

ANALYSIS METHODS

The harvest and cargo samples for each class are evaluated using the following methods. Flour or semolina produced as described in “Laboratory Milling Extraction” is analyzed to provide flour, semolina and end-use product data.

WHEAT AND GRADE DATA

GRADE: Official U.S. Standards for Grain.

DOCKAGE: Official USDA procedure using the Carter Dockage Tester.

MOISTURE: HRW, HRS, SW, HW – Official USDA NIR method; Durum – AACC 44-11.01 (Motomco Moisture Meter) and AACC 44-15.02 (air oven method); SRW – AACC 44-15.02.

TEST WEIGHT: AACC 55-10.01; test weight is converted to hectoliter weight: for durum – $\text{kg/hl} = \text{lb/bu} \times 1.292 + 0.630$, for other classes – $\text{kg/hl} = \text{lb/bu} \times 1.292 + 1.419$.

PROTEIN: HRW, HRS, SW, HW – AACC 39-25.01 (NIR method); all other classes

– AACC 46-30.01 (Dumas combustion nitrogen analysis or CNA method).

SINGLE KERNEL CHARACTERIZATION: AACC 54-31.01 using Perten SKCS 4100.

SEDIMENTATION: HRS, HRW (Midwestern), SRW, SW, HW – AACC 56-61.02; Durum – AACC 56-70.01; HRW California (CA) – AACC 56-63.01.

1000 KERNEL WEIGHT: HRS, Durum, SRW – based on a 10 gram (g) clean wheat sample counted by an electronic counter; SW, HW – based on the average weight of three 100-kernel samples expressed on a 14% moisture basis (mb); HRW – average of SKCS kernel weight times 1000.

ASH: AACC 08-01.01 expressed on a 14% mb.

FALLING NUMBER: AACC 56-81.03; average value is a simple mean of sample results.

DON: All analysis is on ground wheat. HRS, Durum – gas chromatograph with electron capture detector as described in the Journal

of the Association of Official Analytical Chemists 79,472 (1996). SRW, HRW (CA) – Neogen ELISA; HRW (Midwestern) – Charm ROSA DonQ2 Quantitative Test.

VITREOUS KERNELS: HRS and Durum – percentage by vitreous kernels weight handpicked from a 15 g clean wheat sample.

KERNEL SIZE DISTRIBUTION: HRS, Durum (Northern) – Cereal Foods World (Cereal Science Today) 5:(3), 71 (1960). HRW (Midwestern), SW, HW, SRW – Wheat is sifted with a RoTap sifter using Tyler No. 7 (2.82 mm) and No. 9 (2.00 mm) screens. HRW (CA), Durum (Pacific Southwest) – uses U.S. Standard Sieves No. 7 (2.80 mm) and No. 10 (2.00 mm). Kernels remaining on the No. 7 screen are “Large,” passing through the No. 7 screen but not the No. 9 or No. 10 (HRW (CA), Pacific Southwest Durum) are “Medium,” and passing through the No. 9 or No. 10 screen are “Small.”

FLOUR DATA

LABORATORY MILLING EXTRACTION:

Samples are cleaned and tempered according to AACC 26-10.02. All samples other than HRW (CA) are milled with standardized mill settings on a Buhler laboratory mill using these methods: SW – AACC 26-31.01; HRW (Midwestern), SRW, HRS and HW – AACC 26-21.02. HRW (CA) is milled on a Brabender® Quadrumat Senior mill using the Brabender® procedure. All extraction rates are calculated against total products on an “as is” moisture basis.

ASH: AACC 08-01.01, reported on 14% mb.

COLOR: HRW (Midwestern) – Minolta method using Minolta Chroma Meter CR-110 with Granular-Materials Attachment; HRW (CA) – CR-210; HRS, SW, SRW, HW – CR-410 with Granular-Materials Attachment CR-A50. CIE 1976 L*a*b* color system: L* indicates white-black, a* – red-green and b* – yellow-blue.

PROTEIN: HRW, HRS – AACC 39-10.01 (NIR method); all other classes – AACC 46-30.01 (Dumas CNA method).

WET GLUTEN AND GLUTEN INDEX: HRW, HRS, SRW, HW – AACC 38-12.02; SW – AACC 38-12.02 (water reduced from 4.8 to 4.2 ml).

FALLING NUMBER: AACC 56-81.03; average value is a simple mean of sample results.

FARINOGRAPH: AACC 54-21.02 (Constant Flour Method) with 50 g bowl. Absorption is reported on 14% mb.

ALVEOGRAPH: AACC 54-30.02. SW, HW – Alveolab.

AMYLOGRAPH: AACC 22-10.01 modified to use 65 g flour (14% mb) and 450 ml

distilled water with paddle (HRS) or pins (other classes).

EXTENSOGRAPH: AACC 54-10.01, modified 45-min and 135-min rest for HRS, HRW, HW; 45-min rest for SW and SRW.

STARCH DAMAGE: SRW – AACC 76-30.02; all other classes – AACC 76-33.01 (SDmatic method).

SOLVENT RETENTION CAPACITY (SRC): AACC 56-11.02.



Photo courtesy of Wheat Marketing Center

SEMOLINA DATA

LABORATORY MILLING EXTRACTION: Samples are milled using a modified Buhler lab mill with identical settings and equipped with Miag laboratory purifiers, as described by Vasiljevic and Banasik 1980: Quality Testing Methods for Durum Wheat and Its Products, pp. 64-72, Dept. of Cereal Chemistry and Technology, NDSU, Fargo, ND. Roll gaps are modified to (in mm): B1-0.762; B2-0.305; B3-0.254; R1-0.102; B4-0.076; B5-0.038. Extraction rates are calculated against total products on an "as is" moisture basis. Procedure is derived from AACC 26-41.02 based on research showing

improved correlation between laboratory and commercially milled semolina quality.

ASH: AACC 08-01.01 on 14.0% mb.

COLOR: Minolta Method using Minolta Chroma Meter CR-410 (Northern) or CR-210 (Pacific Southwest) with Granular-Materials Attachment.

PROTEIN: AACC 46-30.01 (Dumas CNA method).

WET GLUTEN AND GLUTEN INDEX: AACC 38-12.02 (Glutomatic procedure).

SPECKS: Sample is pressed under a 3-inch x 4-inch glass plate and the specks within a one-inch square marked on the plate are counted. Average of three determinations is expressed as specks per 10 square centimeters.

MIXOGRAPH: 10 g of semolina are mixed in a 10 g (Northern) or 35 g (Pacific Southwest) bowl with 5.8 ml of distilled water to give maximum dough consistency. A classification incorporating peak height and general curve characteristics is assigned based on comparison with eight reference mixograms; the higher the classification number, the stronger the curve type.

END-USE PRODUCT DATA

MIDWESTERN HRW: AACC 10-10.03 (pup loaf method). 100 g flour at 14% mb with optimized water absorption is mixed to optimum development with other ingredients (6% sugar, 3% shortening, 1.5% salt, 1.0% instant dry yeast, 50 ppm ascorbic acid and 0.25% malted barley flour) in a 100g pin mixer with head speed of 100 to 125 rpm. The dough is fermented for 60 min with two punches, then molded, panned and proofed for 60 min before baking at 425 F for 18 min. Loaf volume is measured immediately after baking by rapeseed displacement. Crumb grain and texture are evaluated on a 0 to 6 scale, which for this booklet is converted to a 1 to 10 scale.

CA HRW: AACC 10-10.03 producing two loaves per batch using 6% sugar, 3% shortening, 1.5% salt, 1.5% active dry yeast, 50 ppm ascorbic acid, 0.10% malted barley flour in a 200 g Swanson pin mixer with head speed of 100 to 120 rpm and 120-min fermentation. Loaf volume is measured 1 hour after baking. Grain and texture are scored on a scale of 1 to 10 with higher numbers indicating preferred quality.

SRW: AACC 10-10.03 producing two loaves per batch using dry yeast and ascorbic acid. After mixing, the dough is divided into two equal portions, fermented for 160 min, molded and panned in "pup loaf" pans before proofing and baking. Loaf volume is measured immediately after baking by rapeseed displacement. SRW Cookie Spread Ratio - AACC 10-50.05.

HRS: AACC 10-09.01 (long fermentation method) modified: 15 SKB units fungal amylase/100 g flour; 1% instant dry yeast; 10 ppm ammonium phosphate; 2% added shortening. Dough is mechanically punched, molded and baked in "Shogren-type" pans. Scoring is based on a 1 to 10 scale with higher numbers indicating preferred quality attributes.

SW: Cookie diameter - AACC 10-52.02. Sponge cake volume* and score - Japanese standard method described by Nagao in Cereal

Chemistry 53:977-988, 1976. Sponge cake control flour is western white. SW High Protein - AACC 10-10.03 with 180-min fermentation for bread.*

DURUM: Pasta is made using the laboratory procedure described by Walsh, Ebeling and Dick, Cereal Foods World: 16: (11) 385 (1971). Water (Pacific Southwest - adjusted to optimum hydration based on P-value from Alveograph test; Northern - 32%) is added to semolina and mixed in a Hobart mixing bowl for 5 min. Semolina-water mixture is extruded using a DeMaco laboratory pasta extruder. Northern - Spaghetti is dried using modified Buhler high-temperature drying cycle as described by Debbouz, Pitz, Moore and D'Appolonia, Cereal Chemistry: 72 (1):128-131. Pacific Southwest - Spaghetti is dried using modified Buhler low-temperature drying cycle as described by P. Yue, P. Rayas-Duarte, and E. Elias, Cereal Chemistry 76(4):541-547. Color scores are determined by the procedure described by Walsh, Macaroni Journal 52: (4) 20 (1970), using a Minolta Color Difference Meter (Northern CR-410, Pacific Southwest CR-210). Higher values (scale 1 to 12) are preferred. Cooked weight, cooking loss and firmness are determined by AACC 16-50.01.

HW BAKING: AACC 10-10.03 with 180-min fermentation.*

HW NOODLE: Two noodle types are prepared from each HW flour: Chinese raw noodles and Chinese wet noodles. Raw noodle formula: flour 100%, salt 1.2% and distilled water 28%; wet noodle formula: flour 100%, salt 2%, K₂CO₃ 0.45%, Na₂CO₃ 0.45% and distilled water 32%. Noodle sheet color is measured twice on each side of a dough sheet that is resting atop a two other dough sheets to ensure color consistency. This is done for two dough sheets (eight readings total) using a Minolta CR-410 Chroma Meter; the mean value is reported.

For wet noodles, noodle sheet color is measured on both uncooked and parboiled (for 1.5 min) sheets. Cooking yield is percent

of weight gain after cooking for 5 min for raw noodles and 1.5 min for wet noodles, rinsing in 26°-27° C water and draining. Sensory noodle color stability score is a total score of noodle color rated at 2 and 24 hours against a control sample (an assigned score of 7) and is reported based on a 1 to 10 scale; higher scores indicate better color stability. Noodle texture is determined on five strands of cooked noodles with a strand cross-cut dimension of 2.5 x 1.2 mm for raw noodles, W x T; 1.7 x 1.6 mm for wet noodles, W x T using a Stable Micro Systems TA.XT2 Texture Analyzer. Firmness indicates noodle bite; springiness indicates the degree of recovery after first bite; cohesiveness is a measure of noodle structure disruption during first bite; and chewiness is a product of firmness, cohesiveness and springiness (firmness x cohesiveness x springiness) and thus is a single parameter that incorporates the three textural parameters. Higher textural parameter values are generally more desirable for Chinese-style noodles.

CHINESE STEAMED BREAD: Two types of steamed breads are prepared: Chinese southern-type steamed breads from each of the SW and club wheat flours and Asian-type steamed breads from each of the HW flours. Chinese southern-type formula: flour 100%, sugar 15%, shortening 4%, baking powder 1.2%, instant yeast 0.8%, nonfat dry milk powder 3% and water 39 to 43%; Asian-type formula: flour 100%, instant yeast 1.5%, sugar 12%, shortening 2% and water 42.5 to 45%. Yeast is dissolved in water before use. All steamed breads are prepared using no-time dough methods (Wheat Marketing Center protocols). The total product score comprises volume*, external characteristics, internal characteristics, eating quality and flavor. Each property is rated compared with a control sample. The control flour is scored 70.

*Finished Product Volume for SW bread, sponge cake and steamed bread and HW bread and steamed bread: Laser light using a Tex Vol Instrument (BVM-L370).