SVENSK STANDARD
SS-EN ISO 6540:2010

Fastställd/Approved: 2010-04-20
Publicerad/Published: 2010-06-16
Utgåva/Edition: 1
Språk/Language: engelska/English
ICS: 65.120; 67.060

SWEDISH STANDARDS INSTITUTE

Maize – Determination of moisture content (on milled grains and on whole grains) (ISO 6540:1980)

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN ISO 6540

April 2010

ICS 67.060

English Version

Maize - Determination of moisture content (on milled grains and on whole grains) (ISO 6540:1980)

Maïs - Détermination de la teneur en eau (sur grains broyés et sur grains entiers) (ISO 6540:1980)

Mais - Bestimmung des Feuchtegehalts (von gemahlenen und ganzen Körnern) (ISO 6540:1980)

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: Avenue Marnix 17, B-1000 Brussels

Ref. No. EN ISO 6540:2010: E

Contents

Foreword

The text of ISO 6540:1980 has been prepared by Technical Committee ISO/TC 34 “Food products” of the International Organization for Standardization (ISO) and has been taken over as EN ISO 6540:2010 by Technical Committee CEN/TC 338 “Cereal and cereal products” the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by October 2010, and conflicting national standards shall be withdrawn at the latest by October 2010.

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Endorsement notice

The text of ISO 6540:1980 has been approved by CEN as a EN ISO 6540:2010 without any modification.

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

0 Introduction

The basic reference method and the routine reference method relating to cereals (ISO 711 and ISO 712) 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 pre-drying and grinding.

Consequently, to allow the pre-drying and grinding to be avoided, this International Standard also describes a routine method for whole grain which is easier to use and allows working in series.

Section one : Reference method

1 Scope and field of application

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

2 Reference

ISO 950, *Cereals — Sampling (as grain).*

3 Definition

moisture content of maize : Conventionally, the loss in mass, expressed as a percentage, undergone by the product under the conditions specified in this section.

4 Principle

If necessary, grinding of a sample, after pre-conditioning, if required. Drying of a test portion at a temperature between 130 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.

5.2 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 outside air;

d) adjustable so as to obtain particles of the dimensions indicated in 7.1.1.

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

5.4 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 centimetre.

5.5 Constant-temperature oven, electrically heated, capable of being maintained between 60 and 80 °C, and with adequate ventilation.

5.6 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 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 particle size of 1 mm, as the test material. The ventilation shall be such that after inserting all the test portions that the oven can hold and drying at a temperature of 130 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.

5.7 Desiccator, containing an efficient desiccant.

6 Sampling

See ISO 950.

7 Procedure (See figure 1)

7.1 Preparation of the test sample

7.1.1 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 (7.2).

7.1.2 Products requiring to be ground

If the laboratory sample does not have the particle size characteristics mentioned in 7.1.1, it shall be ground either without pre-conditioning (7.1.2.1) or with pre-conditioning (7.1.2.2) as required.

7.1.2.1 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 and 15 % (*m*/*m*) (see 9.1)], carry out grinding without pre-conditioning.

Adjust the grinding mill (5.2) to obtain particles of the dimensions indicated in 7.1.1, 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 7.2.

7.1.2.2 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 % (m/m) or less than 9 % (m/m)] shall be pre-conditioned to bring their moisture content to between 9 and 15 % (m/m) (see 9.1) before grinding.

If the moisture content is greater than 15 % (m/m) (the more frequent case), weigh, to the nearest 10 mg, about 100 g of the laboratory sample in the metal boat (5.3), place this in the oven (5.5) controlled at between 60 and 80 °C, and leave it for the time necessary to bring the moisture content to between 9 and 15 % (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.

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

NOTE – If the moisture content is less than 9 % (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.

7.2 Test portion

Rapidly weigh, to the nearest 1 mg, about 8 g of the test sample (7.1.1, 7.1.2.1 or 7.1.2.2, as appropriate) in the dish (5.4), which has been previously dried and weighed, together with its lid, to the nearest 1 mg.

7.3 Drying

Place the open dish containing the test portion, and the lid, in the oven (5.6) controlled at 130 to 133 °C and leave it for 4 h, taken from the moment when the oven temperature is again between 130 to 133 °C.

Proceeding rapidly, take the dish out of the oven, cover it and place in the desiccator (5.7); when several tests are being carried out simultaneously, never place dishes on top of one another in the desiccator.

When the dish has cooled to laboratory temperature (generally between 30 and 45 min after it has been placed in the desiccator), weigh it to the nearest 1 mg.

7.4 Number of determinations

Carry out two determinations on test portions taken from different test samples, but from the same laboratory sample (see figure 1).

8 Expression of results

8.1 Method of calculation and formulae

The moisture content, expressed as a percentage by mass of the product as received, is given by the following formulae :

a) *without pre-conditioning :*

$$(m_0 - m_1)\frac{100}{m_0}$$

where

m_0 is the mass, in grams, of the test portion (7.2);

m_1 is the mass, in grams, of the test portion after drying (7.3).

b) *with pre-conditioning :*

$$\left[(m_0 - m_1)\frac{m_3}{m_0} + m_2 - m_3\right]\frac{100}{m_2}$$

$$= 100\left(1 - \frac{m_1 m_3}{m_0 m_2}\right)$$

where

m_0 is the mass, in grams, of the test portion (7.2);

m_1 is the mass, in grams, of the test portion after drying (7.3);

m_2 is the mass, in grams, of the sample before conditioning (7.1.2.2);

m_3 is the mass, in grams, of the sample after conditioning (7.1.2.2).

Take as the result the arithmetic mean of the two values obtained, provided that the requirement for repeatability (see 8.2) is satisfied. If it is not, repeat the determinations.

Express the result to the second decimal place.

8.2 Repeatability

The difference between the values obtained from the two determinations, carried out simultaneously or in rapid succession by the same analyst, shall not exceed 0,15 g of moisture per 100 g of sample.

8.3 Remark

The results compared with those obtained by the absolute method (see the annex) generally differ by less than 0,15 g of moisture per 100 g of sample.