# Method for Canadian Short Process Bread Baking

<table>
<thead>
<tr>
<th>Method Owner(s)</th>
<th>Approval date</th>
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<tbody>
<tr>
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<td>2016-08-29</td>
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</tbody>
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1.0 Scope and Field of Application

This method was developed to assess the bread making quality of Canadian wheat flours using processing conditions with shorter fermentation time and additives typically used in the baking industry. The Canadian short process (CSP) test bake method was used from 1981 to 2015 to assess breeder lines submitted to the Canadian variety registration trials and showing potential for the premium Canada Western Red Spring class. It was replaced in 2015 by the GRL-developed lean no time test bake method because of this method’s improved discrimination of inherent dough strength.

2.0 Principle

The CSP baking test, as described by Preston et al. (1982), uses 150 ppm ascorbic acid as the oxidant and reduces the salt to 2%. Dough is mixed in a Swanson type 100-200 gram pin mixer (National Manufacturing Co., Lincoln NE) at 116 rpm. Loaves are produced from 200 grams of flour in baking pans with cross-sectional dimensions similar to Canadian commercial baking pans. Loaf volume is reported on a 100-gram flour basis. Mixing energy is reported in watt-hours per kilogram (W-h/kg) of dough.

3.0 References


4.0 Materials

This list details materials used by the Bread Wheat Research unit of the Grain Research Laboratory (GRL). Small modifications, depending on laboratory resources, can be acceptable.

4.1 Labware

4.1.1 Laboratory glassware of various types and sizes including beakers, graduated cylinders, reagent bottles and volumetric flasks
4.1.2 Bottle top dispensers – Dispensette with variable volume; 0.5-5 mL, 1-10 mL and 5-50 mL
4.1.3 Metal tins, 250 mL, with lids
4.1.4 Magnetic stir bars
4.1.5 Timers
4.1.6 Thermometer/Hygrometer combo
4.2 Equipment and Apparatus

4.2.1 Circulating water bath (Fisher Scientific)
4.2.2 Pin-type mixer (National Mfg. Co.)
4.2.3 Warming/resting cabinet (GRL)
4.2.4 Sheeter (GRL)
4.2.5 Moulder (GRL)
4.2.6 Fermentation cabinet (National Mfg. Co.)
4.2.7 Electric reel oven (National Mfg. Co.)
4.2.8 Baking crocks with lids
4.2.9 Proof height gauge
4.2.10 Cooling rack
4.2.11 Volscan Profiler 300 (Stable Micro Systems, Surrey, UK)
4.2.12 Electronic balances
4.2.13 Stir plate
4.2.14 Loaf pans for 200g loaves. Approximate pan dimensions currently being used at the GRL:

**GRL in-house pans (Volume: 1,120 ml)**

<table>
<thead>
<tr>
<th>Pan Dimensions in centimeters</th>
<th>Length</th>
<th>Width</th>
<th>Depth</th>
</tr>
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<td>12.4</td>
<td>7.3</td>
</tr>
<tr>
<td>Top Inside</td>
<td>16.7</td>
<td>11.3</td>
<td></td>
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<tr>
<td>Bottom Outside</td>
<td>14.2</td>
<td>9.1</td>
<td>7.1</td>
</tr>
<tr>
<td>Bottom Inside</td>
<td>13.5</td>
<td>8.6</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pan Dimensions in inches</th>
<th>Length</th>
<th>Width</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top Outside</td>
<td>7</td>
<td>4 7/8</td>
<td>2 7/8</td>
</tr>
<tr>
<td>Top Inside</td>
<td>6 5/8</td>
<td>4 3/8</td>
<td></td>
</tr>
<tr>
<td>Bottom Outside</td>
<td>5 5/8</td>
<td>3 5/8</td>
<td>2 3/4</td>
</tr>
<tr>
<td>Bottom Inside</td>
<td>5 1/4</td>
<td>3 3/8</td>
<td></td>
</tr>
</tbody>
</table>
5.0 Formula and Ingredients

5.1 Formulation (% flour weight)

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yeast</td>
<td>3.0%</td>
</tr>
<tr>
<td>Salt</td>
<td>2.0%</td>
</tr>
<tr>
<td>Sugar</td>
<td>4.0%</td>
</tr>
<tr>
<td>Ammonium phosphate</td>
<td>0.1%</td>
</tr>
<tr>
<td>Shortening</td>
<td>3.0%</td>
</tr>
<tr>
<td>Whey powder</td>
<td>4.0%</td>
</tr>
<tr>
<td>Malt (60°L)</td>
<td>0.2%</td>
</tr>
<tr>
<td>Ascorbic acid</td>
<td>150 ppm</td>
</tr>
<tr>
<td>Flour</td>
<td>100%</td>
</tr>
</tbody>
</table>

5.2 Ingredients

5.2.1 Yeast, compressed, commercial
5.2.2 Salt, noniodized fine sodium chloride, commercial grade
5.2.3 Sucrose, fine granulated, commercial grade
5.2.4 Ammonium phosphate, monobasic, reagent grade
5.2.5 Ascorbic acid, reagent grade
5.2.6 Malt syrup or other form (60°L)
5.2.7 Shortening (must be at room temperature), Crisco
5.2.8 Whey powder
5.2.9 Flour
5.2.10 Distilled water, reverse osmosis

6.0 Solutions

6.1 Yeast suspension (3% flour weight basis)

*Note: Prepare a fresh solution every time you bake.*

6.1.1 Weigh 60 g of freshly crumbled yeast and add about 150 mL distilled water.
6.1.2 Stir to make a suspension.
6.1.3 Bring to 250 mL with distilled water in a volumetric flask.
6.1.4 Transfer the solution with a magnetic stirrer to a 1 L dispensing bottle fitted with a 50-mL variable pump dispenser set and calibrated to dispense 25 mL.
6.1.5 Keep stirring the solution until the required volume for each sample has been dispensed.
6.2 Salt (8% w/v) and sugar (16% w/v) solution (2 and 4% of flour weight, respectively)

6.2.1 Weigh 160 g sugar and 80 g salt into a beaker and add about 500 mL distilled water.
6.2.2 Stir until dissolved.
6.2.3 Bring the solution to 1 L with distilled water in a volumetric flask.
6.2.4 Store for up to one week in a 1 L dispensing bottle fitted with a 50-mL variable pump dispenser set and calibrated to dispense 50 mL.

6.3 Ammonium phosphate solution (10% w/v or 0.1% of flour weight)

6.3.1 Weigh 25 g ammonium phosphate into a beaker and add about 150 mL distilled water.
6.3.2 Stir until dissolved.
6.3.3 Bring to 250 mL with distilled water in a volumetric flask.
6.3.4 Store for up to 1 month in a 250-mL dispensing bottle fitted with a 5-mL variable pump dispenser set and calibrated to dispense 2 mL.

6.4 Malt stock solution

6.4.1 Weigh an appropriate amount\(^1\) of malt and add about 100 mL distilled water.
6.4.2 Stir well to obtain a uniform consistency.
6.4.3 Bring to 200 mL with distilled water in a volumetric flask.
6.4.4 Transfer to a 250 mL reagent bottle.
6.4.5 Store at 4°C for up to one week.

6.5 Malt baking solution (0.2% of flour weight)

6.5.1 Gently shake the bottle of stock solution (6.4) before preparing the baking solution.
6.5.2 Using a 25-mL graduated cylinder, measure 20 mL of stock solution into a beaker.
6.5.3 Add 60 mL of distilled water and stir well.
6.5.4 Store the malt baking solution for up to one week in a 250-mL dispenser bottle fitted with a 5-mL variable pump dispenser set and calibrated to dispense 2 mL.

\(^1\) If using syrup, the amount of malt is determined such that 0.5 mL of the solution prepared in step 6.4 when brought to 450 mL distilled water and added to 50g wheat starch produces an amyllograph peak viscosity of 100 BU. If using a dry malt product, dispense dry or in solution to 0.3% flour weight basis.
6.6 Ascorbic acid solution (150 ppm of flour weight)

Note: Prepare this solution every time you bake.

6.6.1 Weigh 0.75 g ascorbic acid and add about 70 mL distilled water.
6.6.2 Stir until dissolved.
6.6.3 Bring to 100 mL with distilled water in a volumetric flask.
6.6.4 Store the solution in a 100-mL dark dispenser bottle (to protect from light) fitted with a 5-mL variable pump dispenser set and calibrated to dispense 4 mL.

7.0 Procedure

7.1 Equipment and Labware Set-up

Note: Set up equipment 45-60 mins before starting. Throughout the procedure, verify that all equipment is running properly.

7.1.1 Turn on the circulating water bath, set at 25°C to circulate through the mixing bowl jacket.
7.1.2 Remove the mixing bowl from the pin mixer.
7.1.3 Turn the mixer on and allow the mixer to run (116 rpm) to warm up and equilibrate before calibration and set up of the P2M software.
7.1.4 Turn on the warming (resting) cabinet, set to 30°C (no humidity control).
7.1.5 Turn on the proofer with settings at dry bulb 38°C, wet bulb 33°C (80% RH), fill the water reservoir (located on top) if the level is below half.
7.1.6 Place in the oven one or two 1L metal containers filled with water.
7.1.7 Turn on the oven and set to 400°F (205°C)
7.1.8 Verify if there is a need to calibrate the moulder weight and if the moulder belt requires tightening (this step can be ignored if not using a GRL moulder).
7.1.9 Grease baking pans and place them inside the warming cabinet.

7.2 Sample Preparation

Note: Include at least one blank sample and two control flour samples for every bake. Since the CSP bake method determines the proofing time for the samples to be tested based on the time it takes the control flour sample to reach a proof height of 120 mm, the first control flour sample should be the first sample after the blank. The second control is randomly sequenced in the day’s bakes.

7.2.1 Prepare one bake record per sample. Record sample number (sample ID), bake date, bake method, moisture content (if this value is old, a new moisture content should be taken), and farinograph absorption (14% mb).
7.2.2 Use a baking schedule to track the processing time for each sample.

7.2.3 Weigh 200 g flour (corrected to 14% moisture basis) into a 250-mL metal tin with lid (pre-weigh all flour samples in advance before starting the first mix and place into numbered tins, each number corresponding to the sample number).

7.2.4 Weigh 6 g shortening (must be at room temperature) and add into each metal tin containing the pre-weighed flour sample (can be done the day before).

7.2.5 Weigh 8 g whey powder and add into each metal tin containing the pre-weighed flour sample and shortening.

7.2.6 Cover the metal tins until ready to mix.

7.3 Mixing

7.3.1 In a 600 mL beaker, weigh the amount of distilled water required for bake absorption (see Appendix 1 for factors to consider).

7.3.2 To the water, dispense 50 mL salt-sugar solution (6.2), 2.0 mL ammonium phosphate solution (6.3) and 2.0 mL malt baking solution (6.5). Set the beaker aside.

7.3.3 Place the dry ingredients (7.2.6) into the 200-g National mixer bowl.

7.3.4 Create a depression in the centre of the dry ingredients by pushing some of the mixture to the sides of the bowl.

7.3.5 Dispense 25 mL yeast suspension (6.1) and 4.0 mL ascorbic acid solution (6.6) (this is added last because it is light sensitive) into the beaker containing the previously combined wet ingredients (7.3.1).

7.3.6 Pour the combined solutions into the depressed centre of the dry ingredients in the mixer bowl.

7.3.7 Stop the mixer warm up.

7.3.8 Secure the bowl onto the mixer.

7.3.9 Start the mixer and P2M software.

7.3.10 Mix the dough to 10% past peak (the P2M software will indicate this by moving the red line to peak).

7.3.11 Once the optimum peak is reached, immediately stop the mixer and P2M software.

7.3.12 Grease the baking crock (numbered according to the sample number), balance pan and your hands.

7.3.13 Remove the dough from the mixer bowl and mixer pins and place on the greased balance pan.

7.3.14 Immediately place a thermometer into the dough.

7.3.15 Record dough weight on the baking schedule and in the P2M software.

7.3.16 Record dough temperature.

7.3.17 Transfer the dough into the appropriately numbered and greased baking crock and cover.

7.3.18 Put the covered baking crock with the dough in the warming cabinet and let the dough rest for 15 minutes.

At this point, the next sample can be mixed following the baking schedule.
7.4 Punching

7.4.1 Remove the crock from the warming cabinet.
7.4.2 Grease your hands and remove the dough from the crock.
7.4.3 Punch the dough 7 times (gently slap against your hand and roll) then round into a ball.
7.4.4 Place the dough ball back into the crock and return to the warming cabinet for another 15 minutes.

7.5 Sheeting and Moulding

7.5.1 Remove the crock from the warming cabinet.
7.5.2 Dust the countertop with flour, only if needed.
7.5.3 Remove the dough from the crock and, only if needed, lightly dust the dough surface by rolling it onto the flour-dusted countertop and tapping any excess flour off the dough.
7.5.4 With the underside (rough edge) of the dough facing toward you, sheet the dough one pass through gap #1 (set at 11/32 inch). As the dough passes through the gap, catch it as it exits from underneath.
7.5.5 Place the dough on the moulder belt and adjust the sheeter gap to #2 (set at 7/32 inch).
7.5.6 Sheet the dough one pass through gap #2. As the dough passes through gap #2, catch it as it exits from underneath.
7.5.7 Place the dough on the moulder belt and adjust the sheeter gap to #3 (set at 5/32 inch).
7.5.8 Sheet the dough one pass through gap #3. As the dough passes through gap #3, catch it as it exits from underneath.
7.5.9 Place the bottom of the dough sheet so it is lying on the moulder belt closest to the roller. Gently stretch this end to make it “square” (leading edge parallel to the moulding rolls) then manually create a roll by rolling the dough edge up and towards you 3 times.
7.5.10 Lift the dough and place the rolled end into the rollers.
7.5.11 Drop the top roll onto the dough piece.
7.5.12 Start the moulder and guide the dough sheet into the rolls. The dough will mould for 30 seconds (automatic timer).

7.6 Panning

7.6.1 In a pre-warmed greased baking pan, place an appropriately numbered, full-length label face down in the bottom of the pan.
7.6.2 Remove the dough roll from the moulder and place it on the countertop.
7.6.3 Manually evaluate the stickiness by touching each end with your index fingers.

(i) If the dough sticks to your fingers but recovers to original form, the bake absorption is considered acceptable.
(ii) If the dough is sticky and does not recover to original form, make a note to decrease the water absorption for the next bake replicate.
(iii) If the dough does not stick to your fingers, it is considered too dry. Make a note to increase water absorption for the next bake replicate.

7.6.4 Place the dough roll into the greased baking pan so that it is pushed to one side and the seam is straight and facing down (by doing this, the break and shred on the bread will be on one side only, making it easier to evaluate).

7.6.5 With flour dusted fingers, tuck the ends of the loaf under.

7.7 Proofing

7.7.1 Place the pan with dough into the proofer and verify that thermometers and hygrometers are at 38°C and 80-85 % RH, respectively.

7.7.2 Record the temperature and RH at regular intervals throughout the bake schedule.

7.7.3 After about 65 minutes, remove the pan containing the control flour dough from the proofer.

7.7.4 Measure the height of the “control” dough:

(i) If the height after 65 minutes proofing is at 120 mm, the yeast is considered very active and proof time for all samples that day must be decreased. Then for subsequent bakes with that same yeast, decrease the amount of dry yeast by 0.3 g and proof for 70 minutes.

(ii) If the height after 65 minutes proofing has not reached 120 mm, return the control dough back to the proofer for an additional 5 minutes (total of 70 minutes).

(iii) If the height after 70 minutes proofing is still below 120 mm, the yeast is considered less active and proof time for all samples that day must be increased. Then for subsequent bakes with that same yeast, increase the amount of yeast by about 0.3 g and proof for 70 minutes.

Note: The “check” dough is allowed to proof to a height of 120 mm after approximately 70 minutes. The proof time is recorded and used to make adjustments for all subsequent samples. These conditions will vary with yeast source and activity and should be optimized by individual laboratories.

7.8 Baking

7.8.1 After approximately 70 minutes proofing (or equivalent time to reach a proof height of 120 mm), place the pan in the rotary oven.

7.8.2 Bake for 30 minutes at 205°C (400°F).

7.8.3 Remove the pan from the oven and remove the loaf from the pan.

7.8.4 Immediately weigh the loaf, then place it on the baking rack to cool.
7.9 Loaf Evaluation

7.9.1 After one hour, measure the loaf volume using the Volscan Profiler 300 or other volume measurement device.

7.9.2 Record the loaf top ratio (LTR) using the maximum height (mm) and maximum width (mm) measurements from the Volscan Profiler 300. Calculation: \( LTR = \frac{\text{maximum height} - 70}{\text{maximum width}} \). The number 70 is the inside depth in mm of the GRL-manufactured 200 g pans. If using a different pan, with a different inside pan depth value, adjust this calculation accordingly. LTR can also be measured using a height gauge.

7.9.3 Optional: Digital crumb images may be taken (e.g. C-Cell measurements) and when required, loaf and crumb photographs may be taken.
8.0 APPENDIX 1: Factors to consider in calculating bake absorption

8.1 Bake absorption = Farinograph absorption + X%; adjustments are made based on subjective assessment by the baker of the dough just before panning.
8.2 Adjust (+/-) for difference in water resulting from flour weight correction to 14% moisture basis.
8.3 Adjust for displacement of water in fresh yeast solution – calculate this displacement in-house or use the information provided in AACC International Method 10.10-03.
8.4 Adjust for displacement of water in sugar-salt solution – calculate this displacement in-house.