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Wheat — Specification

Blé tendre — Spécifications

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Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 7970 was prepared by Technical Committee ISO/TC 34, *Agricultural food products*.

Annexes A, B and C form an integral part of this International Standard. Annex D is for information only.

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Wheat — Specification

1 Scope

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

It also gives an indicative list of harmful and toxic seeds (annex A), a list of unacceptable insect pests of stored cereals (annex B) and a method for the determination of the impurities content (annex C).

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards listed below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 712 : 1985, *Cereals and cereal products — Determination of moisture content (Routine reference method)*.

ISO 950 : 1979, *Cereals — Sampling (as grain)*.

ISO 3093 : 1982, *Cereals — Determination of falling number*.

ISO 5223 : 1983, *Test sieves for cereals*.

ISO 7971 : 1986, *Cereals — Determination of bulk density, called "mass per hectolitre" (Reference method)*.

3 Definitions

For the purposes of this International Standard, the following definitions apply.

impurities: Damaged wheat grains and all organic and inorganic materials other than wheat grains.

The impurities comprise four main categories as follows: damaged wheat grains (3.1), other cereals (3.2), extraneous matter (3.3), and harmful and/or toxic seeds, bunted grains and ergot (3.4). (See also table C.1.)

3.1 Damaged wheat grains

3.1.1 broken grains: Grains of wheat in which part of the endosperm is exposed. This includes wheat without germ.

3.1.2 shrivelled grains: Whole grains, whatever their condition, which pass through a sieve with long rounded apertures 1,70 mm wide.

3.1.3 Unsound grains

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

3.1.3.2 heat-damaged grains: Grains which have a chestnut to black coloration resulting from the effect of heat.

3.1.4 grains attacked by pests: Grains which show visible damage owing to attack by rodents, insects, mites or other pests.

3.1.5 Sprouted grains

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 4.2.4).

3.2 other cereals: Cereal grains belonging to species other than *Triticum aestivum*.

3.3 Extraneous matter

After removal of ergot, this category includes:

— all the components of the sample, with the exception of grains of other cereals (3.2), grains of wheat, harmful and/or toxic seeds (3.4.1) and bunted grains (3.4.2), which are retained by a sieve with long rounded apertures 3,55 mm wide and all the components which pass through a sieve with long rounded apertures 1,00 mm wide. (By convention, the latter shall be considered to be inorganics.)

— all the organic components other than grains of wheat, other cereals (3.2), harmful and/or toxic seeds (3.4.1), bunted grains (3.4.2), foreign seeds, fragments of straw, dead insects and fragments of insects, etc., and inorganic components such as stone and sand, which pass through a sieve with long rounded apertures 3,55 mm wide and which are retained by a sieve with long rounded apertures 1,00 mm wide.

3.4 Harmful and/or toxic seeds, bunted grains and ergot

3.4.1 harmful and/or toxic seeds: Seeds which if present in quantities above a certain limit may have a damaging or dangerous effect on health, organoleptic properties or technological performance.

An indicative list of these seeds is given in annex A.

3.4.2 bunted grains: Grains filled with a fetid-smelling dust comprising the spores of the bunts, i.e. *Tilletia caries*, *Tilletia controversa*, *Tilletia foetida*, *Tilletia intermedia*, *Tilletia triticoïdes* and *Neovossia indica*.

3.4.3 ergot: Sclerotium of the fungus *Claviceps purpurea*.

4 Requirements

4.1 General, organoleptic and health characteristics

Wheat grains shall be sound, clean, have no foreign odours or odours denoting any deterioration, and shall be free of additives and toxic substances.

Pesticide residues and other contaminants shall not exceed the maximum levels laid down in the national legislation of the country of destination or, in the absence of such legislation, the maximum levels laid down by the joint FAO/WHO Codex Alimentarius Commission.

Wheat shall be free from the living insects (visible to the naked eye) listed in annex B.

4.2 Physical and chemical characteristics

4.2.1 Moisture content

The moisture content of wheat, determined in accordance with ISO 712, shall not be greater than 15,5 %.

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

4.2.2 Bulk density

The bulk density (mass per hectolitre) of wheat shall be determined using instruments calibrated according to the reference method given in ISO 7971, and shall not be less than 70 kg/hl.

4.2.3 Impurities

The maximum impurities content, determined using the method described in annex C, shall not exceed the value laid down in table 1.

The maximum content of damaged wheat grains (broken grains, shrivelled grains, unsound grains, grains attacked by pests) and other cereals, determined in accordance with the method described in annex C, shall not exceed 15 % (m/m) in total.

Table 1 — Maximum levels of impurities

Impurities	Definition given in	Maximum permissible level
		% (m/m)
Broken grains ¹⁾	3.1.1	7 ¹⁾
Shrivelled grains ¹⁾	3.1.2	8 ¹⁾
Unsound grains ¹⁾	3.1.3	1 ¹⁾
Grains attacked by pests ¹⁾	3.1.4	2 ¹⁾
Other cereals ¹⁾	3.2	3 ¹⁾
Extraneous matter	3.3	2
Inorganic material		0,5
Harmful and/or toxic seeds, bunted grains and ergot	3.4	0,5
Ergot	3.4.3	0,05

1) The maximum content of broken grains, shrivelled grains, unsound grains, grains attacked by pests and other cereals shall not exceed 15 % (m/m) in total.

4.2.4 α-amylase activity

The α-amylase activity (see 3.1.5) determined in accordance with ISO 3093, and expressed as the falling number, shall be not less than 160.

5 Sampling

Sampling shall be carried out in accordance with ISO 950.

6 Test methods

The tests shall be carried out using the methods specified in 4.2.

Annex A (normative)

Indicative list of harmful and toxic seeds

A.1 Toxic seeds

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

A.2 Harmful seeds

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

Annex B
(normative)

Unacceptable insect pests of stored cereals

Cryptolestes spp.

Ephestia spp.

Nemapogon granella (L.)

Oryzaephilus spp.

Plodia interpunctella (Hübner.)

Prostephanus truncatus (Horn.)

Rhizopertha dominica (F.)

Sitophilus spp.

Sitotroga cerealella (Oliv.)

Tenebroides mauritanicus (L.)

Tribolium spp.

Trogoderma granarium Everts.

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Annex C (normative)

Determination of the impurities content

C.1 Principle

Separation of the impurities, by sieving and grading, into the categories shown in table C.1.

Table C.1 – Categories of impurities

Category of impurity	Corresponding main category
Broken grains Shriveled grains 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 and bunted grains Ergot	Harmful and/or toxic seeds, bunted grains and ergot

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, conforming to ISO 5223, 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 cm².

C.2.6 Balance, accurate to 0,01 g.

C.3 Sampling

See clause 5.

C.4 Procedure (see the scheme given in clause C.7)

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 get stuck in the slots of a sieve shall be considered to be retained by the sieve.

C.4.1 Preparation of the 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 the test sample so obtained to the nearest 1 g and place it in the container (C.2.5).

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

C.4.2 Determination of ergot

Separate ergot (3.4.3) from the test sample (C.4.1), put it in a dish (C.2.4) and weigh it to the nearest 0,01 g.

C.4.3 First division

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

C.4.4 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.4.3) 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 slots 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 them in the dishes (C.2.4), the other cereals (3.2), the organic and inorganic components of the extraneous matter (3.3), harmful and/or toxic seeds (3.4.1) and bunted grains (3.4.2), and any wheat grains which have been retained. The retained wheat grains 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.4.5 Second division

Mix thoroughly the material which has not passed through the 1,00 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, by placing them in the dishes, the broken grains (3.1.1), other cereals (3.2), organic and inorganic extraneous matter (3.3), the unsound grains (3.1.3), grains attacked by pests (3.1.4), harmful and/or toxic seeds (3.4.1) and bunted grains (3.4.2). 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.

C.4.6 Second sieving

Pour the portion from which the impurities specified in C.4.5 have been removed onto 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 slots 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 shrivelled grains (3.1.2).

C.4.7 Number of determinations

Repeat the determination on the same test sample, using another test portion obtained as specified in C.4.3.

C.5 Expression of results

Express the content of each category of impurity, using the formulae given below, as a percentage by mass of the grains as received.

Take as the result the arithmetic mean of the two determinations (C.4.7).

Give the result to one decimal place, except for harmful and toxic seeds, bunted grains and ergot, for which the result shall be given to two decimal places.

Broken grains	$C \times m_6$
Shrivelled grains	$C \times m_{13}$
Unsound grains	$C \times m_{10}$
Grains attacked by pests	$C \times m_{11}$
Other cereals	

$$\frac{100}{m_x} \times m_2 + C \times m_7$$

Extraneous matter (organic and inorganic)

$$\frac{100}{m_x} (m_3 + m_4) + C (m_8 + m_9)$$

Inorganic extraneous matter

$$\frac{100}{m_x} \times m_4 + C \times m_9$$

Harmful and/or toxic seeds, bunted grains and ergot

$$\frac{100}{m_w} \times m_1 + \frac{100}{m_x} \times m_5 + C \times m_{12}$$

Ergot

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

where

C is a coefficient common to the categories of impurity obtained after the second division equal to

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

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

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, i.e. $m_y = m_x - (m_2 + m_3 + m_4 + m_5)$;

m_z is the mass, in grams, of the portion obtained in C.4.5 (about 60 g);

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

m_2 is the mass, in grams, of other cereals retained on the 3,55 mm sieve;

m_3 is the mass, in grams, of organic extraneous matter retained on the 3,55 mm sieve;

m_4 is the mass, in grams, of inorganic extraneous matter retained on the 3,55 mm sieve and of the material which passed through the 1,00 mm sieve;

m_5 is the mass, in grams, of harmful and/or toxic seeds and bunted grains retained on the 3,55 mm sieve;

m_6 is the mass, in grams, of the broken grains retained on the 1,00 mm sieve;

m_7 is the mass, in grams, of other cereals retained on the 1,00 mm sieve;

m_8 is the mass, in grams, of organic extraneous matter retained on the 1,00 mm sieve;

m_9 is the mass, in grams, of inorganic extraneous matter retained on the 1,00 mm sieve;

m_{10} is the mass, in grams, of unsound grains retained on the 1,00 mm sieve;

m_{11} is the mass, in grams, of grains attacked by pests retained on the 1,00 mm sieve;

m_{12} is the mass, in grams, of harmful and/or toxic seeds and bunted grains retained on the 1,00 mm sieve;

m_{13} is the mass, in grams, of shrivelled grains which passed through the 1,70 mm sieve.

C.6 Test report

The test report shall indicate the method used and the result obtained. It shall also give details of any operations not specified in this International Standard, or regarded as optional, as well as any incidents which may have affected the result.

The test report shall give all information necessary for the complete identification of the sample.

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