INTERNATIONAL STANDARD

ISO 21415-3

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Wheat and wheat flour — Gluten content —

Part 3: Determination of dry gluten from wet gluten by an oven drying method

Blé et farines de blé — Teneur en gluten —

Partie 3: Détermination du gluten sec à partir du gluten humide par une méthode de séchage en étuve

Reference number
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Contents

Page

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 21415-3 was prepared by Technical Committee ISO/TC 34, *Food products*, Subcommittee SC 4, *Cereals and pulses*.

This first edition of ISO 21415-3, together with ISO 21415-4:2006, cancels and replaces ISO 6645:1981, which has been technically revised.

ISO 21415 consists of the following parts, under the general title *Wheat and wheat flour — Gluten content*:

— *Part 1: Determination of wet gluten by a manual method*

— *Part 2: Determination of wet gluten by mechanical means*

— *Part 3: Determination of dry gluten from wet gluten by an oven drying method*

— *Part 4: Determination of dry gluten from wet gluten by a rapid drying method*

Wheat and wheat flour — Gluten content —

Part 3:
Determination of dry gluten from wet gluten by an oven drying method

1 Scope

This part of ISO 21415 specifies a method for the determination of the dry gluten content from wet gluten obtained as specified in either ISO 21415-1 or ISO 21415-2. In this method, dry gluten is obtained from wet gluten by drying in an oven.

The method can also be used to determine the moisture content of the wet gluten.

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 21415-1, *Wheat and wheat flour — Gluten content — Part 1: Determination of wet gluten by a manual method*

ISO 21415-2, *Wheat and wheat flour — Gluten content — Part 2: Determination of wet gluten by mechanical means*

3 Terms and definitions

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

3.1
wet gluten
visco-elastic substance, composed principally of two protein fractions (gliadin and glutenin) in a hydrated form, obtained as specified in ISO 21415-1 or ISO 21415-2

3.2
dry gluten
residue obtained from wet gluten dried according to the conditions specified in this part of ISO 21415 or in ISO 21415-4

4 Principle

A ball of wet gluten obtained under the conditions specified in ISO 21415-1 or ISO 21415-2 is dried then weighed.

5 Apparatus

Usual laboratory apparatus and, in particular, the following.

5.1 **Scalpel** or **knife**.

5.2 **Metal** or **glass plate**, 5 cm × 5 cm.

5.3 **Oven**, capable of being maintained at a temperature of 130 °C ± 2 °C.

5.4 **Desiccator**, provided with an efficient desiccant.

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

6 Procedure

6.1 Test portion

Weigh the plate (5.2) to the nearest 0,01 g (m_0). Take the ball of wet gluten, obtained by the method specified in ISO 21415-1 or ISO 21415-2, from which most of the washing solution has been eliminated. Place it on the plate. Weigh the plate and wet gluten to the nearest 0,01 g (m_5).

It is necessary to know the original mass of wheat flour (m) from which the wet gluten was extracted. It should be noted that in the case of the manual washing out procedure, this is not equal to the mass of the test portion of wheat flour.

6.2 Determination

Place the plate and test portion in the oven (5.3) set at 130 °C, and leave for 2 h.

Remove the plate from the oven and make three or four parallel deep incisions in the partially dried gluten using the scalpel or knife (5.1). Then replace it in the oven for a further 4 h, so that the total drying time is 6 h.

Remove the plate and dry gluten and cool in the desiccator (5.4) to ambient temperature (approximately 30 min). Then weigh the plate plus the dry gluten ball to the nearest 0,01 g (m_4).

7 Calculation and expression of results

7.1 Calculation of the dry gluten content

The dry gluten content (G_{dry}), expressed as a mass fraction, in percent, of the original sample (wheat flour, reground semolina or ground wheat), is equal to

$$G_{dry} = \frac{m_4 - m_0}{m} \times 100\ \%$$

where

m_4 is the mass of the plate and the dry gluten together, in grams;

m_0 is the mass of the empty plate, in grams;

m is the mass, in grams, of the portion of the original sample of dough taken for determination of the wet gluten content.

It is necessary to know the mass of the original sample (m) from which the wet gluten was extracted. It should be noted that in the case of the manual washing out procedure this is not equal to the mass of the test portion of the original sample.

If the moisture content of the original sample, determined in accordance with ISO 712, is taken into account, the dry gluten content on a dry matter basis (G_{dm}), in percent, is equal to

$$G_{dm} = \frac{100\,(m_4 - m_0)}{m\,(100 - w)} \times 100\ \%$$

where w is the moisture content of the original sample, as a mass fraction in percent.

Take as the result the arithmetic mean of two determinations.

7.2 Calculation of water content of the wet gluten

The water content of the wet gluten (w_G), expressed as mass fraction in percent, is equal to

$$w_G = \frac{m_5 - m_4}{m_5 - m_0} \times 100\ \%$$

where m_5 is the mass, in grams, of the plate and the test portion of wet gluten together.

8 Precision

8.1 Interlaboratory test

Details of an interlaboratory test on the precision of the method are summarized in Annex A. The values derived from this interlaboratory test may not be applicable to concentration ranges and matrices other than those given.

8.2 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 r = 0,6 g/100 g, starting from either the manual or the mechanical determination of wet gluten.

8.3 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 values given below:

— starting from the manual determination of wet gluten: R = 3,1 g/100 g;

— starting from the mechanical determination of wet gluten: R = 2,3 g/100 g.

9 Test report

The test report shall specify:

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 part of ISO 21415 and reference to that part of ISO 21415 which was used for the determination of wet gluten;

d) all operating details not specified in this part of ISO 21415, or regarded as optional, together with details of any incidents that occurred when performing the method, 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
(informative)

Results of an interlaboratory test

An interlaboratory test involving 21 laboratories in 7 countries was organized by the CONCORDIA Warehouse Ltd., Grain Control Laboratory, Budapest (Hungary) in 2004. It was carried out on the following six samples:

— Sample A: wheat (*Triticum aestivum* L.) as grain;

— Sample B: wheat (*Triticum aestivum* L.) as grain;

— Sample C: wheat (*Triticum durum* Desf.) as grain;

— Sample D: durum wheat semolina;

— Sample E: wheat flour;

— Sample F: wheat flour.

The results obtained were subjected to statistical analysis in accordance with ISO 5725-1 and ISO 5725-2 to give the precision data shown in Tables A.1 and A.2.

Table A.1 — Precision data for dry gluten, starting from wet gluten obtained as in ISO 21415-1

	Samples					
	A	B	C	D	E	F
Number of laboratories after eliminating outliers	6	7	5	7	8	8
Mean value, g/100 g	8,15	11,45	9,66	12,10	9,49	12,21
Repeatability standard deviation, s_r, g/100 g	0,28	0,28	0,13	0,26	0,12	0,14
Coefficient of variation of repeatability, %	3,49	2,45	1,33	2,11	1,29	1,12
Repeatability limit r (= 2,8 s_r), g/100 g	0,80	0,78	0,36	0,71	0,34	0,38
Reproducibility standard deviation, s_R, g/100 g	0,67	1,49	1,68	1,09	0,75	0,92
Coefficient of variation of reproducibility, %	8,24	13,06	17,35	8,97	7,86	7,57
Reproducibility limit R (= 2,8 s_R), g/100 g	1,88	4,19	4,69	3,04	2,09	2,59

Table A.2 — Precision data for dry gluten, starting from wet gluten obtained as in ISO 21415-2

	Samples					
	A	B	C	D	E	F
Number of laboratories after eliminating outliers	8	8	7	8	7	7
Mean value, g/100 g	8,28	11,29	10,58	12,83	9,75	12,29
Repeatability standard deviation, s_r, g/100 g	0,19	0,20	0,26	0,26	0,13	0,25
Coefficient of variation of repeatability, %	2,35	1,76	2,42	2,01	1,32	2,00
Repeatability limit r (= 2,8 s_r), g/100 g	0,55	0,56	0,72	0,72	0,36	0,69
Reproducibility standard deviation, s_R, g/100 g	0,39	0,52	0,68	1,55	0,79	0,91
Coefficient of variation of reproducibility, %	4,68	4,59	6,46	12,09	8,08	7,41
Reproducibility limit R (= 2,8 s_R), g/100 g	1,08	1,45	1,91	4,34	2,20	2,55