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Sweetened condensed milk — Determination of sucrose content — Polarimetric method

Laits concentrés sucrés — Détermination de la teneur en saccharose — Méthode polarimétrique

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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 2911 | IDF 35 was prepared by Technical Committee ISO/TC 34, *Food products*, Subcommittee SC 5, *Milk and milk products*, and the International Dairy Federation (IDF), in collaboration with AOAC International. It is being published jointly by ISO and IDF and separately by AOAC International.

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This edition of ISO 2911 | IDF 35 cancels and replaces ISO 2911:1976, of which it constitutes a minor revision. Only editorial changes have been made.

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Foreword

IDF (the International Dairy Federation) is a worldwide federation of the dairy sector with a National Committee in every member country. Every National Committee has the right to be represented on the IDF Standing Committees carrying out the technical work. IDF collaborates with ISO and AOAC International in the development of standard methods of analysis and sampling for milk and milk products.

Draft International Standards adopted by the Action Teams and Standing Committees are circulated to the National Committees for voting. Publication as an International Standard requires approval by at least 50 % of the National Committees casting a vote.

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All work was carried out by the Joint ISO/IDF/AOAC Group of Experts, *Lactose* (E6), under the aegis of its project leader, Mr E. Langridge (GB).

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Sweetened condensed milk — Determination of sucrose content — Polarimetric method

1 Scope

This International Standard specifies a polarimetric method for the determination of sucrose in sweetened condensed milk.

The method is applicable to sweetened condensed milk of normal composition prepared from whole, partially skimmed or skimmed milk and sucrose only and containing no altered sucrose.

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.

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ISO 648, *Laboratory glassware — One-mark pipettes*

ISO 1042, *Laboratory glassware — One-mark volumetric flasks*

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ISO 1737, *Evaporated milk and sweetened condensed milk — Determination of fat content — Gravimetric method (Reference method)*

3 Terms and definitions

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

3.1
sucrose content of sweetened condensed milk
content of unaltered sucrose (saccharose) determined using the method specified in this International Standard

NOTE It is expressed as a mass fraction in percent.

4 Principle

A test sample is treated with ammonium hydroxide, so as to bring mutarotation of lactose to final equilibrium. It is neutralized and then clarified by successive additions of zinc acetate and potassium hexacyanoferrate(II), followed by filtration.

The optical rotation is determined on a portion of the filtrate.

On another portion of the filtrate, inversion is induced (based on the Clerget principle) by mild acid hydrolysis of the sucrose, leaving lactose and other sugars virtually unaffected. The optical rotation is determined after inversion.

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The sucrose content is calculated from the change in optical rotation on inversion.

5 Reagents

Use only reagents of recognized analytical grade, unless otherwise specified, and distilled or demineralized water or water of equivalent purity.

5.1 Zinc acetate solution, 1,0 mol/l.

Dissolve in water 21,9 g of zinc acetate dihydrate [$Zn(C_2H_3O_2)_2 \cdot 2H_2O$] and add 3 ml of glacial acetic acid. Mix and dilute to 100 ml.

5.2 Potassium hexacyanoferrate(II) solution, 0,25 mol/l.

Dissolve in water 10,6 g of potassium hexacyanoferrate(II) trihydrate [$K_4Fe(CN)_6 \cdot 3H_2O$] and dilute to 100 ml.

5.3 Dilute hydrochloric acid, $c(HCl) = (6,35 \pm 0,20)$ mol/l [20 % to 22 % (mass fraction)].

5.4 Ammonium hydroxide solution, $c(NH_4OH) = (2,0 \pm 0,2)$ mol/l [3,5 % (mass fraction)].

5.5 Dilute acetic acid, $c(CH_3CO_2H) = (2,0 \pm 0,2)$ mol/l [12 % (mass fraction)], of exactly known concentration.

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6 Apparatus

Usual laboratory apparatus and, in particular, the following.

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6.1 Analytical balance, capable of weighing to the nearest 0,01 g.

6.2 Glass beaker, of capacity 100 ml.

6.3 Volumetric flasks, of capacities 200 ml and 50 ml, conforming to class A of ISO 1042.

6.4 Pipette, either 20 ml, conforming to class A of ISO 648, or 40 ml, of corresponding accuracy.

6.5 Graduated measuring cylinders, of capacity 25 ml.

6.6 Graduated pipettes, of capacity 10 ml.

6.7 Filter funnel, of diameter 8 cm to 10 cm, and folded medium-grade **filter papers**, of diameter 15 cm.

6.8 Polarimeter tube, exactly 2 dm long.

6.9 Polarimeter or **saccharimeter**.

6.9.1 Polarimeter, using sodium light or mercury green light (mercury vapour lamp with prism or the special Wratten screen No. 77A), capable of being read to an accuracy of at least 0,05 angular degrees.

6.9.2 Saccharimeter, with international sugar scale, using white light passing through a filter of 15 mm depth of a 6 % solution of potassium dichromate, or sodium light, capable of being read to an accuracy of at least 0,1 international sugar scale degrees.

6.10 Water baths, capable of being maintained at about 40 °C and at (60 ± 1) °C respectively.

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7 Sampling

A representative sample should have been sent to the laboratory. It should not have been damaged or changed during transport or storage.

Sampling is not part of the method specified in this International Standard. A recommended sampling method is given in ISO 707[1].

8 Procedure

8.1 Preparation of test sample

8.1.1 Samples of recently manufactured products in which no appreciable separation of components may be expected

Open the container, transfer all material adhering to the lid into the container and thoroughly mix by an up-and-down movement of a spoon, in such a way that the top layers and the contents of the lower corners are moved and mixed. When the product is in a can, transfer the contents to a jar with a well-fitting lid. When the product is in a collapsible tube, transfer as much as possible of the contents to a jar with a well-fitting lid, then cut open the tube, scrape out all material adhering to the interior and transfer this also to the jar. Mix the contents of the jar as described above.

8.1.2 Samples of older products and samples in which separation of components may be expected

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Heat in a water bath (6.10) at about 40 °C until the sample has nearly reached this temperature. Open the container and proceed as described in 8.1.1. When the product is in a can or tube, transfer the contents to a jar, scrape out all material adhering to the walls (in the case of a collapsible tube, after cutting open the tube) and continue the mixing until the whole mass is homogeneous, reducing the size of any large crystals by crushing them with a glass rod. Close the jar with a well-fitting lid. Allow to cool.

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8.2 Check test

In order to check the procedure, the reagents and the apparatus, make a check test as described below in duplicate, on a mixture of 100 g of whole milk (or 110 g of skimmed milk) and 18,00 g of pure sucrose. This mixture corresponds to 40,00 g of condensed milk containing 45,0 % of sucrose.

Calculate the sugar content by means of the equations in 9.1, using in Equation (2) for m, F and P respectively the quantity of milk weighed and the fat and protein content of this milk, and in Equation (1) for m, the value 40,00.

The mean of the values found shall be within the range (45 ± 0,1) % (mass fraction).

8.3 Determination

8.3.1 Weigh, to the nearest 0,01 g, a test portion of approximately 40 g of the well-mixed test sample into the glass beaker (6.2). Add 50 ml of hot water (80 °C to 90 °C) and mix well.

8.3.2 Transfer the mixture quantitatively to the 200 ml volumetric flask (6.3), rinsing the beaker with successive quantities of water at 60 °C, until the total volume is between 120 ml and 150 ml. Mix and cool to (20 ± 2) °C.

8.3.3 Add 5 ml of the ammonium hydroxide solution (5.4). Mix again and then allow to stand for 15 min at (20 ± 2) °C.

8.3.4 Neutralize the ammonium hydroxide by adding the stoichiometrically equivalent quantity of the dilute acetic acid (5.5). Mix.

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