SLOVENSKI STANDARD
oSIST prEN ISO 16624:2019

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Pšenična moka in pšenični zdrob durum - Določanje barve z difuzno refleksno kolorimetrijo (ISO/DIS 16624:2019)

Wheat flour and durum wheat semolina - Determination of the colour by reflectance diffused colorimetry (ISO/DIS 16624:2019)

Weichweizenmehl und Hartweizengrieß - Farbbestimmung mittels diffuser Reflexionskolorimetrie (ISO/DIS 16624:2019)

Farine de blé tendre et semoule de blé dur - Détermination de la couleur par colorimétrie par réflectance diffuse (ISO/DIS 16624:2019)

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Wheat flour and durum wheat semolina — Determination of the colour by reflectance diffused colorimetry

Farine de blé tendre et semoule de blé dur — Détermination de la couleur par colorimétrie par réflectance diffuse

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Foreword

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This document was prepared by Technical Committee *[or Project Committee]* ISO/TC 34, *Food Products*, Subcommittee SC 4, *Cereals and pulses*.

Wheat flour and durum wheat semolina — Determination of the colour by reflectance diffused colorimetry

1 Scope

This standard describes a method for the determination of the colour in durum wheat semolina and soft wheat flour by reflectance diffused colorimetry. The standard is suitable for industrial semolina and flour.

This method may be applicable to flours obtained from experimentally milled.

2 Normative references

No document is referred to in the text in such a way that some or all of its content constitutes requirements of this document.

3 Terms and definitions

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

3.1
colour metric space
expression of the colour of an object or of a light source by some parameters expressed by figures. Among the different systems, two are considered:

1) the tri-stimulus values x, y, z which are at basis of existing space colour of CIE (Commission Internationale de l'Eclairage). These values reproduce the theory of colour perception by human eye based on three components;

2) the colour space CIELAB (1976); this system is the most used for measuring the colour of objects.

   *L** indicate the lightness and extend from 0 (black) to 100 (white);

   *a** and *b** are chromaticity indexes, respectively;

   a: red/green (a>0 red; a<0 green);

   b: yellow/blue (a>0 yellow; a<0 blue)

3.2
illuminants
light source characterized by a spectral curve, whose energy relative distribution is defined in the field of wavelengths which are able to influence the object colour visionThe illuminants normalized by the CIE are the following:

1 — Illuminant A: representing the light emitted by the integral radiator at the absolute temperature of 2856 K (approximately)

2 — Illuminant B: representing the direct light of sun of a proximal colour temperature similar to 4874 K

3 — Illuminant C: representing a medium day- light with a proximal colour temperature similar to 6774 K

4 — Illuminant D65: representing one of the relative spectral distribution of the day- light energy which correspond to a proximal colour temperature similar to 6504 K

For the present application the colour space CIELAB (1976) and illuminant D_{65} are used.

4 Principles

The principle is based on the measurement of the colour directly on semolina and flour by a reflectance colorimeter.

The colour of wheat milling product (semolina and flour) is due to the pigments naturally present in wheat grains. These pigments (xanthophyll's and carotenoids) are responsible of the colour visually perceived in milling products.

5 Apparatus

5.1 Reflectance colorimeter[1)] with head of measure suitable to carry out measures of absolute chromaticity, complete of a setting system and of a cell samples-driver.

The colorimeter must be characterized by the followings technical characteristics:

— system of measure with lamp pulsated to the light diffused xenon and receipt of the radiation reflected to 0° (geometry d/0°);

— circular surface of measure;

— measures of chromaticity expressed as *L**, *a* b** (CIE 1976) with the use of the illuminating CIE D65 (6504 K°s);

— time of measure 1 sec;

— possibility of calibration with reference plate;

— repeatability within a DE * 0,6 (30 measures effected to an interval of 10 sec on the reference plate);

— accessory samples-driver for granular samples.

5.2 Accessory samples-driver for the measure of granular materials

The dimensions of the plate that it defines the quantity of sample submitted to the test are: external diameter = 60 mm, diameter inside hole = 22 mm, thickness = 9 mm.

5.3 Reference plate in porcelain for the initial setting of the colorimeter

6 Sample preparation

Before the analysis, the samples must be carefully homogenised.

Sampling is not part of the method specified in this International Standard. A recommended sampling method is given in ISO 24333.[1]

7 Procedure

Before each series of measurements, the apparatus must be calibrated.

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1) Laboratories involved in the ring test nearly all used a colorimeter CR 400 or CR 410 Minolta. These are fit apparatus responding to the required technical characteristics. Minolta is a trade name and is an example of a suitable apparatus available commercially. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of this (these) product(s).

The colorimeter calibration must be made through opaque stable materials (as ceramics, glaze etc.) sampled supplied by manufacturers; when the colorimeter (5.1) is used, a further calibration for better measure accuracy can be performed using reference next to the colour of samples to be measured.

Before the calibration, verify the integrity of the plate (5.3) used as reference (absence of linings or colour not homogeneous). Besides, for the setting, to verify that the coordinates are those reported on the reference standard.

7.1 Setting of the colorimeter

To set the colorimeter (5.1), position the head of measure on the centre of the reference plate (5.3) and select the space of colour Y, x, z (with illuminating D 65 in the system CIE Lab).

At the end, return in the space of colour *L***, *a***, *b***, and therefore prepare the colorimeter to the reading of the samples.

7.2 Colorimetric determination

From a homogeneous sample of at least 100 g, to withdraw a share, to fill with care the cell for granular samples and to effect the measure. Every determination shall be performed in double.

To effect at least five determinations having care every time to empty the cell completely, to mix and to fill again the same cell.

The plaque for the setting must carefully be cleaned after every set of measures having care to avoid any rubbing or lining. After the setting the plaque must be put back to the dark in the special custody.

8 Expression of the results

The results will be express as yellow index (*b*) using a decimal number. It is possible to have a datum of dark coloration through the measure "100-L" and of red coloration through the measure "*a*."

9 Precision

The values derived for these interlaboratory tests may not be applicable to concentration ranges and matrices other than those given, i.e. for *L** between 83,4 and 92,5, *a** : – 2,15 and – 0,17, *b** : 8,55 and 27,58.

9.1 Repeatability limit (r)

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 limit *r* given below.

9.1.1 *L**

Repeatability standard deviation (S_r) = – 0,0133L + 1,3157

Repeatability limit (r) = 2,77 × (– 0,0133L + 1,3157)

9.1.2 *a**

Repeatability standard deviation (S_r) = 0,048

Repeatability limit (r) = 2,77 × 0,048 = 0,13

9.1.3 *b**

Repeatability standard deviation (S_r) = 0,0112b – 0,0305

Repeatability limit (r) = 2,77 × (0,0112b – 0,0305)

9.2 Reproducibility limit (*R*)

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 limit *R* given below.

9.2.1 *L**

Reproducibility standard deviation (S_R) = – 0,0332L + 4,633

Reproducibility limit (R) = 2,77 × (– 0,0332L + 4,633)

9.2.2 *a**

Reproducibility standard deviation (S_R) = 0,625

Reproducibility limit (R) = 2,77 × 0,625 = 1,73

9.2.3 *b**

Reproducibility standard deviation (S_R) = 0,0378b + 0,066

Reproducibility limit (R) = 2,77 × (0,0378b + 0,066)

9.3 Critical difference

By critical difference is meant the difference between two averaged values obtained from two test results under repeatability conditions.

9.3.1 Comparison of two groups of measurements in one laboratory

The critical difference (CD) between two averaged values obtained from two test results under repeatability conditions is equal to

$$CD = 2,77\ s_r \sqrt{\frac{1}{2n_1} + \frac{1}{2n_2}} = 2,77\ s_r \sqrt{\frac{1}{2}} = 1,98\ S_r$$

where

S_r is the standard deviation of repeatability;

n_1 and $n_2$are the number of test results corresponding to each of the averaged values.

9.3.2 Comparison of two groups of measurements in two laboratories

The critical difference (CD) between two averaged values obtained in two different laboratories from two test results under repeatability conditions is equal to

$$CD = 2,77 \sqrt{s_R^2 - s_r^2 \left(1 - \frac{1}{2n_1} - \frac{1}{2n_2}\right)} = 2,77 \sqrt{s_R^2 - 0,5\ s_r^2}$$

where