



# Model International Standard

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Third edition  
2023-02

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## Cereals and pulses — Specification and test methods —

### Part 1: Rice

*Céréales et légumineuses — Spécifications et méthodes d'essai —  
Partie 1: Riz*



Reference number  
ISO 17301-1:2023(E)

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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

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Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document 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 17301-1:2016), which has been technically revised.

The main changes are as follows:

- updating of normative references;
- revision of Clause 9.

A list of all parts in the ISO 17301 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).

## Introduction

This document was developed in response to worldwide demand for minimum specifications for rice traded internationally, since most commercial bulks of grain, which have not been screened or aspirated, contain a proportion of other grains, weed seeds, chaff, straw, stones, sand, etc. The vegetable materials can have physical and biological properties which differ from those of the main constituent and can therefore affect the storage behaviour.

Rice is a permanent host to a considerable microflora; most of these microorganisms are cosmopolitan, the majority are innocuous, but some produce harmful by-products. Microflora communities present on freshly harvested rice include many types of bacteria, moulds and yeasts. While the rice is ripening and its moisture content is falling, the number of field microorganisms, mainly bacteria, diminishes. When the rice is harvested, it is invaded by storage microorganisms and the field microflora gradually die out. If the mass fraction of moisture (formerly expressed as moisture content) is less than 18 %, the microflora does not multiply, whereas above 18 % it does so rapidly. Thus, at harvest, the qualitative and the quantitative composition of the microflora depends more upon ecological factors than upon the variety of the rice. During transport and storage, additions to the microfloral population occur. Microorganisms on the rice at harvest tend to die out during storage and are replaced by microorganisms adapted to storage conditions.

Storage losses have been estimated as being an average of 5 %, and as much as 30 %, especially in regions with climates favourable to the rapid development of agents of deterioration, such as tropical climates. The magnitude of these figures highlights the need to promote a rapid improvement in techniques of conservation worldwide.

- Optional element
- Provides background information about the technical content  
→ ISO/IEC Directives, Part 2, 2021, Clause 13

# Cereals and pulses — Specification and test methods —

## Part 1: Rice

### 1 Scope

This document specifies minimum requirements and test methods for rice (*Oryza sativa* L.).

It is applicable to husked rice, husked parboiled rice, milled rice and milled parboiled rice, suitable for human consumption, directly or after reconditioning.

It is not applicable to cooked rice products.

### 2 Normative references

The following documents are referred to in the text and constitute requirements of this document. For dated references, the latest edition of the reference document applies.

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

ISO 6646, *Rice — Determination of the potential milling yield from paddy and from husked rice*

ISO 8351-1:1994, *Packaging — Method of specification for sacks — Part 1: Paper sacks*

ISO 8351-2, *Packaging — Method of specification for sacks — Part 2: Sacks made from thermoplastic flexible film*

ISO 16634-2:2016, *Food products — Determination of the total nitrogen content by combustion according to the Dumas principle and calculation of the crude protein content — Part 2: Cereals, pulses and milled cereal products*

ISO 20483:2013, *Cereals and pulses — Determination of the nitrogen content and calculation of the crude protein content — Kjeldahl method*

ISO 24333:2009, *Cereals and cereal products — Sampling*

- Mandatory clause
  - Defines the subject of the document
  - Used as a summary for the abstract
- ISO/IEC Directives, Part 2, 2021, Clause 14

### 3 Terms and definitions

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

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

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

#### 3.1

##### **paddy**

paddy rice

rough rice

rice retaining its husk after threshing

[SOURCE: ISO 7301:2021, 3.1]

# Cereals and pulses — Specification and test methods —

## Part 1:

## Rice

### 1 Scope

This document specifies minimum requirements and test methods for rice (*Oryza sativa* L.).

It is applicable to husked rice, husked parboiled rice, milled rice and milled parboiled rice, suitable for human consumption, directly or after reconditioning.

It is not applicable to cooked rice products.

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ISO 16634-2:2016, *Food products — Determination of the total nitrogen content by combustion according to the Dumas principle and calculation of the crude protein content — Part 2: Cereals, pulses and milled cereal products*

ISO 20483:2013, *Cereals and pulses — Determination of the nitrogen content and calculation of the crude protein content — Kjeldahl method*

ISO 24333:2009, *Cereals and cereal products — Sampling*

### 3 Terms and definitions

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

ISO and IEC maintain terminology database

— ISO Online browsing platform: available at <https://www.iso.org/obp/ui/#iso:code:371:01>

— IEC Electropedia: available at <https://www.electropedia.org/>

#### 3.1

**paddy**  
paddy rice  
rough rice  
rice retaining its husk after threshing

[SOURCE: ISO 7301:2021, 3.1]

- Mandatory clause
  - List of references that are indispensable to the application of the document
- ISO/IEC Directives, Part 2, 2021, Clause 15



# Cereals and pulses — Specification and test methods —

## Part 1: Rice

### 1 Scope

This document specifies minimum requirements and test methods for rice (*Oryza sativa* L.).

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ISO 8351-2, *Packaging — Method of specification for sacks — Part 2: Sacks made from thermoplastic flexible film*

ISO 16634-2:2016, *Food products — Determination of the total nitrogen content by combustion according to ISO 16634-2:2016, Part 2: Cereals, pulses and milled*

- Mandatory clause
  - Definitions of terms used that are necessary for understanding the document
- ISO/IEC Directives, Part 2, 2021, Clause 16

### 3 Terms and definitions

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

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

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

#### 3.1

##### **paddy**

paddy rice

rough rice

rice retaining its husk after threshing

[SOURCE: ISO 7301:2021, 3.1]

### 3.2

#### **husked rice**

#### **brown rice**

DEPRECATED: cargo rice

*paddy* (3.1) from which only the husk has been removed

[SOURCE: ISO 7301:2021, 3.2, modified — The term “cargo rice” is shown as deprecated. Note 1 to entry has been removed.]

### 3.3

#### **milled rice**

white rice

*husked rice* (3.2) from which some or all of the bran and embryo have been removed by mechanical milling

[SOURCE: ISO 7301:2021, 3.3]

### 3.4

#### **parboiled rice**

rice whose starch has been fully gelatinized by soaking *paddy* (3.1) rice or *husked rice* (3.2) in water followed by a heat treatment and a drying process

### 3.5

#### **waxy rice**

variety of rice whose kernels have a white and opaque appearance

Note 1 to entry: The starch of waxy rice consists almost entirely of amylopectin. The kernels have a tendency to stick together after cooking.

### 3.6

#### **extraneous matter**

EM

<rice> organic and inorganic components other than whole or broken kernels

EXAMPLE Foreign seeds, husks, bran, sand, dust.

- Abbreviated term “EM” given under the term
- EXAMPLE given under the definition

### 3.7

#### **HDK**

heat-damaged kernel

kernel, whole or broken, which has changed its normal colour as a result of heating

Note 1 to entry: This category includes whole or broken kernels that are yellow due to alteration. *Parboiled rice* (3.4) in a batch of non-parboiled rice is also included in this category.

### 3.8

#### **damaged kernel**

kernel, whole or broken, showing obvious deterioration due to moisture, pests, disease or other causes, but excluding *HDK* (3.7)

### 3.9

#### **immature kernel**

unripe kernel

kernel, whole or broken, which is either unripe or underdeveloped, or both

### 3.10

#### **husked rice yield**

amount of *husked rice* (3.2) obtained from paddy

[SOURCE: ISO 6646:2011, 3.1]

- Preferred term “milled rice” in bold type
- Admitted term “white rice” in regular type
- Hyperlink to another defined term (3.2)
- Source document is informative and listed in the Bibliography

Note 1 to entry

**3.3**  
**milled rice**  
white rice  
*husked rice* (3.2) from which some or all of the bran and embryo have been removed by mechanical milling

[SOURCE: ISO 7301:2021, 3.3]

**3.4**  
**parboiled rice**  
rice whose starch has been fully gelatinized by soaking *paddy* (3.1) rice or *husked rice* (3.2) in water followed by a heat treatment and a drying process

**3.5**  
**waxy rice**  
variety of rice whose kernels have a white and opaque appearance

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**3.9**  
**immature kernel**  
unripe kernel  
kernel, whole or broken, which is either unripe or underdeveloped, or both

**3.10**  
**husked rice yield**  
amount of *husked rice* (3.2) obtained from paddy

[SOURCE: ISO 6646:2011, 3.1]

**3.11****nitrogen content**

quantity of nitrogen determined after application of the procedure described

Note 1 to entry: It is expressed as a mass fraction of dry product, as a percentage.

[SOURCE: ISO 20483:2013, 3.1]

**3.12****crude protein content**

quantity of crude protein obtained from the nitrogen content as determined by applying the specified method, calculated by multiplying this content by an appropriate factor depending on the type of cereal or pulse

- Note to terminological entry provides additional information

**3.13****gelatinization**

hydration process conferring the jelly-like state typical of the coagulated colloids, which are named “gels”, on kernels

Note 1 to entry: See [Figure C.1](#).

[SOURCE: ISO 14864:1998, 3.1, modified — Note 1 to entry added.]

**3.14****gel state**

condition reached as a consequence of *gelatinization* ([3.13](#)), when the kernel is fully transparent and absolutely free from whitish and opaque granules after being pressed between two glass sheets

[SOURCE: ISO 14864:1998, 3.2]

- Symbol appears below the term

**3.15****gelatinization time**

$t_{90}$

time necessary for 90 % of the kernels to pass from their natural state to the *gel state* ([3.14](#))

[SOURCE: ISO 14864:1998, 3.3, modified — admitted term,  $t_{90}$ , added to the term entry.]

**4 Specifications****4.1 General, organoleptic and health characteristics**

Kernels of rice, whether parboiled, husked or milled, and whether whole or broken, shall be sound, clean and free from foreign odours which indicate deterioration.

NOTE National regulations can apply to maximum limits of levels of additives and pesticide residues and other contaminants.

The presence of living insects which are visible to the naked eye is not permitted. This should be determined before separating the bulk sample into test samples.

## 4.2 Physical and chemical characteristics

**4.2.1** The mass fraction of moisture, determined in accordance with ISO 712, shall not be greater than 15 %.

The mass fraction of extraneous matter and defective kernels in husked and milled rice, whether or not parboiled, determined in accordance with [Annex A](#), shall not be greater than the values specified in [Table 1](#).

**NOTE** Lower mass fractions of moisture are sometimes needed for certain destinations depending on the climate, duration of transport and storage. For further details, see ISO 6322-1, ISO 6322-2 and ISO 6322-3.

**4.2.2** The defect tolerance for the categories, considered and determined in accordance with the method given in [Annex A](#), shall not exceed the limits given in [Table 1](#).

**Table 1 — Maximum permissible mass fraction of defects**

Defect	Maximum permissible mass fraction of defects			
	$w_{\max}$ %			
	Husked rice	Milled rice (non-glutinous)	Husked par- boiled rice	Milled parboiled rice
Extraneous matter:				
— organic <sup>a</sup>	1,0	0,5	1,0	0,5
— inorganic <sup>b</sup>	0,5	0,5	0,5	0,5
Paddy	2,5	0,3	2,5	0,3
Husked rice, non-parboiled	N/A	1,0	1,0	1,0
Milled rice, non-parboiled	1,0	N/A	1,0	1,0
Husked rice, parboiled	1,0	1,0	N/A	1,0
Milled rice, parboiled	1,0	1,0	1,0	N/A
Chips	0,1	0,1	0,1	0,1
HDK	2,0 <sup>c</sup>	2,0	2,0 <sup>c</sup>	2,0
Damaged kernels	4,0	3,0	4,0	3,0
Immature kernels	8,0	2,0	8,0	2,0
Chalky kernels	5,0 <sup>c</sup>	5,0	N/A	N/A
Red kernels and red-streaked kernels	12,0	12,0	12,0 <sup>c</sup>	12,0
				11,0
				2,0
				1,0

• Table footer can contain requirements, notes and footnotes  
→ ISO/IEC Directives, Part 2, 2021, Clause 29

Live insects shall not be present. Dead insects shall be included in extraneous matter.

**NOTE 1** This table is based on ISO 7301:2021, Table 1.

**NOTE 2** Some commercial contracts can require information in addition to that provided in this table.

**NOTE 3** Only full red husked (cargo) rice is considered in this table.

<sup>a</sup> Organic extraneous matter includes foreign seeds, husks, bran and parts of straw.

<sup>b</sup> Inorganic extraneous matter includes stones, sand and dust.

<sup>c</sup> The maximum permissible mass fraction of defects shall be determined with respect to the mass fraction obtained after milling.

N/A Not applicable.

## 5 Sampling

Sampling shall be carried out in accordance with ISO 24333:2009, Clause 5.

## 6 Test methods

### 6.1 Moisture content

Determine the mass fraction of moisture in accordance with the method specified in ISO 712.

### 6.2 Waxy rice

Determine the

- Cross-references to normative references

→ ISO/IEC Directives, Part 2, 2021, Clause 15

### 6.3 Nitrogen

Determine the nitrogen content in accordance with Clause 10, or ISO 20483:2013, Annex C and Table C.1, that is adapted to the type of cereals or pulses [12][13] and to their use. For details concerning the use of the Dumas method, see References [9] and [15].

- “shall” or imperative

- ISO 24333:2009 and ISO 712 are normative and listed in Clause 2

- ISO 24333 is dated because it refers to a specific clause

Calculate the crude protein content of the dry product by multiplying the value of the nitrogen content by the conversion factor specified in ISO 20483:2013, Annex C and Table C.1, that is adapted to the type of cereals or pulses [12][13] and to their use.

### 6.4 Gelatinization time

Determine the gelatinization time,  $t_{90}$ , for rice kernels during cooking. An example of a typical curve is given in [Figure C.1](#). Three typical stages of gelatinization are shown in [Figure C.2](#).

Report the results as specified in [Clause 7](#).

### 6.5 Husked rice yield

#### 6.5.1 Determination

**WARNING — Only use paddy or parboiled rice for the determination of husked rice yield.**

Determine the husked rice yield in accordance with ISO 6646.

#### 6.5.2 Precision

##### 6.5.2.1 Interlaboratory test

The results of an interlaboratory test

- Warnings should be placed next to the relevant content or at the beginning of the clause

→ ISO/IEC Directives, Part 2, 2021, 18.4

The results of the repeatability and reproducibility tests (see [6.5.2.2](#) and [6.5.2.3](#)) shall be obtained within a short interval of time, using the same:

- method;
- test material;
- laboratory;
- operator;
- equipment.

## 5 Sampling

Sampling shall be carried out in accordance with ISO 24333:2009, Clause 5.

## 6 Test methods

### 6.1 Moisture content

Determine the mass fraction of moisture in accordance with the method specified in ISO 712.

### 6.2 Waxy rice content

Determine the mass fraction of waxy rice. [Annex B](#) gives an example of a suitable method.

### 6.3 Nitrogen content and crude protein content

Determine the nitrogen content and crude protein content in accordance with either ISO 16634-2:2016, Clause 10, or ISO 20483. For details on the determination of protein content using the Kjeldahl method, see Reference [\[12\]](#) in the Bibliography. For details concerning the use of the Dumas method, see References [\[9\]](#) and [\[15\]](#).

Calculate the crude protein content of the dry product by multiplying the value of the nitrogen content by the conversion factor specified in ISO 20483:2013, Annex C and Table C.1, that is adapted to the type of cereals or pulses [\[12\]](#)[\[13\]](#) and to their use.

### 6.4 Gelatinization time

Determine the gelatinization time,  $t_{90}$ , for  $t_{90}$  given in [Figure C.1](#). Three typical stages of

• Cross-references to bibliographic entries  
→ ISO/IEC Directives, Part 2, 2021, 10.3

Report the results as specified in [Clause 7](#).

### 6.5 Husked rice yield

#### 6.5.1 Determination

**WARNING — Only use paddy or parboiled rice for the determination of husked rice yield.**

Determine the husked rice yield in accordance with ISO 6646.

#### 6.5.2 Precision

• Informative cross-reference to Annex D

##### 6.5.2.1 Interlaboratory test

The results of an interlaboratory test are given in [Annex D](#) for information.

The results of the repeatability and reproducibility tests (see [6.5.2.2](#) and [6.5.2.3](#)) shall be obtained within a short interval of time, using the same:

- method;
- test material;
- laboratory;
- operator;
- equipment.

#### 6.5.2.2 Repeatability

The absolute difference between two independent single test results shall not exceed the arithmetic mean of the values for the repeatability limit,  $r$ , obtained from the interlaboratory study for husked rice in more than 5 % of cases:

$$r = 1 \%$$

#### 6.5.2.3 Reproducibility

The absolute difference between two single test results shall not exceed the arithmetic mean of the values for the reproducibility limit,  $R$ , obtained from the interlaboratory study in more than 5 % of cases:

→ ISO/IEC Directives, Part 2, 2021, 18.5.8

### 7 Test report

For each test method, the test report shall specify the following:

- a) all information necessary for the complete identification of the sample;
- b) a reference to this document (i.e. ISO 17301-1:2023);
- c) the sampling method used;
- d) the test method used;
- e) the test result(s) obtained or, if the repeatability has been checked, the final quoted result obtained;
- f) all operating details not specified in this document, or regarded as optional, together with details of any incidents which could have influenced the test result(s);
- g) any deviations from the procedure;
- h) any unusual features (anomalies) observed during the test;
- i) the date of the test.

### 8 Packaging

The packaging shall not transmit any odour or flavour to the product and shall not contain substances which can damage the product or constitute a health risk.

If bags are used, they shall be in accordance with the requirements of ISO 8351-1:1994, Clause 9, or ISO 8351-2, as appropriate.

### 9 Marking and labelling

Marking and labelling shall specify the date of testing and the proportion of moisture, waxy rice, nitrogen and crude protein.

NOTE National regulations can apply.

→ ISO/IEC Directives, Part 2, 2021, Clause 19



- Annexes provide additional information to the main body of the document
- They can be normative or informative

## Annex A (normative)

### Determination of defects

- Annex A is cited normatively in 4.2.1 and 4.2.2  
→ISO/IEC Directives, Part 2, 2021, Clause 20

#### A.1 Principle

Extraneous matter, broken kernels, damaged kernels and other kinds of rice are separated manually according to the following types: husked rice, milled rice, husked parboiled rice and milled parboiled rice. Each type is then weighed.

#### A.2 Apparatus

The usual laboratory apparatus and, in particular, the following.

**A.2.1 Sample divider**, consisting of a conical sample divider or multiple-slot sample divider with a distribution system, e.g. “split-it-right” sample divider, such as that shown in [Figure A.1](#).

**A.2.2 Sieve**, with round perforations of diameter 1,4 mm.

**A.2.3 Tweezers**.

**A.2.4 Scalpel**.

**A.2.5 Paintbrush**.

**A.2.6 Steel bowls**, of diameter 100 mm ± 5 mm; seven per test sample.

**A.2.7 Balance**, which can be read to the nearest 0,01 g.

#### A.3 Sampling

Sampling shall be carried out in accordance with [Clause 5](#).

#### A.4 Procedure

##### A.4.1 Preparation of test sample

Carefully mix the laboratory sample to make it as uniform as possible, then proceed to reduce it, using a divider ([A.2.1](#)), until a quantity of 30 g is obtained.

All parts of kernels which get stuck in the perforations of a sieve should be considered to be retained by the sieve.

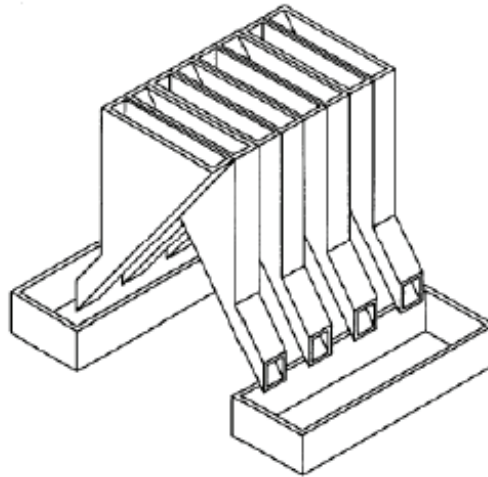


Figure A.1 — “Split-it-right” sample divider

#### A.4.2 Determination

Weigh, to the nearest 0,1 g, one of the test samples obtained in accordance with [A.4.1](#) and separate the different defects into the bowls ([A.2.6](#)). When a kernel has several defects, classify it in the defect category for which the maximum permissible value is the lowest (see [Table 1](#)).

Weigh, to the nearest 0,01 g, the fractions obtained above.

#### A.5 Calculation

Express the mass fraction of each defect using [Formula \(A.1\)](#):

$$w = \frac{m_D}{m_S} \quad (\text{A.1})$$

where

$w$  is the mass fraction of grains with a particular defect in the test sample;

$m_D$  is the mass, in grams, of grains with that defect;

$m_S$  is the mass, in grams, of the test sample.

#### A.6 Test report

Report the results as specified in [Clause 7](#).

- Mathematical formulae
  - Symbols are defined below formulae
- ISO/IEC Directives, Part 2, 2021, Clause 27

## Annex B (informative)

### Determination of the waxy rice content of parboiled rice

#### B.1 Principle

Waxy rice kernels have a reddish-brown colour when stained in an iodine solution, while non-waxy rice kernels show a dark blue colour.

#### B.2 Apparatus

The usual laboratory apparatus and, in particular, the following.

**B.2.1 Balance**, capable of weighing to the nearest 0,01 g.

**B.2.2 Glass beaker**, of capacity 250 ml.

**B.2.3 Small white colour bowls**, or any white colour container of a suitable size.

**B.2.4 Wire sieve**, with long rounded apertures of  $(1 \text{ mm } ^{+0,02}_0 \text{ mm}) \times (20 \text{ mm } ^{+2}_{-1} \text{ mm})$ .

**B.2.5 Stirrer rod**.

**B.2.6 Tweezers or forceps**.

**B.2.7 Tissue paper**.

#### B.3 Reagents

**WARNING** — Care should be taken in handling iodine. Direct contact of iodine with skin can cause lesions. Iodine vapour is very irritating to eyes and mucous membranes.

**B.3.1 Deionized water**, Grade 3 quality as specified in ISO 3696.

**B.3.2 Iodine stock solution**, containing a mass fraction of 4,1 % iodine and 6,3 % potassium iodide in deionized water.

**B.3.3 Iodine working solution**, freshly prepared daily, by diluting the stock solution ([B.3.2](#)) two times (by volume) with deionized water ([B.3.1](#)).

#### B.4 Sampling

Sampling shall be carried out in accordance with [Clause 5](#).

## Annex B (informative)

### Determination of the waxy rice content of parboiled rice

#### B.1 Principle

Waxy rice kernels have a reddish-brown color, while non-waxy kernels show a dark blue color.

- The apparatus clause has a specific presentation style  
→ ISO/IEC Directives Part 2, 2021, 18.5.4

#### B.2 Apparatus

The usual laboratory apparatus and, in particular, the following.

- B.2.1 Balance**, capable of weighing to the nearest 0,01 g.
- B.2.2 Glass beaker**, of capacity 250 ml.
- B.2.3 Small white colour bowls**, or any white colour container of a suitable size.
- B.2.4 Wire sieve**, with long rounded apertures of  $(1 \text{ mm } ^{+0,02}_0 \text{ mm}) \times (20 \text{ mm } ^{+2}_{-1} \text{ mm})$ .
- B.2.5 Stirrer rod**.
- B.2.6 Tweezers or forceps**.
- B.2.7 Tissue paper**.

#### B.3 Reagents

**WARNING** — Care should be taken in handling iodine. Direct contact of iodine with skin can cause lesions. Iodine vapour is very irritating to eyes and mucous membranes.

- B.3.1 Deionized water**, Grade 3 quality as specified in ISO 3696.
- B.3.2 Iodine stock solution**, containing a mass fraction of 4,1 % iodine and 6,3 % potassium iodide in deionized water.
- B.3.3 Iodine working solution**, freshly prepared daily, by diluting the stock solution ([B.3.2](#)) two times (by volume) with deionized water ([B.3.1](#)).

#### B.4 Sampling

Sampling shall be carried out in

- The reagent clause has a specific presentation style  
→ ISO/IEC Directives, Part 2, 2021, 18.5.3

## B.5 Determination

**B.5.1** Weigh a portion of about 100 g of milled rice and put it into a glass beaker ([B.2.2](#)).

**B.5.2** Add enough iodine working solution ([B.3.3](#)) to soak the kernels and stir ([B.2.5](#)) until all the kernels are submerged under the solution. Let the kernels soak in the solution for 30 s.

**B.5.3** Pour the rice and solution into a wire sieve ([B.2.4](#)) and shake the basket slightly in order to drain out the solution. Then place the wire sieve on a piece of tissue paper ([B.2.7](#)) to absorb the excess liquid.

**B.5.4** Pour the stained kernels into a bowl ([B.2.3](#)). Using tweezers or forceps ([B.2.6](#)), separate the reddish-brown kernels of waxy rice from the dark blue kernels of non-waxy rice.

**B.5.5** Weigh the waxy rice portion ( $m_1$ ) and the non-waxy rice portion ( $m_2$ ) to the nearest 0,1 g.

## B.6 Calculation

Calculate the mass fraction, expressed as a percentage, of the waxy rice,  $w_{\text{wax}}$ , using [Formula \(B.1\)](#):

$$w_{\text{wax}} = \frac{m_1}{m_1 + m_2} \times 100 \quad (\text{B.1})$$

where

$m_1$  is the mass, expressed in grams, of the waxy rice portion;

$m_2$  is the mass, expressed in grams, of the non-waxy rice portion.

## B.7 Test report

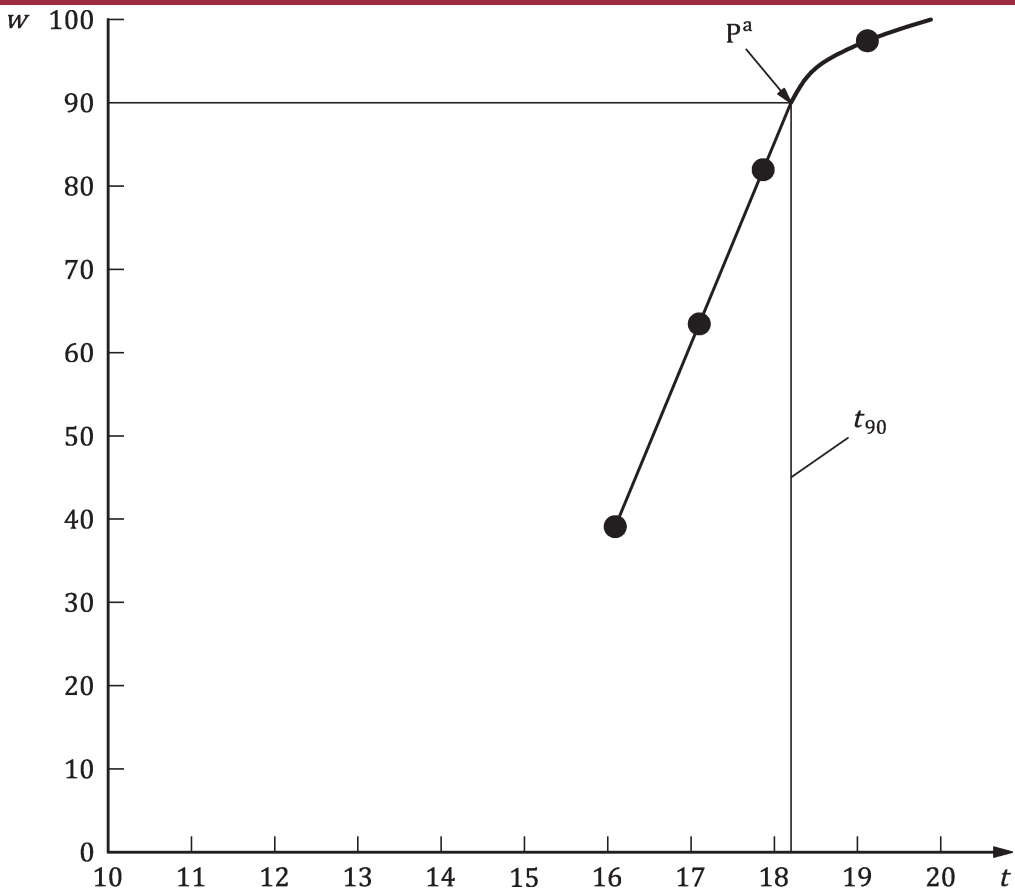
Report the results as specified in [Clause 7](#), giving the results calculated using [Formula \(B.1\)](#).

Annex C  
(informative)  
  
Gelatinization

Figure C.1 gives an example of a typical gelatinization curve. Figure C.2 shows the three stages of gelatinization:

- initial;
- intermediate;
- final.

• Cross-references to the figures  
→ ISO/IEC Directives,2021, Part 2, Clause 28

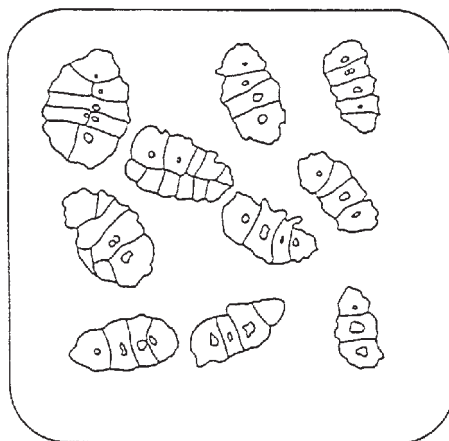


**Key**  
 $t$  cooking time, expressed in minutes  
 $w$  mass fraction of gelatinized kernels, expressed in per cent  
 $t_{90}$  time required to gelatinize 90 % of the kernels  
 $P$  point of the curve corresponding to a cooking time of  $t_{90}$   
<sup>a</sup> The time  $t_{90}$  was estimated to be 18,2 min for this example.

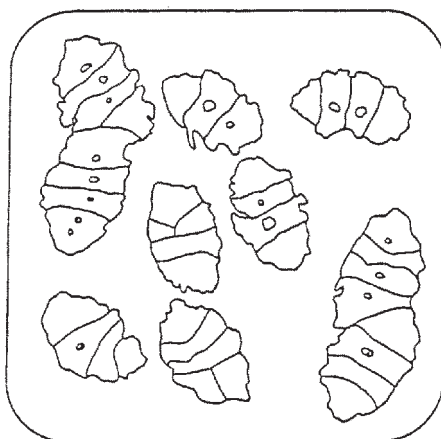
- Figures are language neutral
- Text is placed in a figure key

NOTE These results are based on a study carried out on three different types of kernel.

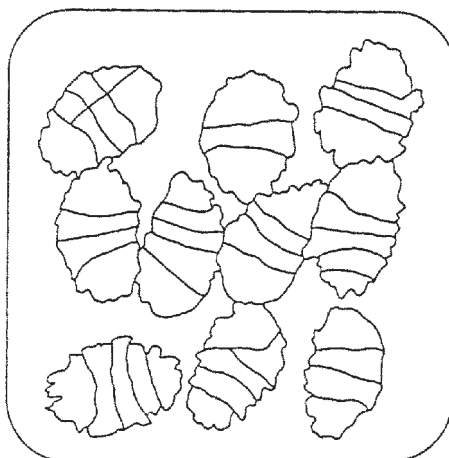
Figure C.1 — Typical gelatinization curve



**a) Initial stage: No grains are fully gelatinized (ungelatinized starch granules are visible inside the kernels)**



**b) Intermediate stage: Some fully gelatinized kernels are visible**



**c) Final stage: All kernels are fully gelatinized**

**Figure C.2 — Stages of gelatinization**

- Figures contain a figure number and title

- Annex D is cited informatively in 6.5.2.1

## Annex D (informative)

### Results of interlaboratory test for husked rice yields

An interlaboratory test [14] was carried out by the ENR [Rice Research Centre (Italy)] in accordance with ISO 5725-1 and ISO 5725-2, with the participation of 15 laboratories. Each laboratory carried out three determinations on four different types of kernel. The statistical results are shown in [Table D.1](#).

**Table D.1 — Repeatability and reproducibility of husked rice yield**

Description	Rice sample			
	Arborio	Drago <sup>a</sup>	Balilla	Thaibonnet
Number of laboratories retained after eliminating outliers	13	11	13	13
Mean value, g/100 g	81,2	82,0	81,8	77,7
Standard deviation of repeatability, $s_r$ , g/100 g	0,41	0,15	0,31	0,53
Coefficient of variation of repeatability, %	0,5	0,2	0,4	0,7
Repeatability limit, $r$ ( $= 2,83 s_r$ )	1,16	0,42	0,88	1,50
Standard deviation of reproducibility, $s_R$ , g/100 g	1,02	0,20	0,80	2,14
Coefficient of variation of reproducibility, %	1,3	0,2	1,0	2,7
Reproducibility limit, $R$ ( $= 2,83 s_R$ )	2,89	0,57	2,26	6,06
<sup>a</sup> Parboiled rice.				



- Documents cited informatively are listed in the Bibliography
- Only documents cited in the standard should be listed in the Bibliography

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- [2] ISO 5725-1, *Accuracy (trueness and precision) of measurement methods and results — Part 1: General principles and definitions*
- [3] ISO 5725-2, *Accuracy (trueness and precision) of measurement methods and results — Part 2: Basic method for the determination of repeatability and reproducibility of a standard measurement method*
- [4] ISO 6322-1, *Storage of cereals and pulses — Part 1: General recommendations for the keeping of cereals*
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• Entries [4], [5] and [6] are cited informatively in 4.2.1 NOTE





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