SLOVENSKI STANDARD
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Koruza - Določevanje vlage (v zmletih in celih zrnih) (ISO/DIS 6540:2020)

Maize - Determination of moisture content (on milled grains and on whole grains) (ISO/DIS 6540:2020)

Mais - Bestimmung des Feuchtegehalts (von gemahlenen und ganzen Körnern) (ISO/DIS 6540:2020)

Maïs - Détermination de la teneur en eau (sur grains broyés et sur grains entiers) (ISO/DIS 6540:2020)

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Maize — Determination of moisture content (on milled grains and on whole grains)

Maïs — Détermination de la teneur en eau (sur grains broyés et sur grains entiers)

ICS: 67.060

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Foreword

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For an explanation on 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 the following URL: www.iso.org/iso/foreword.html.

The committee responsible for this document is Technical Committee ISO/TC 34, *Food Products*, Subcommittee SC 4, *Cereals and pulses*.

This second edition cancels and replaces the first edition ISO 6540:1980 – *Maïze – Determination of moisture content (on milled grains and on whole grains)*, of which clauses 8 to 12 and 17 to 21, as well as annexes, have been technically revised.

Introduction

The basic reference method and the routine reference method relating to cereals (ISO 712 and its annex B) are only applicable to maize with a number of amendments. This is why it has been considered advisable to reproduce the whole of these two methods, amended for application to the case of maize.

The basic reference method, for maize, which is called the absolute method in this case, requires special equipment and experienced personnel, and can only be applied in specialized laboratories.

Because of the very high moisture content which may be present in samples of maize [sometimes greater than 40 % (m/m)] and because of the size and texture of the grains, the determination of the moisture in maize raises problems with regard to its grinding and pre-drying.

Consequently, to allow the pre-drying and grinding to be avoided, this International Standard also describes a routine method for whole grain (section 2) which is easier to use and allows working in series. Its response time is longer but the workload is lower, because of the absence of grinding. However, this practical whole grain method has a positive bias of about 0.30 % (w/w) compared to the reference method.

Section one: Reference method

Maize — Determination of moisture content (on milled grains and on whole grains)

1 Scope

This section specifies the reference method for the determination of the moisture content of maize grains and maize semolina.

2 Normative references

No other standard is indispensable for the application of this document.

3 Terms and definitions

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

3.1
moisture content of maize
conventionally, the loss in mass, expressed as a percentage, undergone by the product under the conditions specified in this section of this standard

4 Principle

If necessary, grinding of a sample, after pre-conditioning, if required. Drying of a test portion at a temperature between 130 °C and 133 °C, under conditions which enable a result to be obtained which is in agreement with that obtained by the absolute method (see the annex).

5 Apparatus

5.1 Analytical balance, able to weight with an accuracy of +/- 0.001 g and therefore having a display accuracy of 0.1 mg.

5.2 Analytical balance, able to weight with an accuracy of +/- 0.1 g and therefore having a display accuracy of 0.01 mg.

5.3 Grinding mill, having the following characteristics:

a) made of material which does not absorb moisture;

b) easy to clean and having as little dead space as possible;

c) enabling grinding of 30 g of maize grains to be carried out rapidly and uniformly, without appreciable development of heat and, as far as possible, without contact with the out side air;

d) adjustable so as to obtain particles of the dimensions indicated in 7.1

5.4 Metal boat, without lid, with an effective surface area enabling 100 g of maize grains to be distributed in a single layer.

5.5 Metal dish, of suitable dimensions, non-corrodible under the test conditions, or, failing this, a **glass dish**, with a sufficiently tight-fitting lid, and having an effective surface area such as to allow distribution of the test portion with no more than 0,3 g per square centimeter.

5.6 Constant-temperature oven, electrically heated, adjustable between 60 °C and 80 °C, and with adequate ventilation.

5.7 Constant-temperature oven, electrically heated, capable of being controlled in such a way that the temperature of the air and of the shelves carrying the test portions is within the range of 130 °C to 133 °C in the neighbourhood of the test portions, in normal working.

The oven shall have a heat capacity such that, when initially adjusted to a temperature of 131 °C, it can again reach this temperature in less than 45 min (preferably in less than 30 min) after insertion of the maximum number of test portions that can be dried simultaneously.

The effectiveness of the ventilation shall be determined using durum wheat semolina, with a maximum panicle size of 1 mm, as the test material. The ventilation shall be such that after in-serting all the test portions that the oven can hold and drying at a temperature of 130 °C to 133 °C, the results after a heating period of 2 h and then a further 1 h will not differ by more than 0,15 g of moisture per 100 g of sample.

5.8 Desiccator, containing an efficient desiccant.

6 Sampling

Sampling is not part of the method specified in this International Standard. A recommended sampling method is given in ISO 24333 – *Cereal and ceral products – Sampling*.

The laboratory should be provided in a sealed package a truly representative sample, undamaged and unmodified during transport and storage.

7 Preparation of the test sample

7.1 Products not requiring to be ground

Products which have particles of sizes less than or equal to 1,7 mm, less than 10 % (*m/m)* being over 1 mm and more than 50 % (*m/m)* being less than 0,5 mm, do not need to be ground before the determination.

Mix the laboratory sample thoroughly before taking the test portion (8.3).

7.2 Products requiring to be ground

lf the laboratory sample does not have the particle size characteristics mentioned in 7.1, it shall be ground either without pre-conditioning (7.2.1) or with pre-conditioning (7.2.2) as required.

7.2.1 Grinding without pre-conditioning

For products which are not likely to undergo variations in moisture content in the course of grinding [in general, products with a moisture content between 9.00 % and 15.00 % *(m/m)* (see 11)], carry out grinding without pre-conditioning.

Adjust the grinding mill (5.3) to obtain particles of the dimensions indicated in 7.1, grind a small quantity of the laboratory sample and discard it.

Then quickly grind about 30 g of the laboratory sample, mix with a spatula and proceed immediately as specified in 8.1.

7.3 Grinding with pre-conditioning

Products which are likely to undergo changes in moisture content in the course of grinding [in general, products with a moisture content more than 15.00 % *(m/m)* or less than 9.00 % (m/m)] shall be pre-conditioned to bring their moisture content to between 9.00 % *(m/m)* and 15.00 % *(m/m)* (see 11) before grinding.

If the moisture content is greater than 15.00 % *(m/m)* (the more frequent case, weigh, to the nearest 0.1g, about 100 g of the laboratory sample in the metal boat (5.3), place this in the oven (5.6) controlled at between 60 °C and 80 °C, and leave it for the time necessary to bring the moisture content to between 9.00 % *(m/m)* and 15.00 % *(m/m).* Take the boat out of the oven and allow it to stand in the laboratory atmosphere for the time necessary (at least 2 h) for the pre-conditioned sample to return to the laboratory temperature and for the moisture distribution to be relatively uniform. During this rest, it must be ensured that no addition or withdrawal of material is made to the contents of the boat. If necessary, cover it with a sheet of paper but not with a lid that could limit the exchange of moisture between the air and the grain.

After conditioning, weigh the sample to the nearest 10 mg, then, proceeding rapidly, grind about 30 g of this product. Mix using a spatula.

If the moisture content is less than 9.00 % (*m/m*), place about 100 g of the laboratory sample, weighed to the nearest 10 mg, in a suitable atmosphere (usually that of the laboratory) and leave it until a moisture content within the limits specified above is obtained.

8 Procedure

8.1 Number of determinations

For each laboratory sample, carry out the determination in duplicate

Carry out one determination on each of the two grinded test portions taken from the laboratory sample, in accordance with paragraphs 8.2 to 8.5. If the absolute difference between the two results is greater than the repeatability limit given in Clause 10, repeat the determination until the requirements are met.

8.2 Taring of capsules

For each sample, dry and tare to the nearest 0.001 g two capsules (5.5) beforehand. For each capsule, note the tare *t*.

8.3 Test portion

Weigh rapidly, to the nearest 0.001 mg, approximately 8 g +/- 1 g of the test sample (7.1.1, 7.2.1 to or 7.2.2 as appropriate) into the capsule (5.4). Note the mass m'_0.

8.4 Drying

Place the open dish containing the test portion, and the lid, in the oven (5.7) controlled between 130 °C and 133 °C and leave it for 4 h +/- 5 min.

Never place moist products in an oven containing test portions at the end of dehydration, as this will result in partial rehydration of the latter.

Do not open the oven door during drying nor introduce new wet test samples before removing the dry test portions as this would rehydrate them.

At the end of the drying time and proceeding rapidly, take the dish out of the oven, cover it and place it in the desiccator (5.8). When several tests are being carried out simultaneously, never place dishes on top of one another in the desiccator.

8.5 Weighing

When the dish has cooled to laboratory temperature (generally between 30 min and 45 min after it has been placed in the desiccator), weigh it to the nearest 0.001 mg. Note the mass m'_1.

9 Expression of results

9.1 Method of calculation and formulae

The moisture content, w_{H2O}, expressed as a percentage by mass of the product has received, is given by the following formulae:

a) without pre-conditioning:

$$w_{H2O} = (m_0 - m_1)\frac{100}{m_0}$$

where

$m_o = m'_0 - t$ is the mass, in grams, of the test portion (8.3) ;

$m_1 = m'_1 - t$ is the mass, in grams, of the test portion after drying (8.5).

t is the tare of the capsule, in grams (8.2)

b) with pre-conditioning:

$$w_{H2O} = \left[(m0 - m1)\frac{m3}{m0} + m2 - m3\right]\frac{100}{m2}$$

$$w_{H2O} = 100\left(1 - \frac{m1m3}{m0m2}\right)$$

where

m_o *and* m_1 have the same signification as in 9.1

m_2 is the mass, in grams, of the sample before conditioning (7.2.2);

m_3 is the mass, in grams, of the sample after conditioning (7.2.2).

Take as the result the arithmetic mean of the two values obtained, provided that the requirement for repeatability (see 10.2) is satisfied. If it is not, repeat the determinations.

Express the result to the second decimal place.

10 Precision

10.1 Inter-laboratory test

10.2 The details of an inter-laboratory test relating to the precision of the method are summarized in Appendix B. Values from this test can only be applied to water content ranges from 11.90 to 39.20 % and the studied matrix (maize).Repeatability

The absolute difference between two independent individual test results, obtained using the same method on identical material tested in the same laboratory by the same operator using the same apparatus and within a short time interval, shall be exceed in no more than 5% of cases the repeatability limit r.

