INTERNATIONAL STANDARD

ISO 11746

First edition
2012-01-15

Rice — Determination of biometric characteristics of kernels

Riz — Détermination des caractéristiques biométriques des grains

Reference number
ISO 11746:2012(E)

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

Published in Switzerland

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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

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.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 11746 was prepared by Technical Committee ISO/TC 34, *Food products*, Subcommittee SC 4, *Cereals and pulses*.

Rice — Determination of biometric characteristics of kernels

1 Scope

This International Standard specifies a method for the determination of the biometric characteristics of husked or milled rice kernels.

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 7301, *Rice — Specification*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 7301 and the following apply.

3.1
biometric characteristics
length, width and thickness of the kernel measured along the three Cartesian axes

NOTE See Annex A.

4 Principle

Manual selection of kernels and measurement of their biometric characteristics (3.1) with a micrometer.

5 Apparatus

Usual laboratory apparatus and, in particular, the following.

5.1 Sample divider[1], conical sampler or multiple-slot sampler with a distribution system.

5.2 Tray, or equivalent device, coloured in contrast with the colour of the rice to be evaluated.

5.3 Tweezers, of different types (metal, plastic, round tips or pointed, etc.), for easy manipulation of kernels.

5.4 Micrometer, or equivalent device capable of being read to the nearest 0,01 mm and which ensures that no kernel deformation occurs during measurement.

Avoidance of kernel deformation is particularly important for husked rice.

6 Sampling

Sampling is not part of the method specified in this International Standard. A recommended sampling method is given in ISO 24333[2].

1) Some sample dividers are described in ISO 24333[2].

It is important the laboratory receive a truly representative sample which has not been damaged or changed during transport or storage.

7 Procedure

7.1 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 sample divider (5.1) to obtain a quantity of about 50 g and spread the grains on the tray (5.2). If necessary, sieve it to retain only whole grains.

7.2 Determination

7.2.1 Randomly draw out two sets of 100 kernels from the test sample obtained in 7.1.

7.2.2 While maintaining each kernel motionless in the correct orientation (see Annex A) with the aid of tweezers (5.3), measure the biometric characteristics (3.1) of the kernels of both sets (7.2.1) using the micrometer (5.4). Report the values to the nearest 0,01 mm.

7.2.3 For each biometric characteristic (length, width and thickness), calculate the arithmetic means for both sets, $(\bar{X}_1, \bar{X}_2)$, and check whether the value calculated using the following formula is less than or equal to 2.

$$\frac{\bar{X}_1 - \bar{X}_2}{\left(\bar{X}_1 + \bar{X}_2\right)/2} \times 100$$

A value higher than 2 indicates that sets have not been randomly selected, in which case, return all the kernels to the test sample and repeat the procedure from 7.2.1.

8 Calculation and expression of results

8.1 Calculation

Calculate the arithmetic means, $\bar{X}_1, \bar{X}_2$, for all the biometric characteristics (3.1).

8.2 Expression of results

Report the mean values of the length, width, and thickness of the kernels to the nearest 0,01 mm.

9 Precision

9.1 Interlaboratory test

Details of an interlaboratory test on the precision of the method are summarized in Annex B. It is possible that the values derived from this interlaboratory test are not applicable to other types of rice and mixtures of other varieties.

9.2 Repeatability

The absolute difference between two independent single test results, obtained using the same method on identical test material in the same laboratory by the same operator using the same equipment within a short interval of time, will, in not more than 5 % of cases, be greater than the repeatability limits:

$r_l = 0{,}125$ mm

r_b = 0,049 mm

r_δ = 0,040 mm

for kernel length, width, and thickness, respectively.

9.3 Reproducibility

The absolute difference between two single test results, obtained using the same method on identical test material in different laboratories with different operators using different equipment, will, in not more than 5 % of cases, be greater than the reproducibility limits:

R_l = 0,337 mm

R_b = 0,163 mm

R_δ = 0,092 mm

for kernel length, width, and thickness, respectively.

10 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 11746:2012);

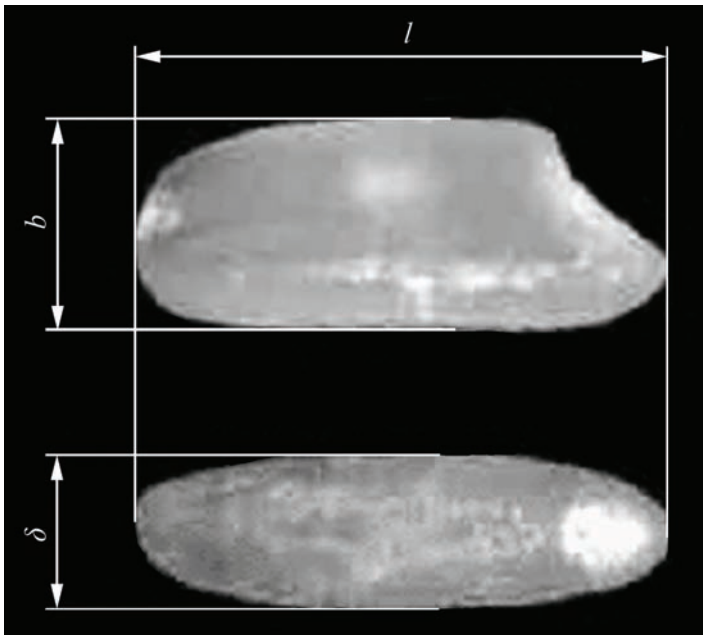
d) all operating details not specified in this International Standard, or regarded as optional, together with details of any incidents which may have influenced the test result(s);

e) the test result(s) obtained;

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

Annex A
(normative)

Kernel measurements



Key

b width
l length
δ thickness

Figure A.1 — Kernel measurements

Annex B
(informative)

Results of interlaboratory test

An interlaboratory test was carried out in 2009 in accordance with ISO 5725-2[1], in which 13 laboratories participated. Samples of rice of six different types were investigated: 1 — parboiled husked (PH); 2 — parboiled milled (PM); 3 — husked (H); 4 — milled (M); 5 — husked mixture of varieties (Hmx); 6 — milled mixture of varieties (Mmx). The precision data are given in Tables B.1, B.2 and B.3.

Table B.1 — Results of the statistical analysis for the kernel length

Parameter	Rice sample [a]					
	1 (PH)	2 (PM)	3 (H)	4 (M)	5 (Hmx)	6 (Mmx)
Laboratories retained after eliminating outliers, n	10	9	10	11	11	9
Mean value, mm	6,73	6,22	6,37	6,02	6,27	5,51
Standard deviation of repeatability, s_r, mm	0,039	0,036	0,030	0,024	0,073	0,045
Coefficient of variation of repeatability, $C_{V,r}$, %	0,6	0,6	0,5	0,4	1,2	0,8
Repeatability limit, r ($r = 2{,}83\ s_r$), mm	0,110	0,102	0,085	0,068	0,206	0,126
Standard deviation of reproducibility, s_R, mm	0,108	0,093	0,134	0,098	0,165	0,099
Coefficient of variation of reproducibility, $C_{V,R}$, %	1,6	1,5	2,1	1,6	2,6	1,8
Reproducibility limit, R ($R = 2{,}83\ s_R$), mm	0,305	0,264	0,380	0,278	0,468	0,281
[a] Each laboratory carried out three determinations/sample.						

Table B.2 — Results of the statistical analysis for the kernel width

Parameter	Rice sample [a]					
	1 (PH)	2 (PM)	3 (H)	4 (M)	5 (Hmx)	6 (Mmx)
Laboratories retained after eliminating outliers, n	9	9	8	9	9	9
Mean value, mm	2,15	2,06	2,97	2,87	2,82	2,62
Standard deviation of repeatability, s_r, mm	0,014	0,015	0,010	0,013	0,022	0,025
Coefficient of variation of repeatability, $C_{V,r}$, %	0,7	0,7	0,3	0,4	0,8	1,0
Repeatability limit, r ($r = 2{,}83\ s_r$), mm	0,040	0,043	0,029	0,036	0,062	0,071
Standard deviation of reproducibility, s_R, mm	0,038	0,039	0,036	0,049	0,086	0,077
Coefficient of variation of reproducibility, $C_{V,R}$, %	1,8	1,9	1,2	1,7	3,0	2,9
Reproducibility limit, R ($R = 2{,}83\ s_R$), mm	0,107	0,109	0,103	0,140	0,243	0,217
[a] Each laboratory carried out three determinations/sample.						

Table B.3 — Results of the statistical analysis for the kernel thickness

Parameter	Rice sample [a]					
	1 (PH)	2 (PM)	3 (H)	4 (M)	5 (Hmx)	6 (Mmx)
Laboratories retained after eliminating outliers, n	9	10	8	9	7	8
Mean value, mm	1,85	1,73	2,03	1,91	1,99	1,83
Standard deviation of repeatability, s_r, mm	0,013	0,019	0,009	0,011	0,019	0,010
Coefficient of variation of repeatability, $C_{V,r}$, %	0,7	1,1	0,5	0,6	0,9	0,6
Repeatability limit, r ($r = 2{,}83\ s_r$), mm	0,036	0,053	0,026	0,031	0,053	0,029
Standard deviation of reproducibility, s_R, mm	0,035	0,034	0,025	0,020	0,047	0,026
Coefficient of variation of reproducibility, $C_{V,R}$, %	1,9	2,0	1,2	1,0	2,4	1,4
Reproducibility limit, R ($R = 2{,}83\ s_R$), mm	0,098	0,096	0,071	0,056	0,133	0,073

[a] Each laboratory carried out three determinations/sample.

Bibliography

[1] 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*

[2] ISO 24333, *Cereals and cereal products — Sampling*

ICS 67.060

Price based on 7 pages