

DRAFT UGANDA STANDARD

DUS ARS 465

First Edition
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Wheat grains — Specification

PUBLIC REVIEW DRAFT



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DUS ARS 465: 2022

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The Executive Director
Uganda National Bureau of Standards
P.O. Box 6329
Kampala
Uganda
Tel: +256 417 333 250/1/2
Fax: +256 414 286 123
E-mail: info@unbs.go.ug
Web: www.unbs.go.ug

National foreword

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This Draft Uganda Standard, DUS ARS 465: 2022, *Wheat grains — Specification*, is identical with and has been reproduced from an African Standard, ARS 465: 2022, *Wheat grains — Specification*, and adopted as a Uganda Standard.

The committee responsible for this document is Technical Committee UNBS/TC 203, *Cereals, pulses and related products and processes*.

Wherever the words, "African Standard" appear, they should be replaced by "Uganda Standard".

Wheat grains — Specification

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



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ICS 67.060

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Foreword

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ARSO Central Secretariat
International House 3rd Floor
P. O. Box 57363 — 00200 City Square
NAIROBI, KENYA

Tel. +254-20-2224561, +254-20-311641, +254-20-311608

Fax: +254-20-218792

E-mail: arso@arso-oran.org

Web: www.arso-oran.org

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ARSO Central Secretariat
International House 3rd Floor
P.O. Box 57363 — 00200 City Square
NAIROBI, KENYA

Tel: +254-20-2224561, +254-20-311641, +254-20-311608
Fax: +254-20-218792

E-mail: arso@arso-oran.org
Web: www.arso-oran.org

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Introduction

Wheat is the third most produced cereal crop after rice, but covers more land area worldwide than any other crop. Unlike rice, wheat is more widespread globally and enters into international trade more than any other food. It tolerates windswept areas too dry and too cold for rice and corn.

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) Microbiological requirements
- (ii) Grading of grains

This African Standard is a technical revision of the earlier ARS 465:2016(E), *Wheat — Specification* which is hereby superseded and cancelled.

Wheat grains — Specification

1 Scope

This African Standard specifies the requirements and methods of sampling and test for wheat grains of varieties (cultivars) grown from common wheat (*Triticum aestivum* L.), club wheat (*T. compactum* Host.) and *Triticum tauschii* (soft wheat) intended for human consumption. Durum wheat (*Triticum durum*) is excluded from this standard.

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.

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

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

ISO 3093, *Wheat, rye and respective flours, durum wheat and durum wheat semolina — Determination of the Falling Number according to Hagberg-Perten*

ISO 5223, *Test sieves for cereals*

ISO 6639-1, *Cereals and pulses — Determination of hidden insect infestation — Part 1: General principles*

ISO 6639-2, *Cereals and pulses — Determination of hidden insect infestation — Part 2: Sampling*

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 7932, *Microbiology of food and animal feeding stuffs — Horizontal method for the enumeration of presumptive *Bacillus cereus* — Colony-count technique at 30 degrees C*

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

ISO 7971-2, *Cereals — Determination of bulk density, called "mass per hectolitre" — Part 2: Routine method*

ISO 13690, *Cereals, pulses and milled products — Sampling of static batches*

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 20483, *Cereals and pulses — Determination of the nitrogen content and calculation of the crude protein content — Kjeldahl method*

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CODEX STAN 1, *General Standard for the labelling of prepackaged foods*

CAC/RCP 1, *Recommended international code of practice — General principles of food hygiene*

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

3 Terms and definitions

For the purpose of this standard the following definitions apply.

3.1

wheat grain

grain that consists of 50 percent or more common wheat (*Triticum aestivum* L.), club wheat (*T. compactum* Host.), and durum wheat (*T. Durum* Desf.)

3.2

broken grain

grain in which part of the endosperm is exposed, or grain without germ that will pass readily through a sieve of specified perforations

3.3

noxious/harmful /injurious seeds

seeds which can have a damaging or dangerous effect on health, sensory properties or technological performance. These include *Crotalaria* (*Crotalaria* spp.), Corn cockle (*Agrostemma githago* L.), Castor bean (*Ricinus communis* L.), Jimson weed (*Datura* spp.)

3.4

foreign matter

all organic and inorganic material (such as plant parts, sand, soil, glass) other than wheat grains

3.5

other edible grains

grains belonging to cereals species other than wheat

3.6

defective grains

include; black point grain, germinated grain, pest-damaged grain, immature grain, diseased grain, shrivelled grain/shrunken grain or discoloured grain

3.6.1

discoloured grain

wheat grain discoloured by heat, fermentation, moulds, weather damage or disease but does not include black point which is brown, dark brown or almost black discoloration at the embryo end of the grain

3.6.2

germinated wheat

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

3.6.3

insect-damaged wheat

wheat grain, which has been damaged by any insect or any other pest

3.6.4

infected wheat

wheat grain containing in or amongst the grain any form of living and/ or other organism known to be capable of causing damage or spoilage to the grain

3.6.5

immature wheat

wheat grains which are distinctly green in colour

3.6.6

heat damaged wheat

wheat damaged by external heat or as a result of heating caused by fermentation

3.6.7

diseased weather-damaged wheat

wheat, which has about one third or more of its surface, discoloured physically damaged or mouldy due to weather conditions

3.7

earth sand and stones

concreted earthy mineral or any other matter derived from the soil and any other matter of similar hardness

3.8

falling number

time in seconds the stirrer takes to fall to the bottom of the test tube of a standard distance.

Note 1 to entry: This test helps identify the structural integrity of the wheat starch chains and is an indicator of amylase activity

3.9

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

3.10

test weight

measure of grain density which is expressed as the weight of grain packed in a specific volume. usually expressed in kilograms per hectolitre

4 Requirements

4.1 General requirements

4.1.1 Wheat grains shall meet the following general requirements/limits as determined using the relevant standards listed in Clause 2. Wheat grains:

- a) shall be the dried mature grains of *Triticum aestivum* (bread wheat), *Triticum compactum* Host. (club wheat), *Triticum tauschii* (soft wheat);
- b) shall be clean, sound, uniform in size and shape;
- c) shall be free from abnormal flavours, musty, sour or other undesirable odour, obnoxious smell and discolouration;
- d) practically free from live pests
- e) free from noxious/harmful seeds in amount which may be harmful to human health

4.2 Specific requirements

4.2.1 Grading

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

4.2.2 Ungraded wheat grains

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Shall be wheat grains which do not fall within the requirements of Grades 1, 2, 3 and 4 of this standard but are not rejected wheat grains.

4.4.2 Reject grade wheat

- Does not meet the requirements for the Grades 1, 2, 3, or 4.
- Has a musty, sour, or commercially objectionable foreign odour except smut or garlic odour; or
- Is heating or otherwise of distinctly low quality.

Table 1 — Specific requirements

Characteristic		Specification				Method of test
		Grade 1	Grade 2	Grade 3	Grade 4	
Moisture, max (%)		14.0	14.0	14.0	14.0	712
Test weight kg/hl (g/0.5 L), min		79(395)	75(375)	70(350)	65(325)	ISO 605
Protein, min (%) m/m N×5.7@11 % moisture basis	Hard/strong white	13.0	12.0	11.0	10.0	ISO 20483
	Soft white	8.0	8.0	8.0	8.0	
Foreign matter, max (%) m/m		0.60	1.00	1.50	2.00	ISO 605
Inorganic matter max (%) m/m		0.5	0.5	0.5	0.5	ISO 605
Shrunken and broken kernel max (%) m/m		0.5	0.5	0.5	0.5	ISO 605
Germinated grains max (%) m/m		2.0	2.5	3.0	4.0	ISO 605
Pest damaged max (%) m/m		1.0	1.5	2.0	3.0	ISO 605
Disease damaged grains max (%) m/m		1.0	2.0	3.0	4.0	ISO 605
Discoloured grains max (%) m/m		1.0	2.0	3.0	4.0	ISO 605
Immature grains max (%) m/m		0.5	0.5	1.0	2.0	ISO 605
Total defective, max (%) m/m		4.2	6.3	8.8	12.3	ISO 605
Unmillable material above the screen, (% by wt)		0.60	0.60	0.60	0.60	
Screenings, Max (% by wt)		5.0	5.0	5.0	0.60	ISO 5223
Falling Number (Amylase activity), Min (sec)		300	230	230	230	ISO 3093
Other edible grains (whole or identifiably broken), (% by wt)		0.50	1.50	2.0	3.0	ISO 7970
Wheat of other classes or varieties (% by wt)	Contrasting classes	1.0	2.0	3.0	5.0	
	Total	3.0	3.0	5.0	5.0	
Bulk density kg/hl, min		70				ISO 7971-1 ISO 7971-2
Ergot, %max		0.05				
Other contaminants, Max	Total Aflatoxin (AFB1+AFB2+AFG1+AFG2), ppb	10				ISO 16050
	Aflatoxin B1 only, ppb	5				
	Fumonisin – Total ppm (FB1 + FB2 + FB3)	2				
NOTE Grade 4 will not be considered suitable for export.						

5 Contaminants

5.1 Heavy metals

Wheat grains shall comply with those maximum limits for heavy metals established by the Codex Alimentarius Commission for this commodity.

5.2 Pesticide residues

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

6 Hygiene

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

7 Packaging

Wheat grains shall be packed in food grade packaging material, which will safeguard the hygienic, nutritional and organoleptic qualities of the products.

8 Marking or labelling

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 "Wheat grains"
- ii) variety;
- iii) grade;
- iv) name, address and physical location of the producer/ packer/importer;
- v) lot/batch/code number;
- vi) net weight, in kg;
- vii) the declaration "Food for Human Consumption";
- viii) storage instruction as "Store in a cool dry place away from any contaminants";
- ix) crop year;
- x) packing date;
- xi) instructions on disposal of used package;
- xii) country of origin;
- xiii) a declaration on whether the wheat grain was genetically modified or not.

9 Weights and measures

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Wheat 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'

10 Sampling

Sampling shall be done in accordance with the ISO 24333.

11 Storage and transportation

Storage and transportation shall be done as per the provisions in ARS 53.

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Annex A (informative)

Harmful and toxic seeds, unacceptable mites and pests of stored cereals

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

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>Trichoderma 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>Trogonella foenum-graecum</i> L.	Fenugreek

A.3 Unacceptable mites and insect pests

The following are unacceptable mites and insect pests in stored cereals:

Acarus spp.
Cryptolestes spp.
Ephestia spp.
Glycyphagus spp.
Nemapogon granella L.
Oryzaeophilus spp.
Plodia interpunctella Hübn.
Prostephanus truncatus Horn.
Rhizopertha dominica F.
Sitophilus spp.
Sitotroga cerealella Oliv.
Tenebroides mauritanicus L.
Tribolium spp.
Trogoderma granarium Everts
Tyrophagus spp.

Annex B (informative)

Determination of impurities, size, foreign odours, insects, and species and variety

B.1 Principle

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

Table B.1 — Categories of impurities

Category of impurity	Corresponding main category
Broken grains Shrivelled 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

B.2 Apparatus

B.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, as described in ISO 5223, a receiver and a lid.

For durum wheat, use test sieves with long rounded apertures, comprising sieves of 1.00 mm x 20.0 mm, 1.90 mm x 20.0 mm and 3.55 mm x 20.0 mm conforming to ISO 5223, a receiver and a lid. This applies in all cases.

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

B.2.3 Tweezers, scalpel and paintbrush.

B.2.4 Dishes.

B.2.5 Shallow container, having a surface area of at least 200 cm².

B.2.6 Balance, capable of weighing to the nearest 0.01 g.

B.3 Sampling

See clause 9.

B.4 Procedure (see Figure B.1)

B.4.1 General

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

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

B.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 (B.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 (B.2.5).

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

B.4.3 Determination of ergot

Separate ergot from the test sample (B.4.2), put it in a dish (B.2.4) and weigh it to the nearest 0.01 g.

B.4.4 First division

Thoroughly mix the sample from which the ergot has been removed and divide it using the divider (B.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.

B.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 (B.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 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 in separate dishes (B.2.4), the other cereals, the organic and inorganic components of the extraneous matter, harmful and/or toxic seeds and bunted grains, 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.

B.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 (B.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, other cereals, organic and inorganic extraneous matter, unsound grains, grains attacked by pests, harmful and/or toxic seeds and bunted grains. 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.

B.4.7 Second sieving

Pour the portion from which the impurities specified in B.4.6 were 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.

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B.4.8 Number of determinations

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

B.5 Expression of results

Express the content of each category of impurity, using the formulae given below, as a mass fraction in percent of the grains as received.

Take as the result the arithmetic mean of the two determinations (B.4.8).

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 $C_1 \times C_2 \times m_6$

Shrivelled grains $C_1 \times C_2 \times m_{13}$

Unsound grains $C_1 \times C_2 \times m_{10}$

Grains attacked by pests $C_1 \times C_2 \times m_{11}$

Other cereals

$$C_1 \times \frac{100}{m_x} \times m_2 + C_1 \times C_2 \times m_7$$

Extraneous matter (organic and inorganic)

$$C_1 \times \frac{100}{m_x} \times (m_3 + m_4) + C_1 \times C_2 \times (m_8 + m_9)$$

Inorganic extraneous matter

$$C_1 \times \frac{100}{m_x} \times m_4 + C_1 \times C_2 \times m_9$$

Harmful and/or toxic seeds, bunted grains and ergot

$$\frac{100}{m_w} \times m_1 + C_1 \times \frac{100}{m_x} \times m_5 + C_1 \times C_2 \times m_{12}$$

Ergot

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

where

C_1 is the coefficient after the first division, equal to $C_1 = \frac{m_w - m_1}{m_w}$;

C_2 is the coefficient after the second division, equal to $C_2 = \frac{100}{m_z} \times \frac{m_y}{m_x}$

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 1.0 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 A.4.6 (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.

B.6 Test report

The test report shall specify:

- all information necessary for the complete identification of the sample;
- the sampling method used, if known;
- the test method used, with reference to this African Standard;
- all operating details not specified in this Standard, or regarded as optional, together with details of any incidents which may have influenced the test result(s);
- the test result(s) obtained; or, if the repeatability has been checked, the final result obtained.

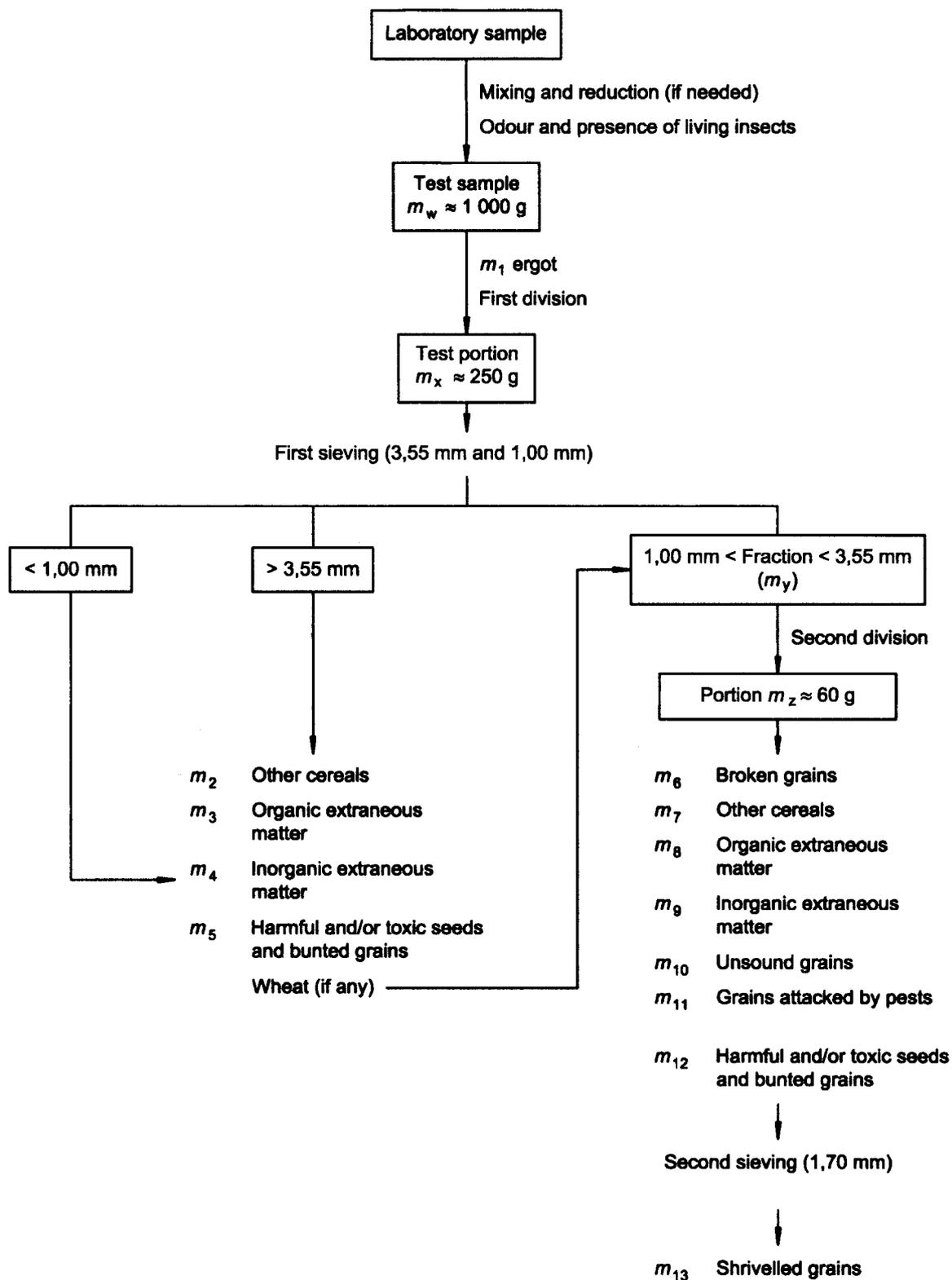


Figure B.1 — Flow chart of procedure

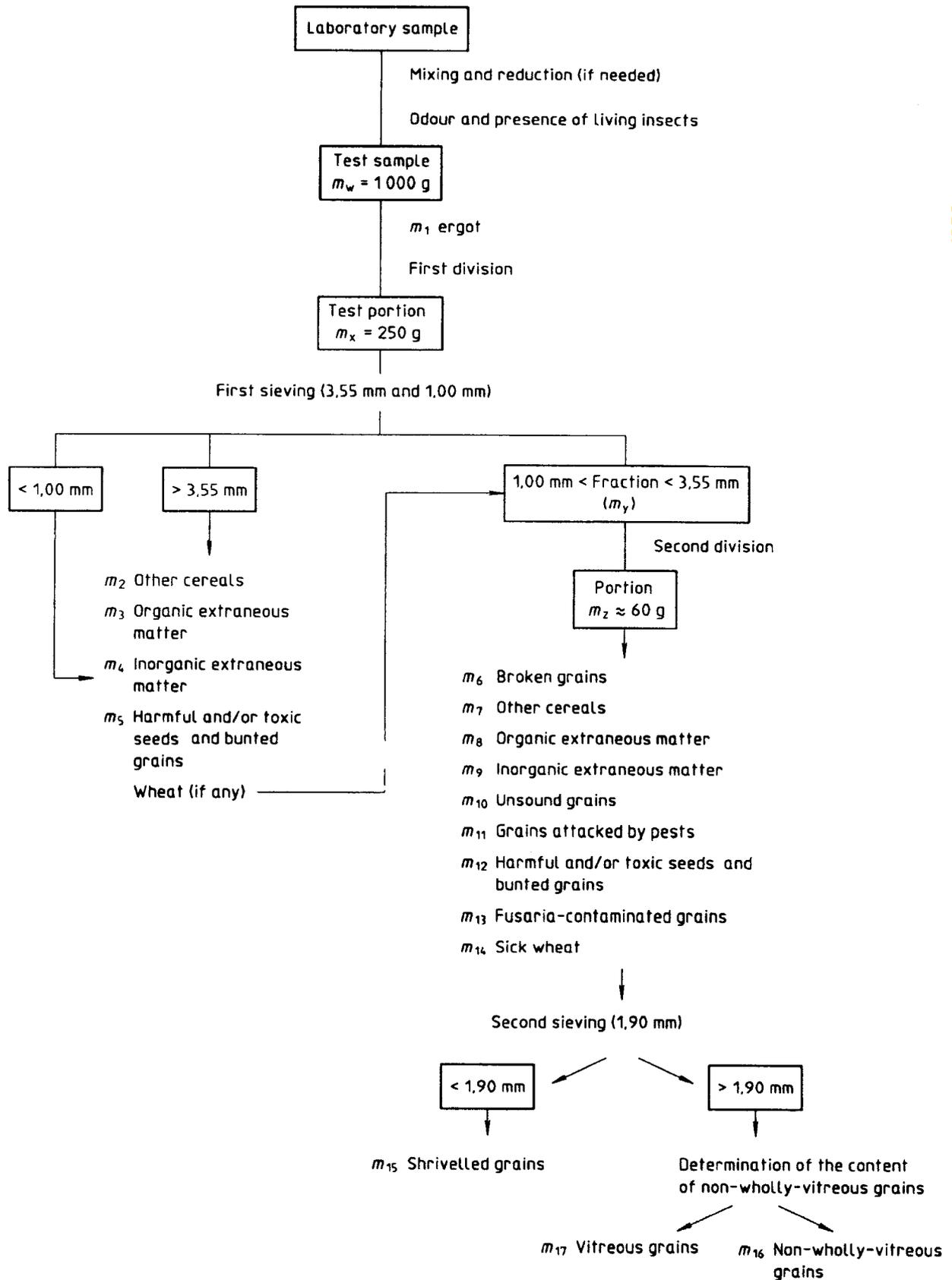


Figure B.2 — Flow chart of procedure for durum wheat

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