wheat grains which should have been retained. Wheat grains retained shall then be added to the material which does not pass through the 1,00 mm sieve. Add the inorganic elements of the extraneous matter to the material which has passed through the 1,00 mm sieve. Weigh the fractions thus obtained to the nearest 0,01 g.

C.4.6 Second division

Thoroughly mix the fraction retained between the 1,00 mm sieve and the 3,55 mm sieve, then add the wheat grains retained on the 3,55 mm sieve, and divide it using the divider (C.2.2) until approximately 60 g is obtained. Weigh to the nearest 0,01 g the portion thus obtained.

Spread out the portion, then separate and classify it by placing in the dishes the broken grains (3.1.1.1), other cereals (3.1.2), organic and inorganic extraneous matter (3.1.3), unsound grains (3.1.1.4), grains attacked by pests (3.1.1.3), harmful and/or toxic seeds (3.1.4), bunted grains (3.1.4.2), *Fusarium* damaged grains (3.1.4.3) , rotten grains (3.1.4.4), immature grains (3.1.1.2.2) and black point grains (3.1.1.2.3). Weigh each fraction to the nearest 0,01 g.

Verify that the sum of impurities plus wheat is equal to the mass of the portion with a tolerance of ±5 %.

C.4.7 Second sieving

Pour the portion from which the impurities specified in C.4.6 were removed on to the 1,70 mm sieve fitted with a receiver and put on the lid.

Shake manually for 45 s with a forwards-and-backwards motion in the direction of the apertures of the sieve, keeping the sieve in the horizontal plane.

Weigh, to the nearest 0,01 g, the undersize grain thus obtained which corresponds to the shriveled grains (3.1.1.2.1).

C.4.8 Number of determinations

Repeat the determination on the same test sample, using another test portion obtained as specified in C.4.4.

C.5 Expression of results

Express the content of each category of impurity, using Formulae (1) to (3), as a percentage mass fraction of the grains as received.

Take as the result the arithmetic mean of the two determinations (C.4.8). The difference between the values of two determinations carried out in rapid succession by the same analyst on the same test sample shall not exceed 5 %. Otherwise, the determination is not valid and a new sample shall be analysed.

Give the result to one decimal place, except for harmful and/or toxic matter, for which the result shall be given to two decimal places.

For ergot

$$\frac{100}{m_w} \times m_1 \tag{1}$$

where

m_w is the mass, in grams, of the test sample (about 1 000 g);

m_1 is the mass, in grams, of ergot in the test sample.

For broken grains, shriveled grains, unsound grains and grains attacked by pests

$$w_1 w_2 m_2 \tag{2}$$

where

w_1 is the mass fraction after the first division, given by

$$\frac{m_w - m_1}{m_w}$$

w_2 is the mass fraction after the second division, given by

$$\frac{100}{m_z} \times \frac{m_y}{m_x}$$

in which

m_x is the mass, in grams, of the test portion (about 250 g),

m_y is the mass, in grams, of the material retained on the 1,00 mm sieve,

m_z is the mass, in grams, of the portion obtained in C.4.6 (about 60 g);

m_2 is the mass, in grams, of the relevant impurity.

For other cereals, extraneous matter (organic and inorganic), inorganic extraneous matter and harmful and/or toxic matter without ergot

$$w_1 \times \frac{100}{m_x} \times m_3 + w_1 w_2 m_4 \quad (3)$$

where

m_3 is the mass, in grams, of the impurity group concerned after the first sieving;

m_4 is the mass, in grams, of the impurity group concerned after the second division.

C.6 Test report

The test report shall contain at least the following information:

a) all information necessary for the complete identification of the sample;

b) the sampling method used, if known;

c) the test method used, with reference to this International Standard (ISO 7970:2011);

d) all operating details not specified in this International Standard, or regarded as optional, together with details of any incidents which may have influenced the test result(s);

e) the test result(s) obtained;

f) if the repeatability has been checked, the final quoted result obtained.