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Wheat — Determination of sedimentation index — Zeleny test

Blé tendre — Détermination de l'indice de sédimentation — Test de Zeleny

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FOREWORD

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Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 5529 was developed by Technical Committee ISO/TC 34, *Agricultural food products*, and was circulated to the member bodies in September 1976.

It has been approved by the member bodies of the following countries :

Australia	Hungary	Portugal
Austria	India	Romania
Bulgaria	Iran	South Africa, Rep. of
Canada	Ireland	Spain
Chile	Israel	Thailand
Czechoslovakia	Korea, Rep. of	United Kingdom
France	New Zealand	U.S.S.R.
Germany	Poland	Yugoslavia

No member body expressed disapproval of the document.

This International Standard is based on Standards Nos. 116, ***Sedimentation test (after Zeleny) to assess the milling value*****, and 118,** ***Experimental milling for the sedimentation test (Zeleny)*****, of the International Association for Cereal Chemistry (ICC).**

Wheat — Determination of sedimentation index — Zeleny test

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies a method, known as the "Zeleny sedimentation test", for assessing one of the factors determining the quality of wheat with regard to the baking strength of flour which can be made from it.

The method is applicable only to *Triticum aestivum* wheat, farinaceous or vitreous.

2 REFERENCES

ISO/R 712, *Cereals and cereal products — Determination of moisture content (Routine method).*

ISO/R 950, *Cereals — Sampling.*

ISO 2171, *Cereals, pulses, and derived products — Determination of ash.*

3 DEFINITION

sedimentation index : The number indicating the volume, expressed in millilitres, of the sediment obtained under specified conditions from a suspension of test flour, prepared from the wheat, in a lactic acid solution.

4 PRINCIPLE

Suspension of a test flour, prepared from the wheat under specified grinding and sieving conditions, in a lactic acid solution in the presence of bromophenol blue. After fixed shaking and rest times, determination of the volume of the deposit resulting from the sedimentation of the flour particles.

5 REAGENTS

Distilled water, or water of at least equivalent purity, containing less than 2 mg/kg of mineral matter, shall be used.

5.1 Sedimentation test reagent.

5.1.1 Prepare a concentrated 85 % (*V*/*V*) lactic acid solution containing not more than 40 mg/kg of mineral matter.

5.1.2 Dilute 250 ml of the concentrated solution (5.1.1) to 1 litre with water. Boil the dilute solution under reflux for 6 h (see note).

Titrate an aliquot portion of this solution with potassium hydroxide solution (for 5 ml of the lactic acid solution, about 28 ml of 0,5 N potassium hydroxide solution should be necessary). The concentration found shall be between 2,7 N and 2,8 N.

NOTE — Concentrated lactic acid contains associated molecules which, on dilution, dissociate slowly to a certain equilibrium. Boiling accelerates this dissociation process, which is essential in order to obtain reproducible sedimentation values.

5.1.3 Thoroughly mix 180 ml of the lactic acid solution (5.1.2) with 200 ml of 99 to 100 % (*V*/*V*) propan-2-ol containing not more than 40 mg/kg of mineral matter, and make up to 1 000 ml with water.

Keep in a stoppered flask and do not use the reagent until it has been left for 48 h.

5.2 Bromophenol blue solution.

Dissolve 4 mg of bromophenol blue in 1 000 ml of water.

6 APPARATUS

6.1 Test mill of an appropriate type[1] (see the annex).

6.2 Woven metal wire cloth sieve,[2] conforming to ISO 565, with nominal mesh aperture of 150 μm, 200 mm in diameter, moved by an appropriate automatic vibration device of eccentricity 50 mm and rotational frequency 200 min^{-1}.

1) At present, the following five types of mill are suitable : Miag-Grobschrotmühle; Brabender-Sedimat; Strand-Roll, model SRM; Straube, model W.1; Tag-Heppenstall.

2) In the case of the Brabender-Sedimat mill, the sieving device is built into the appliance (see the annex, clause A.2).

6.3 Perforated plate sieve with 1 mm wide slots.

6.4 Flat-bottom cylinders, capacity 100 ml, graduated in millilitres, with a distance of 180 to 185 mm between the bottom and the 100 ml mark, and equipped with plastic or glass stoppers.

6.5 Cylinder shaker, fitted with a time-switch and providing a shaking frequency of 40 min^{-1}; each cycle shall be through 60° (30° above and below the horizontal).

6.6 One-mark pipettes, capacities 25 ml and 50 ml, conforming to ISO 648, or **automatic dispensers** emptying in 10 to 15 s.

6.7 Stop-clock.

6.8 Balance.

7 SAMPLING

See ISO/R 950.

8 PROCEDURE

8.1 Moisture content of the grain

If the moisture content of the grain, determined in accordance with the practical method specified in ISO/R 712, is not between 14,5 and 15,5 %, reduce it or increase it so that it lies between these limits, either by drying the grain at laboratory temperature or by placing it in an atmosphere with a high relative humidity.

8.2 Preparation of the test flour

Take a sample of 100, 150 or 200 g of the grain, according to the type of mill (6.1) used for grinding (see the annex).

Separate all impurities from the grain, removing the coarsest particles by hand, and smaller particles by means of the perforated plate sieve (6.3).

Grind the grain and sieve the ground product as described in the annex.

After sieving, thoroughly mix all the test flour obtained, the mass of which shall be at least 10 % of the mass of the sample taken for grinding.

8.3 Ash of the test flour

The ash of the test flour, determined by the incineration method at 900 °C specified in ISO 2171, shall not exceed 0,6 % of the dry matter of the flour. If this is not the case, it is impossible to obtain exact results for the sedimentation index.

8.4 Test portion

Weigh, to the nearest 0,05 g, 3,2 g of the test flour (8.2).

NOTE – If there is any reason to think that the moisture content of the test flour is outside the range 13 to 15 %, determine its value in accordance with ISO/R 712, then weigh a quantity of the test flour corresponding to 3,20 ± 0,05 g at 14 % moisture content (i.e. 2,75 ± 0,04 g of dry matter).

8.5 Determination

8.5.1 The following operations shall be carried out under normal lighting conditions, out of direct sunlight.

The time taken to pour each reagent into the cylinder (see 8.5.2 and 8.5.3) shall not exceed 15 s.

8.5.2 Place the test portion in a graduated cylinder (6.4).

Add 50 ml of the bromophenol blue solution (5.2) to the test portion. Close the cylinder with a stopper and then shake vigorously, for exactly 5 s, keeping the cylinder in a horizontal position and shaking it from right to left (twelve 18 cm movements in each direction correspond approximately to the prescribed time).

8.5.3 Place the cylinder in the shaker (6.5), and start the clock (6.4) and the shaker. After 5 min, remove the cylinder from the shaker and add to its contents 25 ml of the sedimentation test reagent (5.1).

Replace the cylinder and continue the shaking.

8.5.4 After a total time of 10 min, remove the cylinder from the shaker and place it in an upright position.

8.5.5 Leave the contents of the cylinder for exactly 5 min, and then note the volume of the deposit to the nearest 0,5 ml.

8.5.6 Carry out the sedimentation procedure at least twice on separate test portions taken from the same test flour (8.2).

9 EXPRESSION OF RESULTS

9.1 Method of expression

The number indicating the volume, expressed in millilitres, of the deposit noted in accordance with 8.5.5 represents the sedimentation index.

Take as the result the arithmetic mean of the values obtained from the tests, provided the conditions of repeatability (see 9.2) are satisfied. If the conditions of repeatability are not satisfied, repeat the determination.

Report the result to one decimal place.

9.2 Repeatability

The difference between the values obtained from two tests carried out simultaneously or in rapid succession by the same analyst using the same apparatus shall not exceed 2 units.

9.3 Reproducibility

The difference between the values obtained from two tests carried out on the same sample in two different laboratories shall not exceed

2 (absolute value) for a sedimentation index of less than 20;

10 % (relative value) of the mean value for a sedimentation index of greater than 20.

10 TEST REPORT

The test report shall show the method used and the result obtained. It shall also mention any operations not specified in this International Standard and shall specify the type of mill used, as well as any circumstances which may have influenced the result.

The report shall include all details necessary for the complete identification of the sample.

ANNEX

GRINDING AND SIEVING OF THE SAMPLE

The sample specified below, freed from impurities, shall be ground under the following conditions according to the type of mill used.

A.1 MIAG-GROBSCHROTMÜHLE MILL

Sample : 100 g

– Carry out a first grinding with the rolls 1 mm apart and at a rotational frequency of about 300 min^{-1}.

– Regrind all the material obtained from the first grinding, but with the rolls 0,1 mm apart, then repeat this procedure with the rolls in the same position.

– Using a sieve (6.2) with a 150 μm mesh, sieve the product of these three successive grindings for 5 min.

A.2 BRABENDER-SEDIMAT MILL

Sample : 100 g

– Set the timing device of the mill at 3 min.

– Carry out the grinding with a gap of 1 mm between the feed roll and the first grinding roll, and a gap of about 0,5 mm between the other grinding rolls, at a rotational frequency of about 1 000 min^{-1}.

The products of the milling pass directly into the sifter.

– If the mass of the ground product is less than 10 g, continue sieving until that quantity is obtained.

A.3 TAG-HEPPENSTALL MILL

Sample : 200 g

– Carry out a first grinding with the rolls 0,6 mm apart and at a rotational frequency of about 30 min^{-1}.

– Regrind all the material obtained from the first grinding, with the same gap between the rolls, and then repeat this procedure three times.

– Using a sieve (6.2) with a 150 μm mesh, sieve the product of these five successive grindings for 1,5 min.

A.4 STRAND-ROLL MILL, MODEL SRM

Sample : 150 g

– Carry out a first grinding with the rolls 0,8 mm apart and at a rotational frequency of about 30 min^{-1}.

– Regrind all the material obtained from the first grinding, with the same gap between the rolls, then repeat this procedure three times.

– Using a sieve (6.2) with a 150 μm mesh, sieve the product of these five successive grindings for 1,5 min.

A.5 STRAUBE MILL, MODEL W.1

Sample : 150 g

Proceed as in clause A.4, carrying out the five grindings with the rolls 1,10 mm apart and at a rotational frequency of 60 min^{-1}.

A.6 CLEANING OF APPARATUS

Between successive grinding and sieving operations with different samples of wheat, the mills and sieves shall be suitably cleaned.