CEREALS CANADA

Methods

All results are corrected to a 13.5% moisture basis (mb) for wheat and a 14.0% mb for flour or semolina unless otherwise specified. AACC Methods are from the Cereals and Grains Association: Approved Methods of Analysis, 11th Edition.

ALVEOGRAPH — AACC METHOD 54-30.02

Alveograph values (corrected to 15.0% mb) are determined using the AlveoLab according to AACC Method 54-30.02 using light mineral oil. Samples are evaluated one week after milling. The following curve parameters are measured: P (height x 1.1) is the resistance of the dough to deformation; L (length) is a measure of dough extensibility; P/L is the curve configuration ratio; W is the amount of work required to inflate the dough into a bubble; Ie (elasticity) measures the ability of the dough to return to its original shape; G (swelling) relates to the volume of air necessary to inflate the bubble until rupture.

AMYLOGRAPH — AACC METHOD 22-10.01

Amylograph peak viscosity is determined using a Viscograph-E according to AACC Method 22-10.01 with modifications. Flour (65 g, 14% mb) and distilled water (450 mL) are placed in a bowl, mixed with a whisk and then added to the Viscograph-E.

ASH — AACC METHOD 08-01.01

Ash content is determined using AACC Method 08-01.01. Samples are weighed into previously dried dishes (600°C, minimum of 1 h). The samples are then incinerated overnight in a muffle furnace (600°C).

BAKING, PILOT – NO TIME DOUGH (NTD) — INTERNAL METHOD

White pan bread is processed in a pilot scale bakery using a NTD baking procedure. Formulation, processing conditions, and equipment used are typical for commercial production of bread. All ingredients are mixed using a spiral mixer (2 min on slow speed, then on second speed until the dough is fully developed). The dough is then rested (10 min, ambient conditions), scaled into pieces (640 g) and rounded. The dough balls are rested (10 min), shaped using a commercial B&B molder, panned and fully proofed (37°C, 85% RH). The samples are baked in a Picard reel oven (200°C, 25 min).

BAKING, PILOT – SPONGE & DOUGH — INTERNAL METHOD

White pan bread is processed in a pilot scale bakery using a sponge & dough baking procedure. Formulation, processing conditions, and equipment used are typical for commercial production of bread. The sponge ingredients (a portion of flour, water, yeast, and yeast food) are prepared in a spiral mixer. The sponge is then fermented (4 h) in a proofing cabinet (27°C, 75% RH). To prepare the dough, the fermented sponge and the remaining ingredients are placed in a spiral mixer and mixed on slow speed (2 min) and then on second speed until the dough is fully developed. The dough is then rested (10 min, ambient conditions), scaled into pieces (640 g) and rounded. The dough balls are rested (10 min), shaped using a commercial B&B molder, panned and fully proofed (37°C, 85% RH). The samples are baked in a Picard reel oven (200°C, 25 min).

BAKING, TEST – NO TIME DOUGH (NTD) — INTERNAL METHOD

Test baking using a No Time Dough method is based on AACC Method 10-10.03 with modifications. All ingredients are placed in the bowl of a water-jacketed National Manufacturing Swanson pin mixer (20°C, 112 rpm) which is controlled with software to measure mixing time (min) and energy (W) input. The dough is mixed 10% past peak time and then placed in a covered bowl and allowed to rest (10 min, ambient conditions). The dough is scaled (165 g), rounded by hand and allowed a second rest (10 min, ambient conditions). The dough is then sheeted, molded, panned and proofed (37°C, 85% RH) to a fixed height. Samples are then baked in a National MFG. Co. reel oven (204°C, 20 min).

BAKING, TEST – LONG TIME FERMENTATION (LTF) — INTERNAL METHOD

Test baking using a Long Time Fermentation method is based on AACC Method 10-10.03 with modifications. All ingredients are placed in the bowl of a water-jacketed National Manufacturing Swanson pin mixer (15°C, 112 rpm) which is controlled with software to measure mixing time (min) and energy input (W). The dough is mixed 10% past peak time and then scaled, rounded, and allowed to rest in a fermentation cabinet (37°C, 85% RH; 105 min). After the initial fermentation, the first punch is performed by sheeting, tri-folding and placing the dough back into the fermentation cabinet for a second rest period (37°C, 85% RH; 50 min). The second punch is handled the same way as the first punch and the dough is placed back into the fermentation cabinet (37°C, 85% RH; 25 min). After 180 minutes of total fermentation time, the dough is sheeted, molded, panned and proofed (37°C, 85% RH) to a fixed height. Samples are then baked in a National MFG. Co. reel oven (204°C, 20 min).

BAKING – TOTAL BREAD SCORE — INTERNAL METHOD

Pan bread is subjectively scored using an internal method to obtain the total bread score. Total bread score is the sum of the score for external loaf characteristics (symmetry, crust character, crust colour, and break and shred) and the score for internal crumb characteristics (crumb colour and crumb structure).

COLOUR – BREAD CRUMB — INTERNAL METHOD

Assessment of the crumb colour of a bread slice is performed using the Minolta CR-400/410 colorimeter (D65 illuminant, 2° standard observer angle) according to manufacturer's instructions. Two slices of bread are placed on the light projection tube and the measurement is taken. L* values (0 = black to 100 = white), which indicate the brightness of the crumb, are recorded.

COLOUR – FLOUR/SEMOLINA (WET) — INTERNAL METHOD

Assessment of flour/semolina colour is performed on a slurry of flour using the glass ended attachment and water made according to AACC Method 14-30.01 with respect to flour weight, volume of water, mixing time and waiting time. Samples are evaluated one week after milling. The Minolta CR-410 colorimeter (D65 illuminant, 2° standard observer angle) is used according to manufacturer's instructions and the following parameters are measured: L* (0 = black to 100 = white); a* (-a* = green to +a* = redness); b* (-b* = blue to +b* = yellow).

COLOUR – NOODLE — INTERNAL METHOD

Noodle sheet (see *Noodle Processing* for details) colour is measured using a Minolta CR-410 colorimeter (D65 illuminant, 2° standard observer angle). The dough sheet is folded into six layers and stored in a covered container at ambient conditions. The following parameters are measured: L* (0 = black to 100 = white); a* (-a* = green to +a* = red); b* (-b* = blue to +b* = yellow). The average of five colour measurements, taken at five spots on the dough sheet surface at 3 and 24 h from mixing time, are reported.

COLOUR – SEMOLINA (DRY) — INTERNAL METHOD

Assessment of semolina colour is performed using a granular material attachment and the Minolta CR-410 colorimeter (D65 illuminant, 2° standard observer angle) according to manufacturer's instructions. Samples are evaluated one week after milling. The following parameters are measured: L* (0 = black to 100 = white); a* (-a* = green to +a* = red); b* (-b* = blue to +b* = yellow).

COLOUR – SPAGHETTI — INTERNAL METHOD

A Minolta CR-410 colorimeter (D65 illuminant, 2° standard observer angle) is used to measure the colour of dried spaghetti strands (see *Spaghetti Processing* for details). Strands are mounted on standard white cardboard (7.5 cm x 7.5 cm) using double sided tape. The following parameters are measured: L* (0 = black to 100 = white); a* (-a* = green to +a* = red); b* (-b* = blue to +b* = yellow).

CRUMB STRUCTURE – BREAD — AACC METHOD 10-18.01

Crumb structure is evaluated using C-Cell imaging (Calibre Control International Ltd) according to AACC Method 10-18.01 using two slices of bread taken from the centre of the loaf. The following parameters are measured: cell diameter, average cell diameter; number of cells per slice area, number of cells present in a slice per total area of a slice measured in mm^2; cell wall thickness, average cell wall thickness; cell contract, ratio of the average brightness of the cells to the average brightness of the cell walls.

EXTENSOGRAPH — AACC METHOD 54-10.01

Extensographs are performed using the Extensograph-E according to AACC Method 54-10.01 with the modification that the dough test pieces are not stretched at 90 min, only re-formed. Results are reported for the stretches completed at 45 and 135 min. The Extensograph-E is calibrated so that a 100 g load is equivalent to 80 BU. Samples are tested one week after milling. The following parameters are measured: R_{max} is the maximum height (maximum resistance) of the curve; E is a measure of the extensibility in cm; A is the area under the curve in cm^2 (energy).

FALLING NUMBER (FN) — AACC METHOD 56-81.03

Falling number is determined using the FN1000 with the Shakematic 1095 according to AACC Method 56-81.03. For evaluation of wheat FN, a sample of wheat (minimum of 250 g) is ground using the FN3100 laboratory mill with 0.8 mm screen.

FARINOGRAPH — AACC METHOD 54-21.02

Farinographs are performed using the Farinograph-E or Farinograph-AT with either the large bowl (300 g) or small bowl (50 g) according to AACC Method 54-21.02. Flour is tested one week after milling. The following parameters are measured: water absorption (FAB) is the amount of water needed to center the curve on the 500 BU line at maximum consistency (peak); dough development time (DDT) is the time for the dough to reach maximum consistency (peak); stability is the amount of time that the top portion of the curve is above the 500 BU line; mixing tolerance index (MTI) is the drop in BU of the top of the curve at DDT to the top of the curve 5 min after DDT.

FLOUR YIELD, AS IS – LAB MILLING — INTERNAL METHOD

Wheat for milling is cleaned using a dockage tester with standard screens and then conditioned for 20 to 24 hours, based on wheat class: hard wheats (i.e. CWRS; 16.5% moisture); medium hard wheats (i.e. CPSR, CWRW; 16.0% moisture). Milling is done using a Bühler laboratory flour mill (MLU-202) using preset feed rates and roll gap settings for all common wheat classes. After milling, the bran and shorts fractions are put through a Bühler bran finisher (MLU-302) and any additional flour released is added to the original flour and used for calculation of the final flour yield based on total products.

FLOUR YIELD – CORRECTED TO 0.50% ASH BASIS — INTERNAL METHOD

Correction of flour milling yield to a 0.50% ash basis is calculated to show milling yields on a constant ash basis and allows for a better comparison among wheat samples with different extraction rates and flour ash contents. The correction is based on an estimate derived from a laboratory mill ash curve where each 0.01% difference in flour ash content (based on a 0.50% ash content) is equal to a 0.50% extraction adjustment. It is calculated as follows:

$$\text{Milling yield, 0.50\% ash basis} = \%\ \text{milling yield (as is)} + \frac{0.50 \times (0.50 - \text{ash content, as is})}{0.01}$$

SEMOLINA YIELD – LAB MILLING — INTERNAL METHOD

Wheat for milling is cleaned using a dockage tester with standard screens and then conditioned for 16 to 20 hours. Milling is done using a Bühler laboratory semolina mill (MLU-202) using preset feed rates and roll gap settings. After milling, the semolina is purified using Namad laboratory purifier. Break flour is added to purified semolina and the total amount is reported as semolina yield. To calculate total yield, sizing flour is added to purified semolina and break flour blend. Yields are calculated based on total products.

GLUTEN CONTENT & GLUTEN INDEX (GI) — AACC METHOD 38-12.02

Wet gluten content and gluten index values are determined using the Glutomatic 2200 with the Gluten Index Centrifuge 2015 according to AACC Method 38-12.02. The single-stage washing procedure is used for flour while the two-stage washing procedure is used for semolina/ground wheat. Flour/semolina samples are tested one week after milling.

GRANULATION — AACC METHOD 66-20.01

Semolina granulation is determined using a Ro-tap sieve shaker according to AACC Method 66-20.01.

MIXOLAB — AACC METHOD 54-60.01

Mixolab assessment is determined using the Mixolab 2 according to AACC Method 54-60.01. Flour is tested one week after milling. The following parameters are measured: water absorption (WA) is the amount of water needed to form dough with a consistency of 1.1 ± 0.05 Nm on the C1 torque; C1 torque (C1) is initial peak dough consistency; time to T1 (T1) is the time needed to reach C1; Stability is the time around C1 where the torque is greater than C1-11%; CS time; is the time required for the consistency to drop by 50% after heating has started; C2 torque (C2) represents the lowest point of the curve; C3 torque (C3) is the maximum torque obtained after C2 during the heating phase; C4 torque (C4) is the minimum torque obtained after C3; C5 torque (C5) is the torque at the end of the test.

MOISTURE CONTENT – GROUND WHEAT/FLOUR/SEMOLINA — AACC METHOD 44-15.02

The moisture content of ground wheat/semolina/flour is determined according to AACC Method 44-15.02 using the single stage procedure (130^{o}C, 1 h).

MOISTURE CONTENT – WHEAT — AACC METHOD 44-11.01

The moisture content of whole kernel wheat is determined using the Perten AM5200-A according to AACC Method 44-11.01.

NOODLE PROCESSING – INSTANT — INTERNAL METHOD

Flour is processed into instant noodles using an Ohtake vertical mixer. Salt (NaCl; 1% based on flour weight), alkaline salts (K_2CO_3:Na_2CO_3 = 5:5 w/w: 0.1% based on flour weight) and guar gum (0.2% based on flour weight) are dissolved in water and added to flour at a constant water absorption (34%, 14% mb, mass balanced) and then mixed (100 rpm, 10 min). The noodle sheets are prepared using Cereal Canada's pilot Ohtake noodle line starting with an initial gap setting of 5.1 mm. The dough sheet is then subjected to four reduction passes (2.0, 1.5, 1.2, and 1.0 mm) and cut into noodle strands at the final pass. The cut noodle strands are continually fed into a traveling net conveyor. The cut noodles are cooked with steam while passing through a tunnel steamer. Noodles are then cut into a predetermined length to make one serving size. The noodle portions are deep-fried in a tunnel fryer and then cooled to room temperature in a cooling tunnel.

NOODLE PROCESSING – YELLOW ALKALINE NOODLES (YAN) — INTERNAL METHOD

Yellow alkaline noodles are processed using an Ohtake vertical mixer and lab scale Ohtake sheeter. Salt (NaCl; 1% based on flour weight) and alkaline salts (K_2CO_3:Na_2CO_3 = 6:4 w/w: 1.3% based on flour weight) are dissolved in water and added to flour at a constant water absorption (34%, 14% mb, mass balanced). The flour and salt solution are mixed (100 rpm, 10 min) and rested (15 min). Sheeting begins with an initial gap setting of 3.5 mm and then the dough sheet is folded, sheeted again at the same gap setting and rested (30 min) on the noodle roller in a plastic bag. The dough sheet is subjected to four reduction passes (2.0, 1.4, 1.1, 0.9 mm). A section (180 cm) is cut from the noodle sheet for colour (see Colour – Noodle for details). The remaining dough is sheeted a final time before cutting. The final gap setting is adjusted for each sample to ensure the resulting noodle strands have a thickness of 1.4 mm. Noodle strands are cut using a No. 10 cutter to produce noodles with a width of 3.0 mm for texture analysis.

NOODLE PROCESSING – WHITE SALTED NOODLES (WSN) — INTERNAL METHOD

White salted noodles are processed using an Ohtake vertical mixer and lab scale Ohtake sheeter. Salt (NaCl; 2% based on flour weight) is dissolved in water and added to the flour at a constant water absorption (32%, 14% mb, mass balanced). The flour and salt solution are mixed (100 rpm, 10 min) and rested (15 min). Sheeting begins with an initial gap setting of 3.5 mm and then the dough sheet is folded, sheeted again at the same gap setting and rested (30 min) on the noodle roller in a plastic bag. The dough sheet is subjected to four reduction passes (2.0, 1.5, 1.2, 1.0 mm). A section (180 cm) is cut from the noodle sheet for colour (see *Colour – Noodle* for details). The remaining dough is sheeted a final time before cutting. The final gap setting is adjusted for each sample to ensure the resulting noodle strands have a thickness of 1.4 mm. Noodle strands are cut using a No. 10 cutter to produce noodles with a width of 3.0 mm for texture analysis (after cooking, see *Noodle – Texture* for details).

NOODLE – TEXTURE — INTERNAL METHOD

Noodles (16 strands, 10 cm length) are assessed for texture by cooking in boiling water (500 mL) for three different cooking times (2.5, 3.5 and 5.0 min). After each cooking time, the noodles are drained, cooled in water (22°C, 1.5 min) and placed in a sieve. The cooked noodles are lined up on the TA.XT measuring plate and rested (3.75 min) prior to taking a measurement. A TA.XTplus Texture Analyzer with a firmness blade (TA-47) is used to measure maximum cutting stress (g/mm^2). The average of two measurements taken on 16 strands is reported for each sample at each cooking time.

PARTICLE SIZE INDEX (PSI) — AACC METHOD 55-30.01

Wheat kernel hardness is assessed by determining the particle size index using AACC Method 55-30.01 with modifications. Wheat, with moisture content between 11.0-13.0%, is ground using an UDY Cyclone grinder (1.0 mm screen) and a feed rate regulator (52 rpm). Ground wheat is sieved using a Ro-tap sieve shaker.

PROTEIN CONTENT — WILLIAMS ET AL. 1998

Protein content (N x 5.7) is measured by a combustion nitrogen analysis (CNA) method using the LECO FP-828 according to Williams *et al*. (Protein testing methods. In, Wheat Protein, Production and Marketing. Proceedings of the Wheat Protein Symposium. Saskatoon, SK. University of Saskatchewan Press. March 9-10, 1998. pp. 37-47). Drift corrections are done using EDTA.

RVA – PASTING PROFILE — AACC 76-21.02

Evaluation of the pasting profile of flour is performed using the RVA 4500 according to AACC 76-21.02 (STD1, 13 min profile). The following parameters are measured: peak viscosity is the maximum viscosity during the heating cycle; peak time is the time at peak viscosity; pasting temperature is the temperature where a rapid increase in viscosity occurs; hot paste viscosity is the minimum viscosity observed during the heating period; breakdown is the difference between peak and hot paste viscosities; final viscosity is the viscosity at the end of the test; setback is the difference between final and hot paste viscosities.

SPAGHETTI – COOKING LOSS — INTERNAL METHOD

Dried spaghetti (30 g, 1 cm length) is cooked in boiling water (300 mL) to its cooking time (CT) which is defined as the time when the centre core of the spaghetti just disappears when pressed between two Plexiglas plates. After the CT is reached, the spaghetti is drained and the cooking water is retained. The cooking water is evaporated (130°C, 24 h) and the remaining residue is weighed and expressed as a percentage of the initial spaghetti weight.

SPAGHETTI – FIRMNESS — INTERNAL METHOD

Dried spaghetti (12 strands, 5 cm length) is cooked in boiling water (250 mL, 9 min). After cooking, the spaghetti is drained and placed on a fine sieve. A TA.HD Texture Analyzer with a firmness blade (TA-47) is used to measure firmness. The average of four measurements is reported for each sample (two measurements per set of five strands).

SPAGHETTI – PROCESSING: LAB SCALE — INTERNAL METHOD

A Namad laboratory pasta extruder with a Teflon die (1.80 mm diameter) is used to process spaghetti. Semolina and water (27% absorption based on semolina weight) are mixed with a paddle mixer for 12 min, then the dough is extruded under vacuum. Spaghetti is dried using a Bühler batch dryer using a high temperature drying cycle (85°C, 5.75 h).

SPECIFIC VOLUME - BREAD — AACC METHOD 10-14.01

The Perten bread volume meter (BVM 6600) is used to measure loaf volume (cm^3) according to AACC Method 10-14.01. The loaf weight is also determined. Specific volume (cm^3/g) is calculated as the ratio of loaf volume to loaf weight.

STARCH DAMAGE — AACC METHOD 76-33.01

Starch damage is measured using the SDmatic according to AACC Method 76-33.01 and is reported in UCD.

STEAMED BREAD PROCESSING (LAB SCALE) — INTERNAL METHOD

Ingredients are mixed using a GRL-1000 mixer (45 rpm, 0.5 min) and then at a higher speed (105 rpm) until the dough is developed. The dough is rested (15 min) and then sheeted (20 passes, 5.5 mm gap). The dough sheet is subsequently rolled into a cylinder and six dough pieces are scaled (150 g each), and then rounded by hand. The dough pieces are placed in a covered steamer tray, and proofed (45 min, 32°C, 85% RH), and then steamed (25 min) in a commercial steamer.

STEAMED BREAD EVALUATION — INTERNAL METHOD

Steamed breads are weighed and measured for height and width. Volumes are determined by rapeseed displacement. The colour of the steamed bread skin is measured by a Minolta Chroma Meter CR-410 (C illuminant). The following parameters are measured: L* (0 = black to 100 = white); a* (-a* = green to +a* = redness); b* (-b* = blue to +b* = yellow). Breads are scored by a trained sensory panel using an in-house developed scoring system. Steamed breads are evaluated for physical measurements of weight, width, height and volume and sensory measurements of exterior appearance, crumb structure and colour, texture and overall acceptability.

WATER DOUGH COLOUR — INTERNAL METHOD

Flour (300g) is mixed with 36% water (w/w) in the GRL 1000 Mixer (6 min, 105 rpm) to produce a homogeneous dough crumb. The dough crumbs are sheeted with an Ohtake laboratory noodle machine (Ohtake, Tokyo, Japan) with an initial gap setting of 3.5 mm, followed by a lamination step at the same gap setting. The dough sheet is then rested (10 min) in a plastic bag and then subjected to four reduction passes (2.0, 1.5, 1.2, 1.0 mm gap settings). The resulting noodle sheet is sealed in a plastic bag to prevent moisture loss. Colour measurements are taken on the folded dough sheet (6 layers) at 2 and 24 h using a Minolta colorimeter (L*, a*, b*) with D65 illuminant.

YELLOW PIGMENT CONTENT — FU ET AL. 2013

Semolina yellow pigment content is determined according to Fu *et al*. (2013. J. Cereal Sci. 57: 260-566).

FOR MORE INFORMATION CONTACT:

NORBERT CABRAL
Manager, Milling
204-983-2171 / ncabral@cerealscanada.ca

KRISTINA PIZZI
Manager, Analytical Services
204-984-6076 / kpizzi@cerealscanada.ca

YULIA BORSUK
Manager, End-products
204-983-1055 / yborsuk@cerealscanada.ca