Powder Dispersibility IDF Method
GEA Niro analytical method A 6 a

1. Definition

The dispersibility of a powder in water is its ability to break down into particles passing through a 150 µm sieve.

2. Scope

This method is used for any kind of dried dairy product, but is especially applicable to skim milk and whole milk.

3. Principle

A powder sample of known water content is evenly spread on the surface of 25°C water. The mixture is stirred manually for a short time and part of the mixture is filtered through a sieve. The total solids content of the collected liquid is determined. Dispersibility is calculated from the mass of the test portion and the values for water content and total solids.

4. Apparatus

4.1 Balance, sensitivity - 0.1 g.

4.2 Analytical balance - sensitivity 0.1 mg.

4.3 Drying oven without forced air circulation, with a thermostatic control capable of maintaining the temperature at 102°C ± 2°C.

4.3 Desiccator.

4.4 Beaker - 600 ml, inside diameter 88 mm, height 123 mm, with graduation mark at 150 ml.

4.5 Glass plate - 120 x 120 mm, thickness 2.5 mm.

4.6 Metal tubing - inside diameter 73 mm, height 50 mm.

4.7 Stand and clamp for holding the glass tubing.

4.8 Spatula - stainless steel, thickness 1 mm, overall length 250 mm, length of blade 135 mm, width of blade 25 mm (see Fig. 1).

4.9 Stop watch.

4.10 Test sieve - diameter 200 mm, 150µ woven metal wire cloth complying with ISO 565.

4.11 Erlenmeyer flask - 250 ml with stopper.

4.12 Glass funnel (see Fig. 1).

4.13 Pipette.

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4.14 Glass weighing dish.

4.15 Pumice.

4.16 Brush.

5 Reagents

N/A

6. Procedure

6.1 Determine the moisture content of the powder as described in method No. A 1 b.

6.2 Weigh out 26 ± 0.1 g of skim milk or 34 ± 0.1 g of whole milk. Transfer the powder to the glass plate within the metal tubing and spread evenly with the spatula.

6.3 Weigh out 250 ± 0.1 g of deionised water at 25°C ± 0.2°C in a dry glass beaker, taking care that the inside of the beaker above the final water level remains dry.

6.4 Place the beaker on the stand, place the glass plate on top of the beaker and mount the metal tubing over the glass plate, clamping it so that it is centrally located above the beaker and leaving the glass plate free enough to be withdrawn.

6.5 Start the stop watch.

6.6 At the same time, start the withdrawal of the glass plate. This should be performed with a gentle and continuous movement and should be accomplished in 2.5 sec.

6.7 Immediately remove the beaker from the stand and insert the spatula down the side of the beaker until it touch the bottom, this should take exactly 5 sec. During the next 5 sec. stir the content with the spatula making one complete stirring movement per sec., i.e. a smooth and continuous movement of the spatula back and forth across the diameter of the beaker and occupying 1 sec., with the end of the spatula in continuous contact with the bottom of the beaker and slightly tilted away from the side of the beaker at the end of each half stirring movement. This will minimize the accumulation of unwetted dried milk on the side of the beaker. Without interruption, continue stirring in the same manner for 15 sec., but hold the spatula in a vertical position throughout. While making the 20 complete stirring movements in 20 sec., continuously rotate the beaker on its base so that approx. one complete turn (360°) is achieved during the stirring.

6.8 Allow the beaker to stand for 30 sec. (i.e. until the stop watch shows 55 sec.) and then, without disturbing any sediment, quickly pour some of the liquid (down to the 150 ml graduation mark) into the test sieve. Do not tilt or move the sieve

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during filtration. Use a wet sieve which has been wiped with a towel to remove excess water. During filtration, the sieve should be placed on a dry and clean receiver.

6.9 30 sec. after start of the filtration (i.e. at 1 min. 25 sec. on the stop watch), transfer the contents of the receiver to the conical flask and insert a stopper.

6.10 Mix the content thoroughly. Determine the dry matter in duplicate, as described in step 11-13.

6.11 Pipette approx. 8-12 g of the milk into a dry, glass weighing dish containing dried pumice or sea sand.

6.12 Dry to constant weight at 102°C in an oven. Cool to room temperature in a desiccator and weigh. The difference in weight indicates amount of milk dry matter in the reconstituted milk.

6.13 Measurements are carried out in duplicate.

7. Result

$$Instant\ skim\ milk, D = \frac{T \times 962}{100 - (W + T)}$$

$$Instant\ whole\ milk, D = \frac{T \times 735}{100 - (W + T)}$$

D = Dispersibility in %.
T = Total solids in % of the liquid (4.10).
W = Moisture in % (4.1).

The mean value of two tests should be calculated to the nearest 1%.
If the difference between two tests exceeds 4%, the determination is not valid and another set of duplicate values should be obtained as described in 4.

The formulas are derived as follows:

If p grams (dry matter and water) of the test portion (P grams) are dispersed in the 250 g of water, then

$$T = \frac{p \times (\frac{100 - W}{100}) \times 100}{250 + p} \quad \text{and therefore} \quad p = \frac{250 \times T}{100 - (W + T)}$$

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$$D = \frac{p \times (\frac{100 - W}{100}) \times 100}{p \times (\frac{100 - W}{100})} = \frac{p \times 100}{P}$$

Then $$D = \frac{250 \times T}{100 - (W - T)} \times \frac{100}{P}$$

This can be simplified as follows:

With instant dried milk where P is 26,

$$D = \frac{T \times 962}{100 - (W + T)}$$

With instant dried whole milk where P is 34,

$$D = \frac{T \times 735}{100 - (W + T)}$$

8. Reproducibility

N/A

9. Remarks

N/A

10. Reference

- GEA Niro Research Laboratory
- IDF Standard 87:1979.

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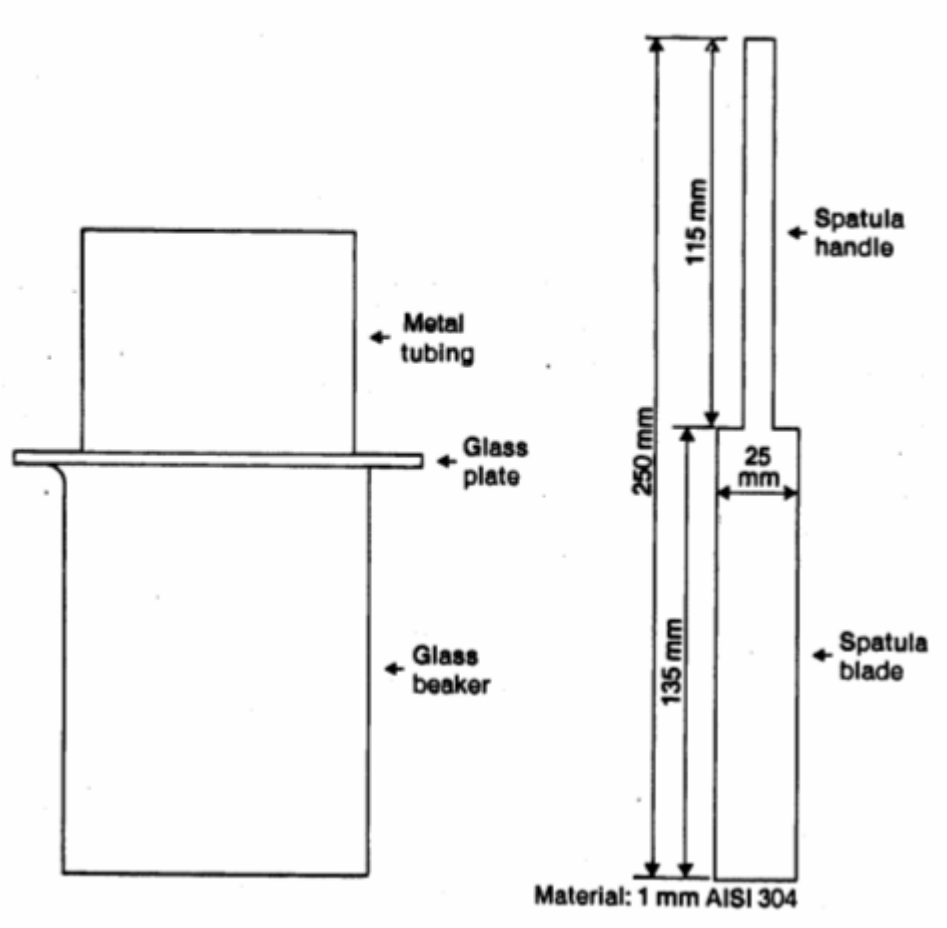
Fig. 1. Apparatus for determination of dispersibility.



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