INTERNATIONAL STANDARD

ISO 14864

First edition
1998-12-15

Rice — Evaluation of gelatinization time of kernels during cooking

Riz — Évaluation du temps de gélatinisation lors de la cuisson des grains

Reference number
ISO 14864:1998(E)

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 3.

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.

International Standard ISO 14864 was prepared by Technical Committee ISO/TC 34, *Agricultural food products*, Subcommittee SC 4*, Cereals and pulses*.

Annexes A and B of this International Standard are for information only.

International Organization for Standardization
Case postale 56 • CH-1211 Genève 20 • Switzerland
Internet iso@iso.ch

Printed in Switzerland

Rice — Evaluation of gelatinization time of kernels during cooking

1 Scope

This International Standard specifies a method of evaluating the gelatinization time of rice kernels during cooking.

It is applicable to milled rice as defined in ISO 7301.

2 Normative references

This following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subseqent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO editions maintain registers of currently valid International Standards.

ISO 712, *Cereals and cereal products — Determination of moisture content — Routine reference method*.

ISO 7301, *Rice — Specification.*

3 Terms and definitions

For the purposes of this International Standard, the terms and definitions given in ISO 7301 and the following apply.

3.1
gelatinization
hydration process conferring the jelly-like state typical of the coagulated colloids, which are named "gels", on kernels

3.2
gel state
condition reached as a consequence of gelatinization (3.1), when the kernel is fully transparent and absolutely free from whitish and opaque granules after being pressed between two glass sheets

See Figures 1 to 3.

3.3
gelatinization time
time necessary for 90 % of the kernels to pass from their natural state to the gel state (3.2)

4 Principle

The time span is determined between the immersion of the kernels into boiling water and those kernels becoming fully gelatinized, evaluated by visual observation.

5 Apparatus

Usual laboratory apparatus and, in particular, the following.

5.1 Electric plate, able to maintain a constant temperature of 350 °C ± 10 °C.

5.2 Beakers, of borosilicate glass, of capacity 400 ml and diameter 8 cm.

5.3 Perforated spoon, of stainless steel, with a thermo-insulated handle.

5.4 Glass rod, about 25 cm long and 5 mm in diameter.

5.5 Round or **square glass slides**, about 70 mm in diameter or side length, and 5 mm thickness.

5.6 Balance, capable of weighing to the nearest 0,01 g**.**

5.7 Stop clock.

5.8 Worksurface, contrasting in colour to rice kernels.

5.9 Sample divider, conical or multiple-slot sampler with a distribution system.

5.10 Glass balls, of diameter of 5 mm.

6 Sampling

Sampling is not part of the method specified in this International Standard. A recommended sampling method is given in ISO 13690 [3].

It is important that the laboratory receive a sample which is truly representative and has not been damaged or changed during transport or storage.

7 Preparation of test sample

7.1 Carefully mix the laboratory sample to make it as homogeneous as possible.

7.2 Determine the moisture content of the sample according to ISO 712. The acceptable range is a mass fraction of (13,0 ± 1,0) %.

If the moisture content is different from the above, condition the sample at ambient temperature and relative humidity until a moisture content within the specified range is obtained.

7.3 Reduce the laboratory sample, when necessary, using the sample divider (5.9) to obtain an amount of about 15 g. Discard all kernels with visible embryo (germ) residues and broken grains. Randomly select (10,0 ± 0,1) g from the remaining whole kernels as the test sample.

7.4 Prepare five test samples as described in 7.3.

8 Procedure

8.1 Place some glass balls (5.10) into the beaker (5.2). Add 275 ml of deionized water and place it on the electric plate (5.1).

8.2 Heat the water until boiling vigorously.

8.3 Pour one test sample (7.3) into the beaker, and, at the same time, start the stop clock. Stir with the glass rod (5.4) for a few seconds to prevent the kernels sticking to the bottom of the beaker.

Meanwhile place the perforated spoon into a beaker of boiling water.

8.4 After 7 min, use the perforated spoon to remove at least 10 kernels. Place the kernels, evenly spaced, on a glass slide (5.5) set on the worksurface (5.8). Cover with a second glass slide and apply finger pressure to the upper slide. In order to visualize the ungelatinized kernels, slide the upper glass slide a little on the lower one. Examine the flattened kernels and note the number which are fully gelatinized. Return the perforated spoon to the beaker of hot water after use.

8.5 At the 8th minute and every successive minute, repeat the operations described in 8.4 until all 10 kernels have reached the gel state for two successive times.

8.6 Repeat the procedure from 8.1 to 8.5 for each test sample (7.4).

9 Expression of results

9.1 Calculate the time required to fully gelatinize 90 % of the kernels (t_{90}) as follows (see example in annex A):

a) quantify, as a percentage, the number of kernels reaching the gel state (G_n) with reference to the corresponding time (t_n); calculate the mean of the five test samples (8.4);

b) perform two equalizations on the G_n series of values, calculating simple averages of two consecutive values, to obtain the G_{pn} values (see Table A.1);

c) draw a Cartesian axes system, where the t_n values are ranged on the abscissa and the G_{pn} values on the ordinate;

d) plot on this diagram the points determined through the t_n and G_{pn} values. Draw the line joining these points to obtain the curve C. At the 90 % value on the ordinate axis, a point P corresponds, on the C curve, to a t_{90} value on the abscissa axis (see Figure A.1).

As an alternative, a suitable regression analysis giving equivalent results may be used.

9.2 Express the t_{90} values in minutes and seconds.

10 Precision

Details of an interlaboratory test on the precision of the method are summarized in annex B. The values derived from this interlaboratory test may not be applicable to concentration ranges and matrices other than those given.

11 Test report

The test report shall specify:

— all information necessary for the complete identification of the sample;

— the sampling method used, if known;

— the test method used, with reference to this International Standard;

— all operating details not specified in this International Standard, or regarded as optional, together with details of any incidents which may have influenced the test result(s);

— the test result(s) obtained; or

— if the repeatability has been checked, the final quoted result obtained.

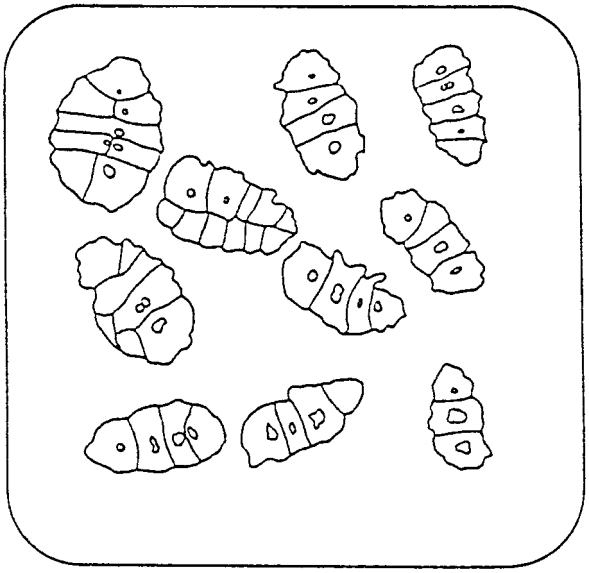

Figure 1 — Initial stages: No grains fully gelatinized (ungelatinized starch granules are visible inside the kernels)

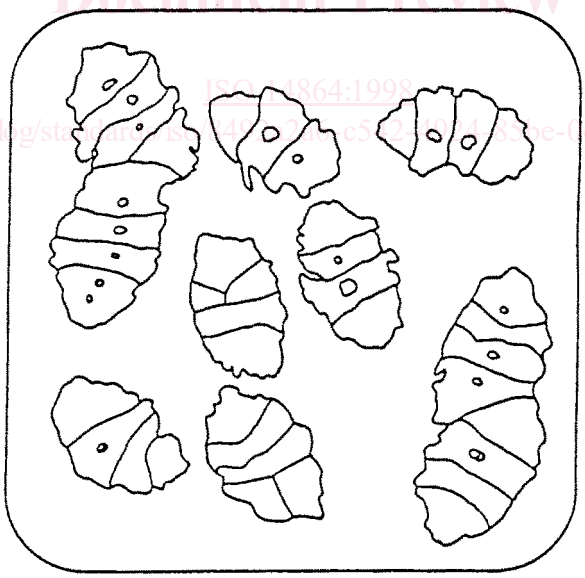

Figure 2 — Intermediate stages: Some fully gelatinized kernels are visible