Extensigraph Method, General

Final approval November 8, 1995; Reapproval November 3, 1999

Objective

The extensigraph records a force-time curve for a test piece of dough stretched until it breaks. Characteristics of force-time curves, or extensigrams, are used to assess the general quality of flour and its response to improving agents.

Apparatus

Farinograph and extensigraph. These instruments are set up and operated in accordance with manufacturer's instructions. Temperature of humidity cabinet where doughs for extensigraph test are stored should be 30 ± 1°. Ratio setting of extensigraph scale is 500 g = 400 Brabender units (BU). Other ratios may be used but should be specified.

Procedure

For routine testing of flours, procedure described by manufacturers, or variants of such procedures, is used. A summary of the general method follows.

Preparation of dough

1. Make normal farinograph curve to obtain estimate of absorption (Method **54-21.01**).

2. Prepare doughs in large farinograph bowl from 300 g flour (14% moisture), water, and 6 g salt dissolved in part of water. Amount of water added (including salt water) is equal to farinograph absorption less 2% for soft wheat flour and 3% for hard wheat flour to compensate for the effect of salt.

3. Mix dough 1 min, using higher speed. Stop for 5 min, and resume mixing to full development time of farinogram, which is reached when center of curve at maximum consistency has reached 500-unit line. Correct absorption is amount of water that will give 500-unit consistency at maximum. Repeat test if maximum consistency is more than ±20 BU from 500-unit line. Dough development as shown in normal farinogram may be taken as guide.

Preparation of test piece

When mixing is complete, scale off 150 ± 0.1 g dough and give it 20 revolutions in extensigraph rounder. Newer instruments are equipped with automatic shutoff after 20 revolutions. Carefully center dough ball on shaping unit and roll it into cylindrical test piece; clamp this in lightly greased dough holders. Store test pieces on dough holders in humidified chamber until required for testing. Remainder of dough in farinograph mixer may be used for replicate test.

http://dx.doi.org/10.1094/AACCIntMethod-54-10.01

Extensigraph Method, General (continued)

Load-extension test

1. After rest period of nearly 45 min from end of shaping operation, place cradle holding test sample on balance arm of extensigraph. Check to ensure that hook will pass through dough piece and that cradle has not been placed backwards. Adjust horizontal position of pen to zero line on chart by means of adjusting screw on pen. Check writing of pen. At exactly 45 min from end of shaping operation, start stretching hook, and stop it when test piece breaks. Instrument records force-time curve, or extensigram.
2. Remove dough of first test from holder, reshape. As before, allow rest period of 45 min and then stretch again.
3. Make third test on same dough by reshaping test piece and allowing further rest period of 45 min before stretching. In this way, dough is tested at 45, 90, and 135 min total time. For more rapid evaluation, extensigrams can be run at 30, 60, and 90 min.

Evaluation

The four most common measurements made on force-time charts, or extensigrams, are:

1. Resistance to extension: obtain as height of curve in BU or in cm either at maximum or at 5 cm from where test starts on chart.
2. Extensibility: total length of curve in cm. There is some "noise" in curve after dough breaks. This should be ignored.
3. Evaluate area under curve with planimeter and report in square cm.
4. Ratio between resistance and extensibility.

Variants of method

A number of variants of this basic method that deviate in one or more points, especially in preparation of dough, are used in different laboratories. If method differs from basic method, difference should be specified.

Notes

1. Water should be placed in holding chamber under dough clamps to keep dough from drying out. To avoid mold growth between tests, water should be emptied and the holding chamber dried when tests are completed.
2. Existing instruments can be retrofitted to have data analyzed by computer, or new ones with computerized analysis can be obtained.