40 YEARS

U.S. WHEAT ASSOCIATES

2020 CROP QUALITY REPORT

FROM THE PRESIDENT

Welcome to the 2020 U.S. Wheat Associates (USW) Crop Quality Report.

I believe that our customers and friends around the world will agree with me when I say there has never been a year quite like 2020. However, we were not going to let a global pandemic prevent us from providing the information you need to put our six distinct classes of U.S. wheat to work in your business.

Throughout 2020, we have celebrated our 40th year operating as U.S. Wheat Associates in part by looking back at the legacy of commitment by our farmers to their partnership with USW, the U.S. Department of Agriculture and with our customers around the world.

While the pandemic kept us apart in distance, the partnership remained strong. Our farmers produced another abundant supply of wheat with a very useful range of functional characteristics. Our USW colleagues and state wheat commission members adapted new ways to provide trade service and technical support. Our export supply system, designated by the government as an essential service, operated without disruption.

As we continue to meet today's challenges together, I want you to know that USW will continue building our partnership — with respect for our past, with understanding that the safest and highest quality food demands the highest quality wheat, and with sincere passion for your success.

We hope that you have a safe, healthy and productive 2021.

Sincerely,

Vince Peterson,
USW President

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Arizona Grain Research and Promotion Council

California Wheat Commission

Colorado Wheat Administrative Committee

Idaho Wheat Commission

Kansas Wheat Commission

Maryland Grain Producers Utilization Board

Minnesota Wheat Research and Promotion Council

Montana Wheat & Barley Committee

Nebraska Wheat Board

North Dakota Wheat Commission

Ohio Small Grains Marketing Program

Oklahoma Wheat Commission

Oregon Wheat Commission

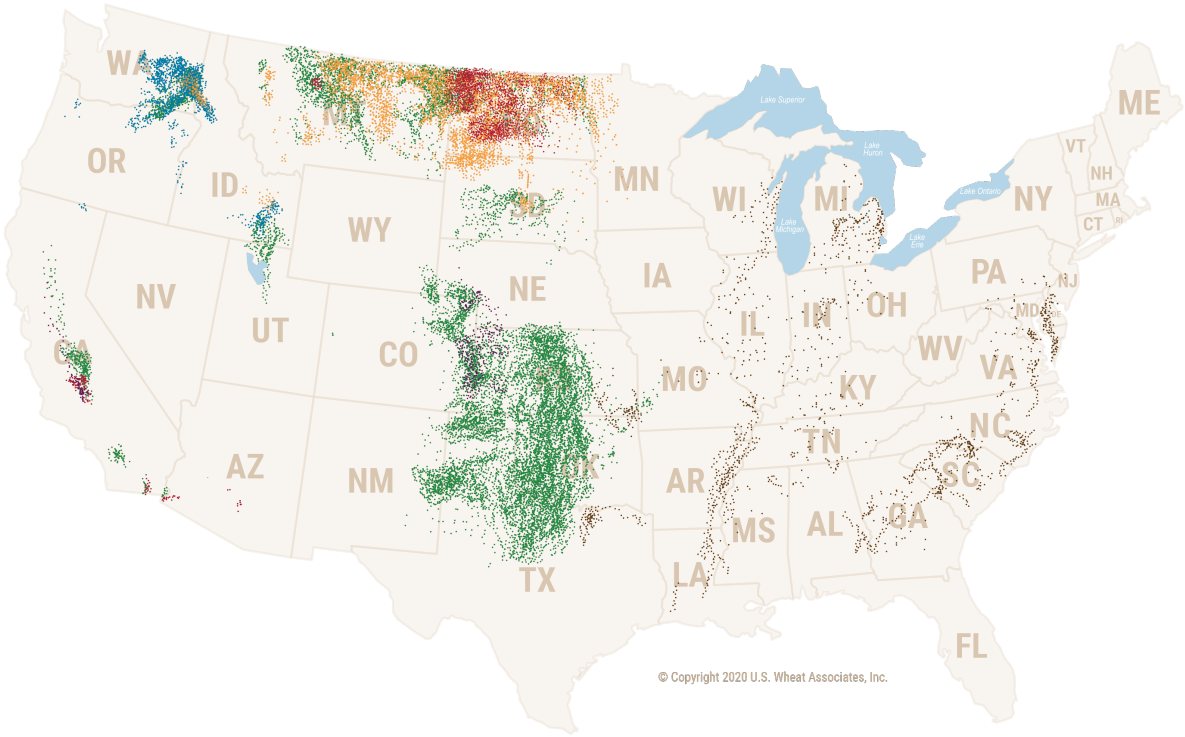
South Dakota Wheat Commission

Texas Wheat Producers Board

Washington Grain Commission

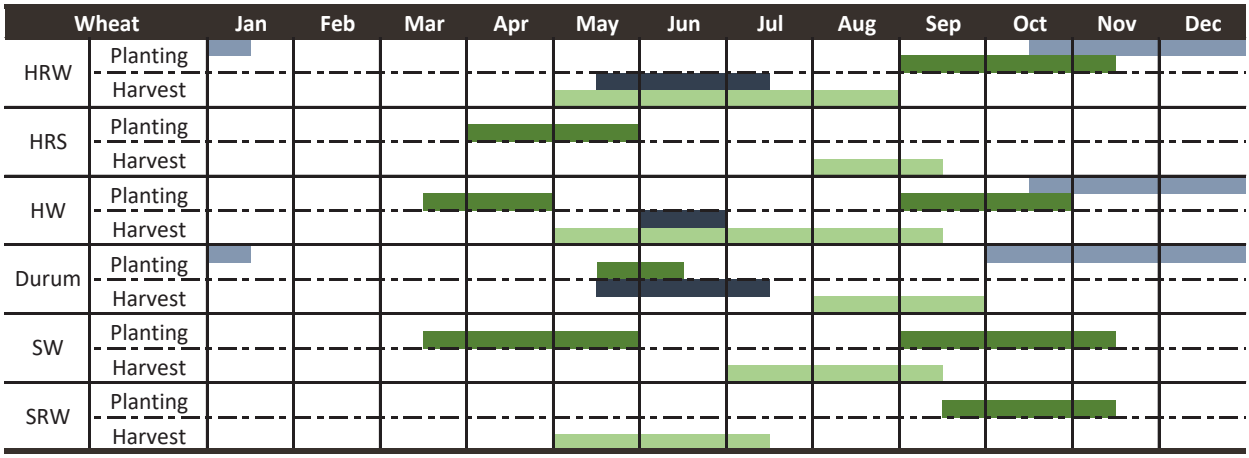
Wyoming Wheat Marketing Commission

2020 CROP QUALITY OVERVIEW



HARD RED WINTER | HARD RED SPRING | HARD WHITE | SOFT WHITE | SOFT RED WINTER | DURUM

PLANTING AND HARVEST DATES



CALIFORNIA-ARIZONA PLANTING
CALIFORNIA-ARIZONA HARVEST
OTHER STATES PLANTING
OTHER STATES HARVEST

U.S. PRODUCTION BY CLASS

CROP YEAR (BEGINNING JUNE 1) (MMT)

	2020	2019	2018	2017	2016
Hard Red Winter	17.93	23.00	18.02	20.42	29.45
Hard Red Spring	14.43	14.15	15.98	10.46	13.37
Hard White	0.65	0.87	0.89	1.01	0.90
Durum	1.85	1.46	2.08	1.44	2.80
Soft White	7.60	6.60	6.50	6.20	6.90
Soft Red Winter	7.25	6.53	7.77	7.77	9.40
Total	**49.70**	**52.60**	**51.24**	**47.30**	**62.82**

Based on USDA crop estimates as of September 30, 2020.

U.S. SUPPLY AND DEMAND

ESTIMATED FOR 2019/20 (YEAR BEGINNING JUNE 1) (MMT)

	HRW	HRS	White	SRW	Durum	Total
Beginning stocks	13.77	7.62	2.59	2.86	1.14	27.98
Production	17.94	14.43	8.22	7.24	1.88	49.70
Imports	0.14	1.63	0.14	0.27	1.22	3.40
Total supply	**31.85**	**23.68**	**10.94**	**10.37**	**4.25**	**81.08**
Domestic use	11.59	8.49	2.59	5.42	2.42	30.51
Exports	11.16	7.35	5.04	2.18	0.82	26.54
Total demand	**22.75**	**15.84**	**7.62**	**7.59**	**3.24**	**57.05**
Ending stocks	**9.09**	**7.84**	**3.32**	**2.78**	**1.01**	**24.03**
Stocks 5-year average	**14.36**	**6.76**	**2.44**	**4.57**	**1.07**	**29.20**

Based on USDA Supply/Demand estimates as of October 10, 2020.

SUMMARY OF CLASSES

	Hard Red Winter[2]		Hard Red Spring		Soft White[1]		Soft Red Winter		Northern Durum[3]		Desert Durum®[3]	
	2020	5-Year Avg	2020	5-Year Avg	2020	5-Year Avg	2020	5-Year Avg	2020	5-Year Avg	2020	5-Year Avg
Test Weight (lb/bu)	61.4	60.4	61.8	61.5	61.9	60.9	59.7	58.1	62.2	60.9	62.3	62.7
(kg/hl)	80.8	79.4	81.3	80.9	81.4	80.0	78.6	76.5	80.9	79.3	81.1	81.7
Grade	1 HRW	1 HRW	1 NS	1 NS	1 SW	1 SW	2 SRW	2 SRW	1 HAD	1 HAD	1 HAD	1 HAD
Dockage (%)	0.5	0.5	0.6	0.5	0.5	0.5	0.3	0.5	0.8	0.8	0.4	0.4
Wheat Moisture (%)	11.0	11.3	11.9	12.1	9.2	9.2	13.4	13.0	10.7	11.5	6.9	6.9
Wheat Protein (%), 12% mb	11.9	12.1	14.3	14.2	9.8	10.0	9.4	9.7	13.4	14.0	14.5	13.7
Wheat Ash (%), 14% mb	1.53	1.51	1.59	1.51	1.35	1.36	1.32	1.43	1.57	1.54	1.74	1.71
1000 Kernel Weight (g)	31.2	31.1	31.5	31.2	36.3	34.9	34.0	32.0	46.7	40.5	43.3	49.1
Wheat Falling Number (sec)	369	382	374	374	323	327	319	305	419	397	790	642
Flour/Semolina Extraction (%)[3]	73.5	75.4	67.4	67.9	72.6	73.1	66.8	68.9	58.5	65.7	70.7	67.5
Flour/Semolina Ash (%)[3]	0.49	0.54	0.51	0.51	0.43	0.43	0.41	0.46	0.64	0.67	0.86	n/a
Wet Gluten (%)	27.1	27.3	33.4	34.2	22.3	23.6	20.4	21.9	33.2	34.4	34.7	33.6
Farinograph:												
Peak Time (min)	5.3	4.6	7.9	7.4	1.9	2.5	1.2	1.3	n/a	n/a	n/a	n/a
Stability (min)	10.3	8.1	12.1	10.8	2.3	2.8	1.6	2.2	n/a	n/a	n/a	n/a
Absorption (%)	58.7	59.3	61.8	62.9	52.2	52.8	52.4	52.7	n/a	n/a	n/a	n/a
Alveograph W (10^{-4} J)	261	232	368	375	94	91	662	463	163	172	294	232
Loaf Volume (cm^3)	859	853	973	969	n/a	n/a	605	718	n/a	n/a	n/a	n/a
Production (MMT)	17.52	21.21	14.43	13.68	7.60	6.76	7.25	7.74	1.69	0.83	0.16	0.13
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[1]HW data is not included.

[2]HRW data does not include California.

[3]Durum extraction and ash values are for semolina.

ANALYSIS METHODS

WHEAT GRADE FACTORS

U.S. WHEAT GRADE is a numeric value from 1 to 5 or the designation "Sample Grade," which reflects the physical condition of a sample and thus may indicate its general suitability for milling. All numeric factors other than test weight are reported as a percentage by weight of the sample. (See table on page 9.) Unless otherwise noted, all Wheat Grade Factor methodology can be found in the Official U.S. Standards for Grain. Grade determining factors include:

TEST WEIGHT is a measure of density in pounds per bushel (lb/bu) or kilograms per hectoliter (kg/hl). Test weight may be an indicator of potential milling yield and the general condition of the sample. Problems during growing season or at harvest often reduce test weight. AACCI 55-10.01, test weight is converted to hectoliter weight: for durum (kg/hl = lb/bu x 1.292 + 0.630); for other classes (kg/hl = lb/bu x 1.292 + 1.419).

DAMAGED KERNELS show signs of disease, insect activity, frost or sprouting and may adversely affect milling and flour quality.

FOREIGN MATERIAL is any material other than wheat that remains after dockage is removed. Because foreign material is not easily removed, it may have an adverse effect on milling and flour quality.

SHRUNKEN AND BROKEN kernels have a shrunken or shriveled appearance or were broken in handling and may reduce milling yield.

TOTAL DEFECTS is the sum of damaged kernels, foreign material and shrunken and broken kernels.

VITREOUS KERNELS in HRS wheat are uniformly dark and have no spots that appear chalky or soft. In durum, vitreous kernels have a glassy and translucent appearance without any spots that appear chalky. Vitreous kernel is the percentage handpicked from a 15 gram (g) clean wheat sample.

WHEAT NON-GRADE FACTORS

DOCKAGE is the percentage by weight of material removed from a sample by the Carter Dockage Tester. Being easy to remove, dockage should not affect milling quality but may have other economic effects for buyers. U.S. Wheat Grade Factors are determined after dockage is removed. Official USDA Procedures.

MOISTURE content is the percentage of water by weight of a sample and is an important indicator of profitability in milling. Flour millers add water to adjust wheat moisture to a standard level before milling. Lower wheat moisture allows more water to be added, increasing the weight of grain to be milled at virtually no cost. Moisture content is also an indicator of grain storability as wheat and flour with low moisture are more stable during storage. Because moisture can be readily added to or removed from a sample, other analysis results are often mathematically converted to a standard moisture basis (mb), such as 14%, 12% or dry matter, so results can be compared. Moisture content for HRW, HRS, SW, HW is determined by Official USDA Conductance method; Durum (Northern) AACCI 44-11.01, Motomco Moisture Meter; (Desert Durum®) AACCI 44-15.02, air oven method; SRW AACCI 44-15.02.

PROTEIN content is the percentage of protein by weight in a sample. Because there is no rapid method for determining wheat protein quality, protein quantity is used as an indicator in trade and by millers of the suitability of wheat or flour for various products and is an important factor in determining the value of wheat. High protein is usually desired for products such as pan breads, pasta, buns and frozen yeast-raised products. Low protein is usually desired for products such as snacks or cakes.

WHEAT PROTEIN (12% mb) measured for HRW, HRS, SW, HW – AACCI 39-25.01 (NIR method); all other classes – AACCI 46-30.01 (Dumas combustion nitrogen analysis or CNA method).

FLOUR PROTEIN (14% mb) measured for HRW, HRS – AACCI 39-10.01 (NIR method); all other classes of flour and semolina– AACCI 46-30.01 (Dumas CNA method).

ASH content is the percentage of minerals by weight in wheat or flour. In wheat, ash is primarily concentrated in the bran and is an indication of the flour yield that can be expected during milling. In flour, ash content indicates milling performance by indirectly revealing the amount of bran contamination in flour. Ash in flour can impart a darker color to finished products. Products requiring white flour call for low ash content, while whole wheat flour has higher ash content. AACCI 08-01.01 expressed on a 14% mb.

KERNEL SIZE is a measure of the percentage by weight of large, medium and small kernels in a sample. Large kernels or a more uniform kernel size may help improve milling yield. 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), Desert Durum® – 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), Desert Durum®) are "Medium," and passing through the No. 9 or No. 10 screen are "Small."

SINGLE KERNEL CHARACTERIZATION SYSTEM (SKCS) measures 300 individual kernels from a sample for size (diameter), weight, hardness (based on the force needed to crush) and moisture. Detailed SKCS results (not reported in this booklet) include the distribution of these factors, which may be an indicator of the uniformity of the sample and help millers experienced with the system to optimize flour milling yields. Kernel characteristics may help millers optimize tempering or adjust roll gap settings. AACCI 54-31.01 using Perten SKCS 4100.

1000 KERNEL WEIGHT is the weight in grams of 1000 kernels of wheat and may indicate grain size and expected milling yield. HRS, Durum (Northern, Desert Durum®), SRW, HRW (CA) – based on a 10 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% mb; HRW (Midwestern) – average of SKCS kernel weight x 1000.

SEDIMENTATION value is a measure of the volume of sediment that results when lactic acid is added to a sifted, ground wheat sample. High sedimentation volume indicates strong gluten while low sedimentation volume indicates weaker gluten. HRS, HRW (Midwestern), SRW, SW, HW – AACCI 56-61.02; Durum (Northern, Desert Durum®) – AACCI 56-70.01; HRW (CA) – AACCI 56-63.01.

FALLING NUMBER is the time required for a plunger to fall through a heated mixture of flour and water and is a measure of enzyme activity. Sprouted wheat forms alpha-amylase (α-amylase) which breaks down starch into sugars. High falling number values indicate low α-amylase activity. Some α-amylase is required for certain products such as yeast-raised bread. However, excessive α-amylase in wheat cannot be removed and is difficult to reduce by blending. Flour with excessive amylase activity produces a sticky dough that can cause processing problems and products with poor color and weak texture. Falling number usually correlates closely with amylograph peak viscosity results. AACCI 56-81.04 for all classes with SW, HW, SRW, HRW (Midwestern) and HRS using the 2019 FGIS barometric pressure correction procedure; average value is a simple mean of sample results.

DON (DEOXYNIVALENOL), or vomitoxin, produced by Fusarium fungi, is the most common mycotoxin in wheat. All analysis is on ground wheat. HRS, Durum (Northern, Desert Durum®) – gas chromatograph with electron capture detector as described in the Journal of AOAC International 79,472 (1996). SRW, HRW (CA) – Neogen ELISA; HRW (Midwestern) – Charm ROSA DonQ2 Quantitative Test.

PHOTO TAKEN AT THE FEDERAL GRAIN INSPECTION SERVICE

PHOTO TAKEN AT THE FEDERAL GRAIN INSPECTION SERVICE

FLOUR DATA

See **"WHEAT NON-GRADE FACTORS"** for **PROTEIN, ASH** and **FALLING NUMBER.**

LABORATORY MILLING EXTRACTION is the percentage by weight of flour obtained from a wheat sample. The extraction rate is critically important to a commercial mill's profitability. In a laboratory, milling is done mainly to obtain flour for other tests and the extraction rate is always significantly lower than the rate that can be obtained on a commercial mill.

Laboratory samples are cleaned and tempered according to AACCI 26-10.02. Samples for the following are milled on a Buhler Laboratory mill: SW – AACCI 26-31.01; HRW (Midwestern), SRW, HRS and HW – AACCI 26-21.02; SRW – uses a 183-micron (μ) sieve. HRW (CA) is milled on a Brabender® Quadrumat Senior Mill using the Brabender® procedure; Durum (Northern) is milled using a Brabender® Quadrumatic Junior Semolina Mill. Grain is tempered to 15.5% moisture one day before milling. Desert Durum® is milled on a Modified Roller Mill. All extraction rates are calculated against total products on an "as is" mb.

COLOR measures a sample's lightness (L*) on a scale of 0 to 100 and "chromaticity" or hue on two scales from -60 to +60 for green to red (a*) and blue to yellow (b*). High L* values indicate a bright color and higher b* values indicate more yellow. Flour color is influenced by endosperm color, particle size and ash content and often affects the color of the finished product. Durum semolina color is heavily influenced by particle size. CIE 1976 L*a*b* color system. The following used the Minolta method using Minolta Chroma Meter with Granular-Materials attachment: HRW (Midwestern) CR-110; HRW (CA), Desert Durum® – CR-210; Semolina color (Northern) CR-410; HRS, SW, SRW, HW – CR-410 with Granular-Materials attachment CR-A50.

WET GLUTEN is a measure of the quantity of gluten in wheat or flour samples as determined using the Glutomatic System. Wet gluten forms when water is added to the protein in wheat or flour and is responsible for the elasticity and extensibility characteristics of flour dough. HRW (Midwestern, CA), HRS, SRW, HW – AACCI 38-12.02; SW – AACCI 38-12.02 (water reduced from 4.8 to 4.2 ml); Semolina (Northern, Desert Durum®) gluten is measured using AACCI 38-12.02 (Glutomatic procedure).

GLUTEN INDEX is also determined by the Glutomatic System and is a measure of gluten strength regardless of the quantity of gluten present. Gluten index is used commercially to select durum samples with strong gluten characteristics. In bread (hard) wheat, a variety of factors other than gluten quality can affect the results, though very low gluten index may be an indication of protein damage from insect or disease activity. HRW (Midwestern, CA), HRS, SRW, HW – AACCI 38-12.02; SW – AACCI 38-12.02 (water reduced from 4.8 to 4.2 ml); Semolina (Northern, Desert Durum®) gluten is measured using AACCI 38-12.02 (Glutomatic procedure).

AMYLOGRAPH PEAK VISCOSITY measures flour starch pasting properties that are important to products such as sheeted Asian noodles. Amylograph also measures enzyme (α-amylase) activity, which is usually from sprout damage. AACCI 22-10.01 modified to use 65 g flour (14% mb) and 450 ml distilled water with paddle (HRS) or pins (all other classes).

DAMAGED STARCH, the percentage by weight of damaged starch in a flour sample, is a measure of the physical damage done to starch granules during milling. Bread wheat flour typically has higher starch damage than soft wheat flour. Highly damaged starch readily absorbs more water, which affects dough mixing and other processing properties. Because starch damage depends on how the sample was milled, starch damage is important for interpreting other results reported. SRW – AACCI 76-30.02; all other classes – AACCI 76-33.01 (SDmatic method).

SOLVENT RETENTION CAPACITY (SRC) is the weight, expressed as percentages, of four solvents held by flour after centrifugation to the original flour weight on a 14% mb. The solvents – distilled water, sucrose (measuring pentosans), lactic acid (glutenins) and sodium carbonate (starch damage) – indicate the ability of flour to absorb water during mixing and release water during baking. Specific ranges of lower SRC values are desirable for specific soft wheat products, while higher SRC values are desirable for bread products. Gluten performance index (GPI), a calculation of three SRC values – lactic acid/(sodium carbonate + sucrose) – is a good predictor of overall performance of flour in baking applications. SW, HW – SRC machine (Chopin); all other classes – AACCI 56-11.02.

SEMOLINA DATA

See **"WHEAT NON-GRADE FACTORS"** for **PROTEIN** and **ASH.**

See **"FLOUR FACTORS"** for **EXTRACTION, COLOR WET GLUTEN** and **GLUTEN INDEX.**

SPECKS: are visually counted in a semolina sample and reported as the number in 10 in^2 (50 cm^2). These small particles of bran or other material that escaped the wheat cleaning and semolina purifying process reflect the milling process and the characteristics of the durum, and can detract from pasta appearance and desirability. Sample is pressed under a 3 x 4 in (7.6 x 10.2 cm) glass plate and the specks within a 1 in^2 (6.5 cm^2) marked on the plate are counted. Average of three determinations is expressed as specks per 10 in^2 (50 cm^2).

PHOTO TAKEN AT THE CALIFORNIA WHEAT LABORATORY

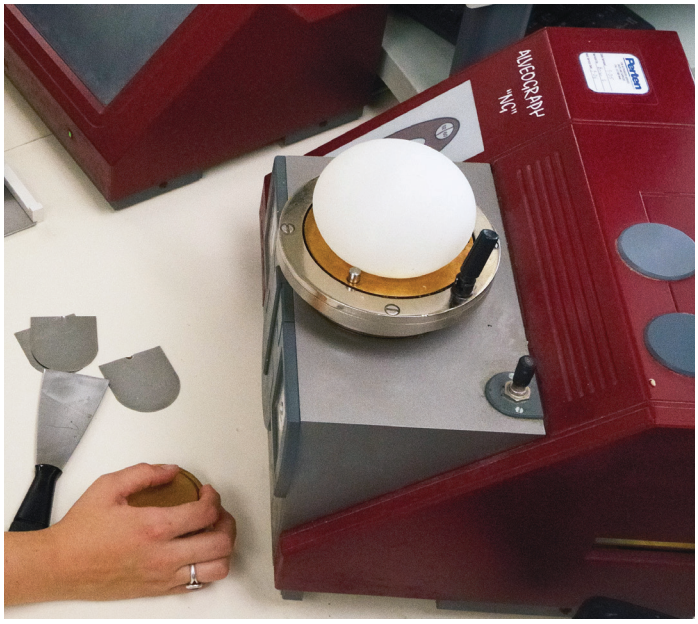

PHOTO TAKEN AT THE FEDERAL GRAIN INSPECTION SERVICE

DOUGH PROPERTIES

FARINOGRAPH generates a curve that indicates the resistance of dough to mixing (the power used over time) as flour and water are mixed into dough. AACCI 54-21.02 (Constant Flour Method) with 50 g bowl. The results describe the mixing properties of the dough and include:

- **PEAK TIME** is the time interval from the first addition of water to the maximum consistency immediately prior to the first indication of weakening. Long peak times indicate strong gluten and dough properties while short peak times may indicate weak gluten.
- **STABILITY** is the interval between the point where the top of the curve first intersects the 500-Brabender Unit (BU) line (called the "arrival time") and the point where the top of the curve departs the 500-BU line ("departure time"). Long stability times also indicate strong gluten and dough properties, useful in products such as yeast-raised breads, while short stability times indicate weaker gluten useful in many other products.
- **ABSORPTION** is the amount of water (as a percent by weight on a 14% mb) required to center the curve peak on the 500-BU line. High water absorption provides economic advantages for producing more dough pieces than flour with lower water absorption.

ALVEOGRAPH generates a curve indicating the air pressure necessary to inflate a piece of dough like a bubble to the point of rupture and indicates the gluten strength and extensibility of dough. Values reported include:

- **P** ("overpressure" or resistance), measured in millimeters of water to the maximum height of the curve, reflects the maximum pressure while blowing the bubble of dough and indicates dough resistance to extension.
- **L** (length), the length of the curve measured in millimeters, reflects the size of the bubble and indicates dough extensibility.
- **W** (the area under the curve) reflects the amount of energy needed to inflate the dough to the point of rupture and indicates dough strength.

The alveograph is well-suited for measuring the dough characteristics of weaker gluten wheat and, with adapted hydration using Consistograph, for stronger wheats including durum. Requirements differ depending on intended flour use. Low P values (indicating weak gluten) and short L values (low extensibility) are preferred for cakes and confectionery products; P/L close to 1 and high W values (strong gluten) are preferred for pan breads; and P/L values close to 0.75 are favored for durum for pasta semolina. HRW (Midwestern, CA), SRW – AACCI 54-30.02. SW, HW, HRS, Durum (Northern, Desert Durum®) – Alveolab.

EXTENSOGRAPH generates a force-time curve for a piece of dough that is stretched until it breaks. Results include:

- **RESISTANCE**, measured at the maximum curve height in Brabender Units (BU), reflects the maximum force applied and indicates the resistance of the dough to extension.
- **EXTENSIBILITY**, measured as the total length of the curve at the baseline in centimeters, reflects how far the dough was stretched.
- **AREA** is the area under the curve reported in square centimeters.

These factors help describe the gluten strength and dough extensibility characteristics of flour for a wide range of end-products. The extensograph can also evaluate the effects of fermentation time and additives on dough performance. AACCI 54-10.01, modified 45 and 135-min rest for HRS, HRW (Midwestern, CA) and HW; 45 min rest for SW and SRW.

EVALUATION OF END-PRODUCTS

BAKING ABSORPTION is the water required for optimum dough mixing performance, expressed as a percent of flour weight on a 14% mb.

CRUMB GRAIN AND TEXTURE is determined on a scale of 1 to 10 by visual comparison to a standard using a constant illumination source. Higher scores are preferred.

LOAF VOLUME is the volume of a test loaf after baking. Higher loaf volumes indicate better baking performance for pan breads.

MIDWESTERN HRW: AACCI 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 100 g 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 220 °C (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: AACCI 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 0.10% malted barley flour) in a 200g Swanson pin mixer with head speed of 100 to 120 rpm and 90 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: AACCI 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.

HRS: AACCI 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.

HW AND SW HIGH PROTEIN: AACCI 10-10.03 with 180 min fermentation.*

COOKIES: SW: cookie diameter – AACCI 10-52.02. **SRW:** cookie spread ratio – AACCI 10-50.05.

NOODLES, CHINESE: Two noodle types are prepared from each HW flour: Chinese raw and Chinese wet noodles.

RAW NOODLE FORMULA: HW flour 100%, salt 1.2% and deionized water 28%. Noodle sheet color is measured twice on each side of a dough sheet that is resting atop 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.

WET NOODLE FORMULA: HW flour 100%, salt 2%, K_2CO_3 0.45%, Na_2CO_3 0.45% and deionized water 32%. 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 1.5 min, rinsing in 26 to 27°C (79 to 81°F) tap water and draining. Sensory noodle color stability score is a total score of noodle color rated at 2 and 24 hrs 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 (Width x Thickness); 1.7 x 1.7 mm for wet noodles (Wheat Marketing Center (WMC) procedures), W x T using a Stable Micro Systems TA.XTPlus 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.

PASTA: Durum pasta is made using the laboratory procedure described by Walsh, Ebeling and Dick, Cereal Foods World: 16: (11) 385 (1971). Water (Desert Durum® – 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. 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, Desert Durum® CR-210). Higher values (scale 1 to 12) are preferred. Cooked weight, cooking loss and firmness are determined by AACCI 16-50.01.

SPONGE CAKE: 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."

STEAMED BREAD: Two types of steamed breads are prepared: Chinese southern-type and Asian-type steamed breads.

CHINESE SOUTHERN-TYPE: SW or white club (WC or Club) flours; 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: HW flour; flour 100%, instant yeast 1.5%, sugar 12%, shortening 2% and water 42.5 to 45.0%.

Yeast is dissolved in water before use. All steamed breads are prepared using no-time dough methods (WMC procedures). 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.

COOKIE, SPONGE CAKE, STEAMED BREAD, PASTA AND NOODLE tests all use standardized methods to evaluate the suitability of the sample for that product or similar products.

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

GRADES AND GRADE REQUIREMENTS

GRADES U.S. NO.:	1	2	3	4	5
MINIMUM LIMITS:					
Test Weight (lb/bu)					
HRS or White Club	58.0	57.0	55.0	53.0	50.0
All other classes and subclasses	60.0	58.0	56.0	54.0	51.0
Test Weight (kg/hl)					
HRS or White Club	76.4	75.1	72.5	69.9	66.0
Durum	78.2	75.6	73.0	70.4	66.5
All other classes and subclasses	78.9	76.4	73.8	71.2	67.3
MAXIMUM PERCENT LIMITS:					
Defects					
Damaged kernels:					
- Heat (part of total)	0.2	0.2	0.5	1.0	3.0
- Total	2.0	4.0	7.0	10.0	15.0
Foreign material	0.4	0.7	1.3	3.0	5.0
Shrunken and broken kernels	3.0	5.0	8.0	12.0	20.0
Total[1]	3.0	5.0	8.0	12.0	20.0
Wheat of Other Classes[2]					
Contrasting classes	1.0	2.0	3.0	10.0	10.0
Total[3]	3.0	5.0	10.0	10.0	10.0
Stones	0.1	0.1	0.1	0.1	0.1
MAXIMUM COUNT LIMITS (ALL GRADES):					
Other material (1000 g sample)					
Animal filth			1		
Castor beans			1		
Crotalaria seeds			2		
Glass			0		
Stones			3		
Unknown foreign substance			3		
Total[4]			4		
Insect-damaged kernels in 100 g			31		

U.S. Sample Grade is wheat that:

(a) does not meet the requirements for U.S. Nos. 1, 2, 3, 4, 5; or

(b) has a musty, sour or commercially objectionable foreign odor (except smut or garlic odor); or

(c) is heating or of distintively low quality.

Notes:

[1] Includes damaged kernels (total), foreign material, and shrunken and broken kernels.

[2] Unclassed wheat of any grade may contain not more than 10.0% of wheat of other classes.

[3] Includes contrasting classes.

[4] Includes any combination of animal filth, caster beans, crotalaria seeds, glass, stones, or unknown foreign substance.

CONVERSION MATRIX

The weight units conversion matrix should be read from the bottom, left. For example: **1 MT** is equal to **1000 kg**.

LEGEND:

bu (*Winchester* bushel)

lb (pound)

MT (metric ton)

cwt (quintal or hundredweight)

kg (kilogram)

———

1 hectare = 2.47 acres

1 acre = 0.40 hectare

	1 bu	1 lb	**1 MT**	1 long ton	1 short ton	1 cwt	1 kg
bu	1	0.01666667	36.74	37.33	33.33	3.674	0.0367647
lb	60	1	2,204.60	2,240	2,000	100	2.204586
MT	0.02721829	0.0004536	1	1.016	0.9072	22.0458554	0.001
long ton	0.02678811	0.00044643	0.98425197	1	0.89291339	0.04464558	0.0009843
short ton	0.030003	0.0005	1.102293	1.11993	1	0.05	0.0011023
cwt	0.599651	0.01	22.0458554	22.3986	20.3748	1	0.022046
kg	27.2	0.4536	**1000**	1,016	907.2	45.36	1

HARD RED WINTER

With excellent milling and baking characteristics for wheat foods like pan breads, hard rolls, croissants and flat breads, U.S. hard red winter (HRW) is a versatile wheat. It is also an ideal choice for some types of Asian noodles, general purpose flour and as an improver for blending.

For the miller, HRW brings consistency to the grist. A balanced mill optimizes flour extraction and helps maximize milling efficiency. Maintaining HRW as the foundation of the mill grist allows the miller to blend other U.S. classes, local wheat or wheat from other origins as cost advantages or product differentiation opportunities develop in the market.

For the baker, HRW benefits include improved baking characteristics, including dough stability and water absorption, either alone or as part of a blend. HRW delivers consistency as it is always available and provides the most reliable foundational ingredient for most wheat-based products.

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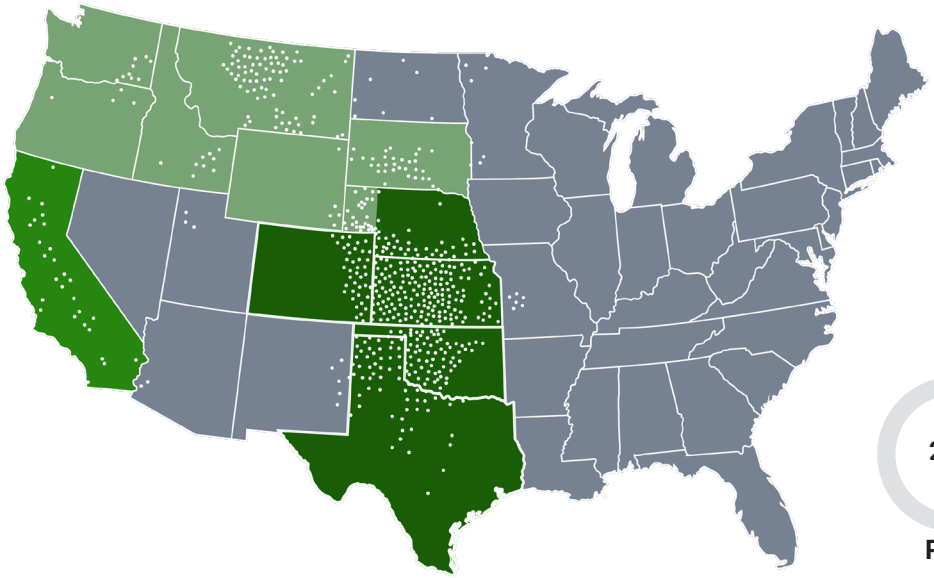
Samples collected from grain elevators in 40 reporting areas after at least 30% of the local harvest was complete.

USDA/ARS Hard Winter Wheat Quality Lab, Manhattan, Kansas, and Plains Grains, Inc., collected samples and conducted quality analyses. Official grade and non-grade factors were determined on each sample. Functionality tests were conducted on 90 composite samples categorized by growing region and protein ranges of <11.5%, 11.5 to 12.5% and >12.5%. Production weighted results are presented as Composite, Gulf-Tributary and Pacific Northwest (PNW)-Tributary averages. Gulf-Tributary states, PNW-Tributary states and California are highlighted on the map below. The methods are described in the Analysis Methods section of this booklet.

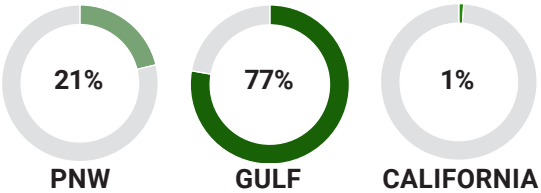


12

STATES SURVEYED FOR QUALITY DATA

99%

OF TOTAL HRW PRODUCTION REPRESENTED



PERCENTAGE OF TOTAL U.S. HRW PRODUCTION BY EXPORT TRIBUTARY

GULF AND PNW HARVEST SURVEY

OVERVIEW: Growing conditions greatly influenced the 2020 HRW wheat crop. In areas with favorable growing conditions, record yields resulted in lower protein but excellent kernel characteristics, while regional swings in temperature and moisture led to higher protein, lower yields and smaller kernels. The result is a crop that has generally outstanding kernel characteristics with flour, dough and bake quality attributes equal to or better than last year and many of the 5-year averages. Overall, the 2020 HRW crop can be characterized as clean and sound with good milling and processing characteristics, providing customers with an exceptionally good range of quality and value.

WEATHER AND HARVEST: The 2020 HRW planted area was again near historic 100-year lows, continuing the trend of recent years. HRW production is estimated at 18.9 million metric tons (MMT), a 3.8 MMT decrease from 2019.

Growing conditions varied among the HRW production regions. Western Central and Southern Great Plains experienced insufficient moisture, freeze events and high temperatures during key stages of crop development, resulting in lower yields and kernel size, but higher protein. While the eastern Central and Southern Great Plains experienced favorable growing conditions resulting in record yields, very good kernel characteristics, but lower protein. The Northern Great Plains and PNW also experienced variable growing conditions. Washington, Montana and South Dakota harvested crops equal to or better than average with very good kernel characteristics and protein. At the same time, Oregon experienced a significant reduction in yield due to unseasonably dry weather. With very few exceptions disease and insects were not a major issue for the 2020 HRW crop.

WHEAT AND GRADE DATA: Overall 92% of Composite, 90% of Gulf Tributary and 96% of PNW Tributary samples graded U.S. No. 2 or better. Average test weight of 61.4 lb/bu (80.8 kg/hl) is above 2019 and the 5-year averages. Average dockage (0.5%), total defects (1.4%) and foreign material (0.1%) are all equal to or similar to 2019 and the 5-year averages. Average protein (11.9%, 12% mb) and shrunken and broken (1.1%) are above 2019 and the 5-year averages. Average 1000 kernel weight of 31.2 g is less than 2019 but higher than the 5-year average. The average wheat falling number is 369 sec, indicative of sound wheat.

FLOUR AND BAKING DATA: The Buhler laboratory mill flour yield average is 73.5%, lower than the 2019 and 5-year averages. The 2020 flour ash of 0.49% (14% mb) is comparable to last year but lower than the 5-year average. The alveograph W value of 261(10^{-4} J) is significantly higher than last year and the 5-year averages. Farinograph peak and stability times, 5.3 and 10.3 min, respectively, are higher than the 2019 and the 5-year averages. Average bake absorption is 63.1%, above the value for 2019 and the 5-year average. Overall loaf volume averaged 859 cc, comparable to last year's and the 5-year averages.

HARVEST DATA

	COMPOSITE					
	2020 BY PROTEIN[1]			2020	2019	5-Year
	Low	Med	High	Avg	Avg	Avg
WHEAT GRADE DATA:						
Test Weight (lb/bu)	62.6	61.1	60.2	61.4	60.6	60.4
(kg/hl)	82.3	80.3	79.2	80.8	79.6	79.4
Damaged Kernels (%)	0.2	0.2	0.2	0.2	0.3	0.3
Foreign Material (%)	0.2	0.1	0.1	0.1	0.2	0.2
Shrunken and Broken (%)	0.8	0.9	1.8	1.1	0.8	1.0
Total Defects (%)	1.2	1.2	2.1	1.4	1.3	1.4
Grade	1 HRW	1 HRW	1 HRW	1 HRW	1 HRW	1 HRW
WHEAT NON-GRADE DATA:						
Dockage (%)	0.4	0.5	0.5	0.5	0.5	0.5
Moisture (%)	10.8	10.9	11.0	11.0	11.5	11.3
Wheat Protein (%) 12%/0% mb	10.8/12.2	11.9/13.6	13.1/14.9	11.9/13.5	11.4/12.9	12.1/13.7
Wheat Ash (%) 14%/0% mb	1.48/1.71	1.55/1.79	1.58/1.83	1.53/1.77	1.50/1.75	1.51/1.76
1000 Kernel Weight (g)	33.4	31.0	28.9	31.2	32.7	31.1
Kernel Size (%) lg/md/sm	72/27/1	62/37/1	51/47/2	63/35/2	71/28/1	65/34/1
Single Kernel: Hardness	68.2	64.2	66.0	66.1	58.1	61.4
Weight (mg)	33.4	31.0	28.9	31.2	32.7	31.1
Diameter (mm)	2.70	2.60	2.49	2.61	2.66	2.61
Sedimentation (cc)	42.3	50.3	60.6	50.2	45.9	49.0
Wheat Falling Number (sec)	364	373	369	369	376	382
DON (ppm)	<0.5	<0.5	<0.5	<0.5	<0.5	
FLOUR DATA:						
Lab Mill Extraction (%)	74.3	73.2	72.8	73.5	74.5	75.4
Color: L*	91.2	91.1	91.0	91.1	91.3	90.3
a*	-1.7	-1.6	-1.5	-1.6	-1.7	-1.5
b*	10.3	10.2	9.9	10.2	10.0	10.1
Flour Protein (%) 14%/0% mb	9.7/11.3	11.0/12.8	12.2/14.2	10.9/12.7	10.0/11.8	11.0/12.8
Flour Ash (%) 14%/0% mb	0.48/0.56	0.49/0.57	0.51/0.60	0.49/0.57	0.48/0.56	0.54/0.63
Wet Gluten (%)	23.9	27.2	30.7	27.1	28.1	27.3
Gluten Index	98	97	97	97	98	94
Flour Falling Number (sec)	410	428	425	421	393	382
Amylograph Viscosity: 65g (BU)	799	903	910	868	580	519
Damaged Starch (%)	6.9	6.3	6.2	6.5	6.6	6.5
SRC: Water/50% Sucrose	70/109	69/109	68/110	60/109	63/106	
5% Lactic Acid/5% Na_2CO_3	129/100	135/97	139/96	135/97	138/83	
GPI	0.62	0.66	0.68	0.65	0.73	
DOUGH PROPERTIES:						
Farinograph: Peak Time (min)	3.9	5.6	6.4	5.3	3.3	4.6
Stability (min)	8.4	11.0	11.7	10.3	7.3	8.1
Absorption (%)	58.8	58.4	58.9	58.7	57.8	59.3
Alveograph: P (mm)	104	95	91	97	78	82
L (mm)	58	82	91	77	81	86
P/L Ratio	1.81	1.16	1.00	1.26	0.97	0.95
W (10^{-4} J)	219	273	296	261	223	232
Extensograph: Resistance (BU)	464/779	498/938	548/978	496/838	476/798	387/612
(45/135 min) Extensibility (cm)	13.9/11.8	14.4/12.6	15.5/13.5	14.5/12.4	14.2/12.0	14.3/13.1
Area (cm^2)	86/113	93/135	109/156	94/133	88/116	84/114
BAKING EVALUATION:						
Pan Bread: Bake Absorption (%)	61.6	62.9	65.1	63.1	62.7	62.4
Crumb Grain and Texture (1-10)	5.8	6.2	6.8	6.2	6.1	6.8
Loaf Volume (cc)	785	861	948	859	863	853
PRODUCTION OF 11 STATES (%):	**32%**	**42%**	**26%**	**100%**		

[1]Protein Range: Low, <11.5%; Med, 11.5 - 12.5%; High, >12.5%.

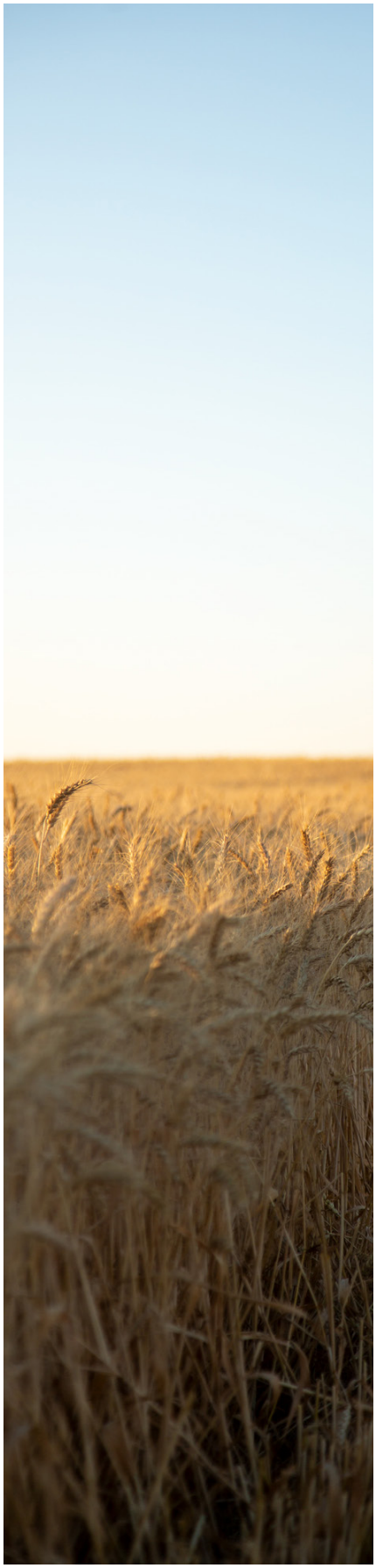
HARVEST DATA

GULF EXPORTABLE

	2020 BY PROTEIN[1]			2020	2019	5-Year
	Low	Med	High	Avg	Avg	Avg
WHEAT GRADE DATA:						
Test Weight (lb/bu)	62.6	60.6	59.6	61.1	60.3	60.0
(kg/hl)	82.3	79.8	78.4	80.4	79.3	79.0
Damaged Kernels (%)	0.2	0.2	0.2	0.2	0.4	0.3
Foreign Material (%)	0.2	0.1	0.1	0.1	0.2	0.2
Shrunken and Broken (%)	0.8	1.0	2.1	1.2	0.9	1.0
Total Defects (%)	1.2	1.3	2.4	1.5	1.4	1.5
Grade	1 HRW	1 HRW	1 HRW	1 HRW	1 HRW	1 HRW
WHEAT NON-GRADE DATA:						
Dockage (%)	0.5	0.6	0.5	0.5	0.5	0.5
Moisture (%)	11.1	11.0	10.9	11.0	11.6	11.6
Wheat Protein (%) 12%/0% mb	10.8/12.2	11.9/13.6	13.1/14.9	11.8/13.4	11.2/12.7	12.1/13.8
Wheat Ash (%) 14%/0% mb	1.48/1.72	1.55/1.80	1.58/1.84	1.53/1.78	1.52/1.77	1.52/1.77
1000 Kernel Weight (g)	32.6	30.1	27.9	30.4	32.3	30.5
Kernel Size (%) lg/md/sm	71/28/1	59/40/1	45/52/3	60/38/2	71/28/1	63/36/1
Single Kernel: Hardness	68.4	62.2	64.8	65.0	57.0	60.6
Weight (mg)	32.6	30.1	27.9	30.4	32.3	30.5
Diameter (mm)	2.68	2.57	2.44	2.58	2.63	2.59
Sedimentation (cc)	40.6	48.8	61.0	48.7	44.0	47.8
Wheat Falling Number (sec)	366	375	372	371	382	385
DON (ppm)	<0.5	<0.5	<0.5	<0.5	<0.5	
FLOUR DATA:						
Lab Mill Extraction (%)	74.3	72.8	72.7	73.3	74.5	75.5
Color: L*	91.2	91.1	91.1	91.2	91.2	90.2
a*	-1.7	-1.6	-1.5	-1.6	-1.7	-1.5
b*	10.4	10.1	10.0	10.2	10.1	10.1
Flour Protein (%) 14%/0% mb	9.7/11.3	10.9/12.7	12.2/14.2	10.8/12.6	9.8/11.5	11.1/12.9
Flour Ash (%) 14%/0% mb	0.48/0.56	0.50/0.58	0.52/0.61	0.50/0.58	0.49/0.57	0.56/0.65
Wet Gluten (%)	24.0	26.5	29.9	26.4	23.7	27.7
Gluten Index	98	97	98	98	98	94
Flour Falling Number (sec)	412	434	433	426	396	385
Amylograph Viscosity: 65g (BU)	797	939	944	890	572	520
Damaged Starch (%)	6.8	6.1	6.1	6.3	6.6	6.5
SRC: Water/50% Sucrose	67/108	64/102	65/105	65/105	63/106	
5% Lactic Acid/5% Na_2CO_3	124/96	124/84	134/88	126/89	137/83	
GPI	0.61	0.67	0.69	0.65	0.72	
DOUGH PROPERTIES:						
Farinograph: Peak Time (min)	3.8	5.7	6.5	5.2	3.0	4.7
Stability (min)	8.4	11.2	12.5	10.5	6.8	8.0
Absorption (%)	58.5	57.7	58.2	58.1	57.4	59.4
Alveograph: P (mm)	101	90	89	93	76	80
L (mm)	59	85	93	78	79	87
P/L Ratio	1.72	1.05	0.96	1.20	0.96	0.92
W (10^{-4} J)	213	266	300	255	211	225
Extensograph: Resistance (BU)	447/776	496/953	575/1035	497/910	470/785	375/596
(45/135 min) Extensibility (cm)	13.9/11.8	14.4/11.9	15.6/13.1	14.5/12.1	14.1/11.9	14.3/13.2
Area (cm^2)	83/112	93/134	115/160	94/132	87/113	82/111
BAKING EVALUATION:						
Pan Bread: Bake Absorption (%)	61.5	62.7	65.0	62.8	62.3	62.8
Crumb Grain and Texture (1-10)	6.0	6.2	6.9	6.3	6.2	6.8
Loaf Volume (cc)	788	860	954	857	858	859
PRODUCTION OF 11 STATES (%):	**27%**	**32%**	**17%**	**76%**		

[1]Protein Range: Low, <11.5%; Med, 11.5 - 12.5%; High, >12.5%.

HARVEST DATA



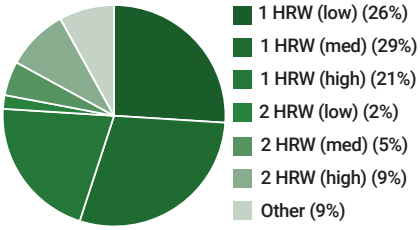
	PNW EXPORTABLE					
	2020 BY PROTEIN[1]			2020	2019	5-Year
	Low	Med	High	Avg	Avg	Avg
WHEAT GRADE DATA:						
Test Weight (lb/bu)	62.6	62.5	62.2	62.4	61.7	61.4
(kg/hl)	82.3	82.2	81.8	82.0	80.4	80.6
Damaged Kernels (%)	0.1	0.2	0.3	0.2	0.2	0.2
Foreign Material (%)	0.1	0.1	0.1	0.1	0.1	0.1
Shrunken and Broken (%)	0.7	0.6	0.6	0.6	0.6	0.8
Total Defects (%)	0.9	0.9	1.1	1.0	0.9	1.1
Grade	1 HRW	1 HRW	1 HRW	1 HRW	1 HRW	1 HRW
WHEAT NON-GRADE DATA:						
Dockage (%)	0.4	0.3	0.5	0.4	0.5	0.5
Moisture (%)	9.9	10.8	11.4	10.8	10.8	10.4
Wheat Protein (%) 12%/0% mb	10.8/12.3	12.1/13.7	13.2/15.0	12.3/13.9	11.9/13.5	11.9/13.6
Wheat Ash (%) 14%/0% mb	1.46/1.66	1.54/1.75	1.59/1.81	1.54/1.75	1.44/1.68	1.47/1.71
1000 Kernel Weight (g)	35.8	34.1	32.1	33.7	34.3	32.8
Kernel Size (%) lg/md/sm	77/22/1	72/27/1	68/31/1	72/27/1	73/26/1	70/29/1
Single Kernel: Hardness	67.6	70.5	69.6	69.6	62.1	64.0
Weight (mg)	35.8	34.1	32.1	33.7	34.3	32.8
Diameter (mm)	2.78	2.69	2.65	2.69	2.75	2.69
Sedimentation (cc)	47.5	55.0	59.3	54.9	52.8	53.2
Wheat Falling Number (sec)	359	366	360	362	356	375
DON (ppm)	<0.5	<0.5	<0.5	<0.5	<0.5	
FLOUR DATA:						
Lab Mill Extraction (%)	74.5	74.5	73.3	74.0	74.5	74.9
Color: L*	91.1	90.9	90.7	90.9	91.4	90.6
a*	-1.6	-1.6	-1.5	-1.6	-1.6	-1.4
b*	10.1	10.3	9.7	10.0	9.8	9.9
Flour Protein (%) 14%/0% mb	9.9/11.5	11.2/13.1	12.3/14.3	11.3/13.1	10.9/12.7	11.0/12.8
Flour Ash (%) 14%/0% mb	0.46/0.54	0.47/0.54	0.49/0.57	0.47/0.54	0.46/0.54	0.50/0.59
Wet Gluten (%)	23.5	29.3	33.3	29.5	26.7	26.6
Gluten Index	98	97	95	97	97	96
Flour Falling Number (sec)	402	406	401	403	386	375
Amylograph Viscosity: 65g (BU)	803	789	805	798	609	518
Damaged Starch (%)	7.2	7.1	6.7	7.0	6.8	6.7
SRC: Water/50% Sucrose	71/109	71/112	96/111	70/111	64/106	
5% Lactic Acid/5% Na_2CO_3	131/101	139/101	141/98	138/100	143/84	
GPI	0.62	0.65	0.67	0.65	0.75	
DOUGH PROPERTIES:						
Farinograph: Peak Time (min)	4.2	5.6	6.0	5.4	4.2	4.6
Stability (min)	8.4	10.4	9.2	9.5	8.9	8.5
Absorption (%)	59.8	60.6	61.2	60.7	59.4	59.6
Alveograph: P (mm)	115	111	96	106	88	88
L (mm)	54	74	85	74	86	85
P/L Ratio	2.11	1.50	1.13	1.45	1.02	1.04
W (10^{-4} J)	238	294	287	279	266	258
Extensograph: Resistance (BU)	518/787	503/891	461/797	491/608	497/843	422/660
(45/135 min) Extensibility (cm)	13.9/12.0	14.2/12.9	15.3/14.9	14.5/13.4	14.4/12.4	14.2/12.9
Area (cm^2)	94/115	92/137	92/144	92/135	93/125	93/121
BAKING EVALUATION:						
Pan Bread: Bake Absorption (%)	61.9	63.6	65.2	63.8	64.0	63.1
Crumb Grain and Texture (1-10)	5.0	6.3	6.4	6.0	5.7	6.9
Loaf Volume (cc)	773	862	930	867	884	841
PRODUCTION OF 11 STATES (%):	**5%**	**10%**	**9%**	**24%**		

[1]Protein Range: Low, <11.5%; Med, 11.5 - 12.5%; High, >12.5%.

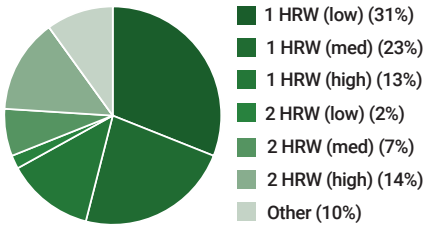
DISTRIBUTIONS BY GRADE

PROTEIN RANGE, 12% MB, DENOTED IN PARENTHESES: LOW, <11.5%; MED, 11.5-12.5%; HIGH, >12.5%

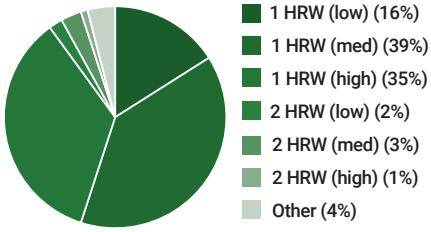
OVERALL



GULF EXPORTABLE



PNW EXPORTABLE



HARD RED WINTER PRODUCTION

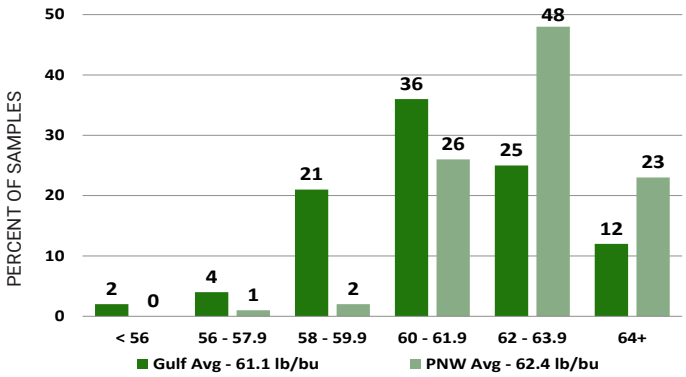
FOR THE MAJOR PRODUCING STATES (MMT)

	2020	2019	2018	2017	2016
California	0.15	0.12	0.20	0.25	0.32
Colorado	1.08	2.51	1.74	2.10	2.66
Idaho	0.33	0.32	0.33	0.28	0.41
Kansas	7.35	9.10	7.25	8.81	12.34
Montana	2.07	2.59	2.14	1.82	2.87
Nebraska	0.89	1.41	1.25	1.19	1.85
Oklahoma	2.80	2.96	1.89	2.66	3.68
Oregon	0.06	0.11	0.10	0.09	0.07
South Dakota	0.95	1.09	0.86	0.57	1.74
Texas	1.61	1.87	1.42	1.74	2.37
Washington	0.33	0.45	0.48	0.49	0.53
Wyoming	0.06	0.12	0.09	0.07	0.11
Twelve-State Total	**17.67**	**22.66**	**17.75**	**20.06**	**28.93**
Total HRW Production	**17.93**	**23.00**	**18.02**	**20.42**	**29.45**

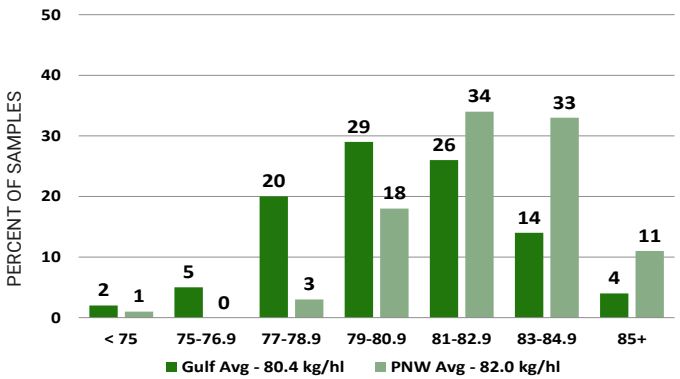
Based on USDA crop estimates as of September 30, 2020.

DISTRIBUTIONS

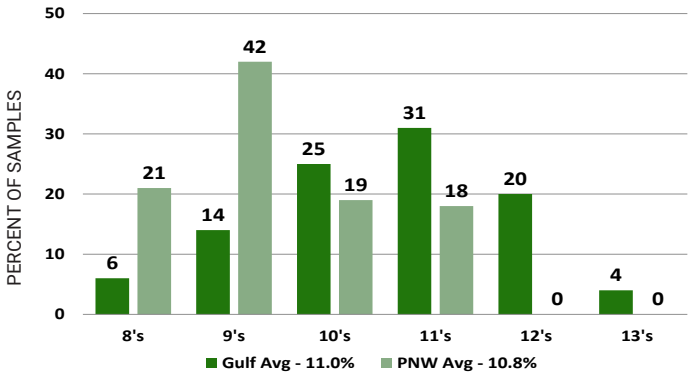
TEST WEIGHT *(Pounds/Bushel)*



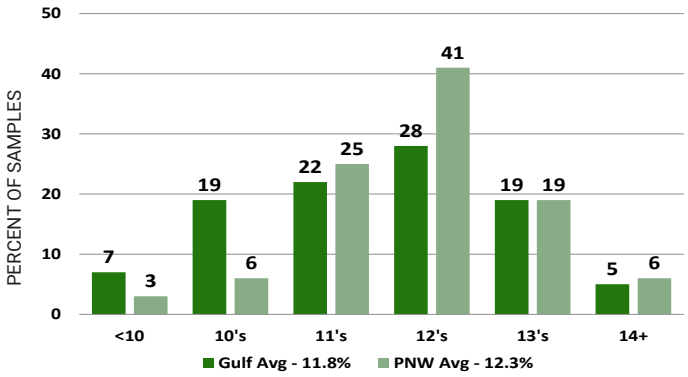
TEST WEIGHT *(Kilograms/Hectoliter)*



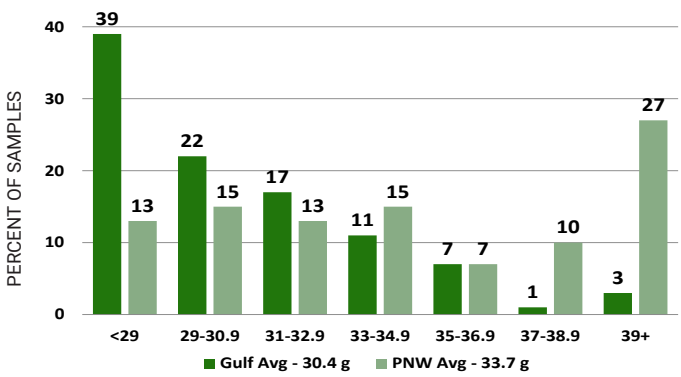
WHEAT MOISTURE *(Percent)*



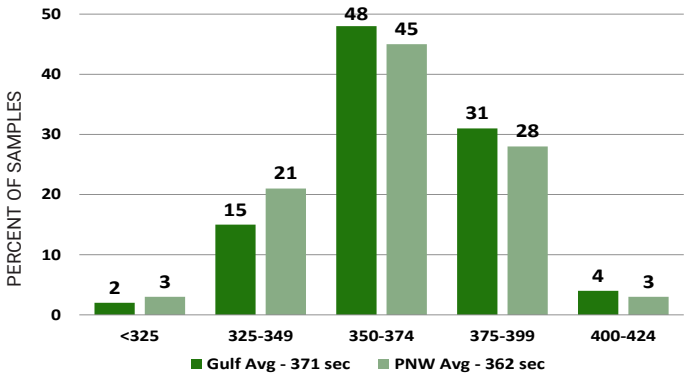
PROTEIN (12% MB) *(Percent)*



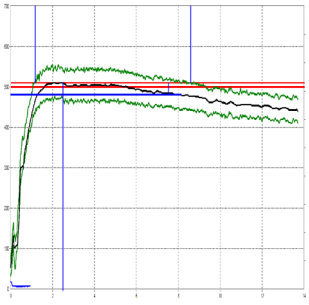
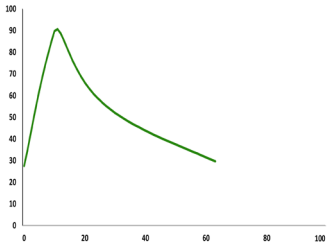
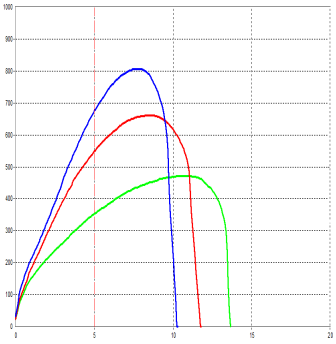
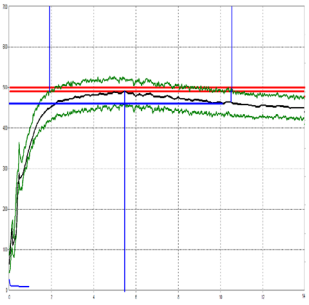
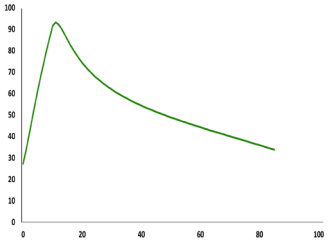
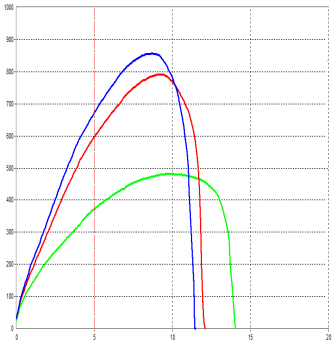
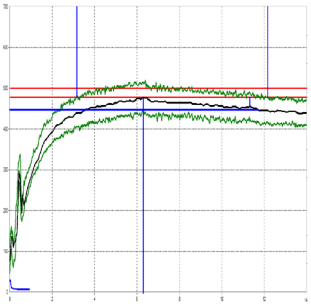
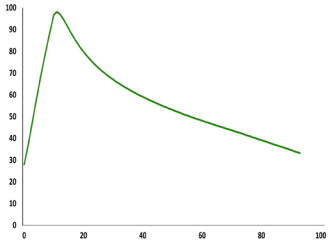
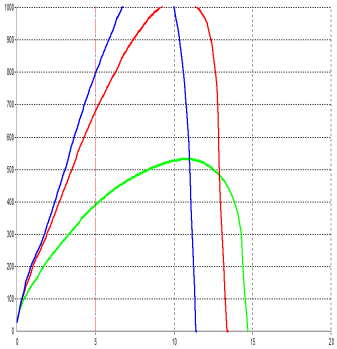
1000 KERNEL WEIGHT *(Grams)*



FALLING NUMBER *(Seconds)*



COMPOSITE DOUGH PROPERTIES

	FARINOGRAMS	ALVEOGRAMS	EXTENSOGRAMS
LOW PROTEIN			
MEDIUM PROTEIN			
HIGH PROTEIN			

CALIFORNIA HARVEST AND DATA SURVEY

OVERVIEW: California's wheat growing regions are defined by climate, value of alternative crops and distinct differences in variety selection. Most California hard wheat is planted from October to January and harvested in June and July. With the strong demand for new crop wheat in the domestic marketplace, importers are encouraged to express their interest in purchasing California wheat in early spring.

WEATHER AND HARVEST: California had below average rainfall in 2019/20, except for the southern San Joaquin Valley; state spring rainfall was at or above average. Disease incidence was below average; however, stripe rust was observed in the San Joaquin Valley, including in stripe-rust resistant varieties. Yields in the San Joaquin Valley were normal to above average, while yields of non-irrigated crops in the Sacramento Valley were generally below average.

SUMMARY: California hard wheat varieties are known for their low moisture and large, uniform kernels. Because wheat is predominantly grown under irrigation, growers achieve high yields and consistent quality. Overall, the majority of the 2020 crop has medium protein. Consistent with other years, the 2020 crop has low moisture, high flour extraction and strong baking performance — all of which make California wheat suitable for blending.

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Samples collected from grain elevators during local harvest.

California Wheat Commission Laboratory and Federal Grain Inspection Service (FGIS) conducted tests and analyses. Official grade and non-grade factors and functionality tests were determined on each sample. Results are weighted averages. The methods are described in the Analysis Methods section of this booklet.

	MEDIUM PROTEIN[1]		HIGH PROTEIN[1]	
	2020	2019	2020	2019
WHEAT GRADE DATA:				
Test Weight (lb/bu)	62.5	62.8	62.2	61.9
(kg/hl)	82.2	81.8	81.8	81.3
Damaged Kernels (%)	0.1	0.0	0.1	0.1
Foreign Material (%)	0.1	0.2	0.1	0.2
Shrunken and Broken (%)	0.7	0.6	0.8	1.1
Total Defects (%)	0.8	0.8	1.0	1.3
Grade	1 HRW	1 HRW	1 HRW	1 HRW
WHEAT NON-GRADE DATA:				
Dockage (%)	0.9	0.9	0.9	1.3
Moisture (%)	9.2	8.3	9.3	8.3
Wheat Protein (%) 12%/0% mb	11.8/13.4	12.4/14.1	12.9/14.7	13.3/15.2
Wheat Ash (%) 14%/0% mb	1.43/1.67	1.51/1.76	1.58/1.83	1.57/1.82
1000 Kernel Weight (g)	42.2	43.1	42.7	43.1
Kernel Size (%) lg/md/sm	84/15/1	87/13/0	91/9/0	82/18/0
Single Kernel: Hardness	60.9	70.0	60.5	72.1
Weight (mg)	38.2	42.1	40.3	39.3
Diameter (mm)	2.92	3.09	2.99	2.98
Sedimentation (cc)	41.0	52.0	49.0	55.0
Wheat Falling Number (sec)	321	360	316	382
DON (ppm)		<0.5	<0.5	<0.5
FLOUR DATA:				
Lab Mill Extraction (%)	71.3	67.1	70.2	67.4
Color: L*	92.3	92.5	92.5	93.0
a*	-0.7	-0.8	-0.6	-0.9
b*	7.9	7.3	7.4	7.7
Flour Protein (%) 14%/0% mb	10.7/12.4	11.6/13.5	11.9/13.9	11.9/13.8
Flour Ash (%) 14%/0% mb	0.47/0.55	0.51/0.59	0.49/0.58	0.52/0.60
Wet Gluten (%)	29.5	31.6	35.1	33.0
Gluten Index	93	93	92	87
Flour Falling Number (sec)	356	408	348	385
Amylograph Viscosity: 65g (BU)	593	823	531	910
Damaged Starch (%)	6.2	7.9	5.8	8.7
SRC: Water/50% Sucrose	64/107	67/111	65/104	68/114
5% Lactic Acid/5% Na_2CO_3	135/83	138/88	142/79	144/86
GPI	0.71	0.69	0.78	0.72
DOUGH PROPERTIES:				
Farinograph: Peak Time (min)	6.7	6.8	6.7	6.6
Stability (min)	10.6	13.4	13.2	15.1
Absorption (%)	61.4	63.2	63.0	64.0
Alveograph: P (mm)	94	118	97	114
L (mm)	108	71	125	109
P/L Ratio	0.87	1.66	0.78	1.05
W (10^{-4} J)	349	295	405	390
Extensograph: Resistance (BU)	238/276	255/267	208/272	268/300
(45/135 min) Extensibility (cm)	22.5/22.3	21.3/21.4	25.6/23.0	22.2/19.9
Area (cm^2)	142/152	136/145	152/154	150/145
BAKING EVALUATION:				
Pan Bread: Bake Absorption (%)	61.5	63.3	62.5	64.0
Crumb Grain and Texture (1-10)	8.0	8.0	8.0	8.0
Loaf Volume (cc)	890	973	945	1005
PRODUCTION OF 11 STATES (%):	**89**	**57**	**72**	**34**

[1]California HRW Protein Range: Med, 11.0 - 12.5%; High, >12.5%.

HARD RED SPRING

The aristocrat of wheat when it comes to “designer” wheat foods like bagels, artisan hearth breads, pizza crust and other strong dough applications, U.S. hard red spring (HRS) wheat is also a valued improver in flour blends.

For the miller, the reward for incorporating HRS into their grist includes a higher than average flour yield from its harder, more compact endosperm. This creates excellent granulation through the break system, providing an abundance of stock to the purifiers producing the maximum amount of low ash, bright color flour.

For the baker, HRS delivers strong dough characteristics used alone or as part of a blend to improve the overall performance of the desired dough. In markets where consumers are demanding a “clean label,” HRS flour blended with HRW or other wheat flour can create better water absorption and loaf volume while reducing or eliminating the use of chemical improvers.

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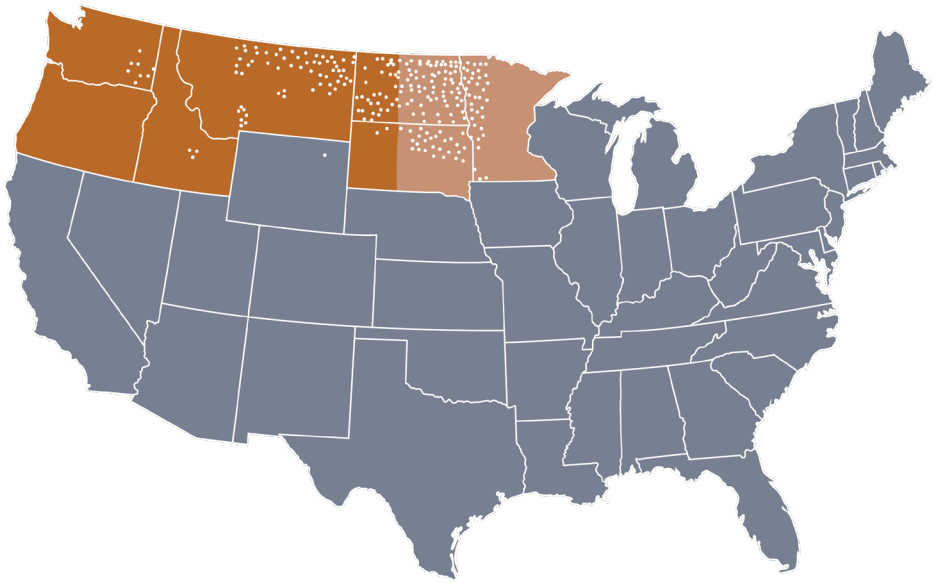
Samples collected from fields, on-farm bins sites or elevators, and separated by export region.

The HRS Wheat Quality Lab Department of Plant Sciences, North Dakota University (NDSU), Fargo, North Dakota, collected samples and conducted quality analyses. Official grade and non-grade factors were determined on 60% of samples. Functionality tests were conducted on 6 composite samples categorized by export region and protein ranges of <13.5%, 13.5 to 14.5% and >14.5%. Production-weighted results are presented as Composite, Eastern and Western Region averages based on composite samples. Eastern and Western Region states are highlighted on the map below. The methods are described in the Analysis Methods section of this booklet.



7

STATES SURVEYED

100%

OF TOTAL HRS PRODUCTION REPRESENTED

WESTERN REGION **EASTERN REGION**

PERCENTAGE OF TOTAL U.S. HRS PRODUCTION BY EXPORT TRIBUTARY

HARVEST SURVEY

OVERVIEW: The 2020 U.S. HRS wheat crop boasts excellent kernel and grade qualities, with significantly improved kernel soundness compared to 2019. Timely rains and a dry, rapid harvest period limited disease pressures and benefitted kernel quality parameters. Planted area fell in 2020, but total production is estimated at 14.4 million metric tons (MMT), slightly more than a year ago and up four percent from the 5-year average. Production was further enhanced due to a record national yield. Many factors customers value are broadly available across the crop, including improved dough strength with very high bread scores. With above-average supplies and high-quality parameters, the 2020 U.S. HRS crop offers excellent value to buyers.

WEATHER AND HARVEST: Planting began in late April, later than normal due to cool temperatures. Precipitation and lingering cold soil further delayed planting in the eastern growing region, while the western region had better planting conditions. Planting progress accelerated during May as temperatures warmed, and most of the crop was planted by the first week of June.

Cool temperatures slowed emergence in parts of the growing region. As June progressed, the central growing region endured drought stress while the eastern and western areas benefitted from moisture. Conditions improved in the second half of the growing season with timely rains and moderate temperatures region-wide, resulting in good kernel fill conditions. Disease pressure was minimal across the region.

Harvest began in late July and made steady progress with favorable weather. Most of the crop was harvested by mid-September with good quality, a marked change from the 2019 harvest.

WHEAT AND GRADE DATA: The average grade on the 2020 samples is a No. 1 Northern Spring (NS), the same as 2019 and 5-year averages; 94% of Eastern Region samples and 93% of Western Region samples grade U.S. No. 1. Average test weight of 61.8 lb/bu (81.3 kg/hl) is higher than 2019 and 5-year averages; 83% of Eastern samples and 89% of Western samples are above 60 lb/bu (78.9 kg/hl). Average damage is 0.0% on final composites, down sharply from 2019. Vitreous kernel levels (DHV) are notably higher, with overall samples averaging 71%. Both regions are showing improved DHV levels, but Western samples are significantly higher, averaging 82%, compared to 60% in Eastern samples. Nearly two-thirds of the Western samples make the Dark Northern Spring (DNS) subclass.

The crop averages 14.3% (12% mb) protein, similar to 2019 and 5-year averages. Western average protein is 14.4%, while Eastern average protein is 14.2%. The distribution of protein levels across both regions is skewed lower compared to 2019. Nearly half of all samples have more than 14.5% protein, similar to 2019, but nearly 25% fall below 13.5%, up from 20% in 2019.

Disease pressures were relatively light across the region, with slightly more Fusarium head blight in southern areas. The crop's overall DON average is 0.2 ppm, down from 0.6 in 2019, and averaging 0.1 for Western samples, and 0.3 for Eastern samples. Average 1000 kernel weight (TKW) is 31.5 g, heavier than 2019 and 5-year averages. There is a vast improvement in kernel soundness across the crop, with an average falling number (FN) of 374 sec; Eastern samples showed the most improvement.

FLOUR, DOUGH AND BAKING DATA: Buhler laboratory mill flour yield averages 67.4%, lower than 2019 and 5-year averages. Flour ash was similar to 2019 at 0.52%, while flour color showed higher L* color scores in both regions. Wet gluten averages 33%, lower than both 2019 and 5-year averages. Amylograph values average 642 BU for 65 g of flour, sharply higher than 2019, with Western area averaging 708 BU, and Eastern area 582 BU.

Farinograph indicates the crop has lower absorption compared to last year and 5-year averages, with Western area average at 63.3%, and Eastern area at 60.4%. The average farinograph stability is 12.1 min, significantly stronger than 2019 and the 5-year averages. Dough strength is improved across both regions with the Eastern average slightly stronger at 12.6 min, compared to 11.5 for the Western average.

Extensograph analyses shows less extensibility and more resistance compared to 2019, but similar to 5-year averages. The overall extensibility and resistance to extension of the 135 min extensograph are 12.8 cm and 856 BU, with slightly more extensibility across Eastern areas. The average alveograph P/L ratio is 0.59, similar to 2019, but lower than 5-year averages of 0.7, and the W-value increased to 368 (10^{-4} J), up from 342 in 2019. W-values are similar across Western and Eastern areas.

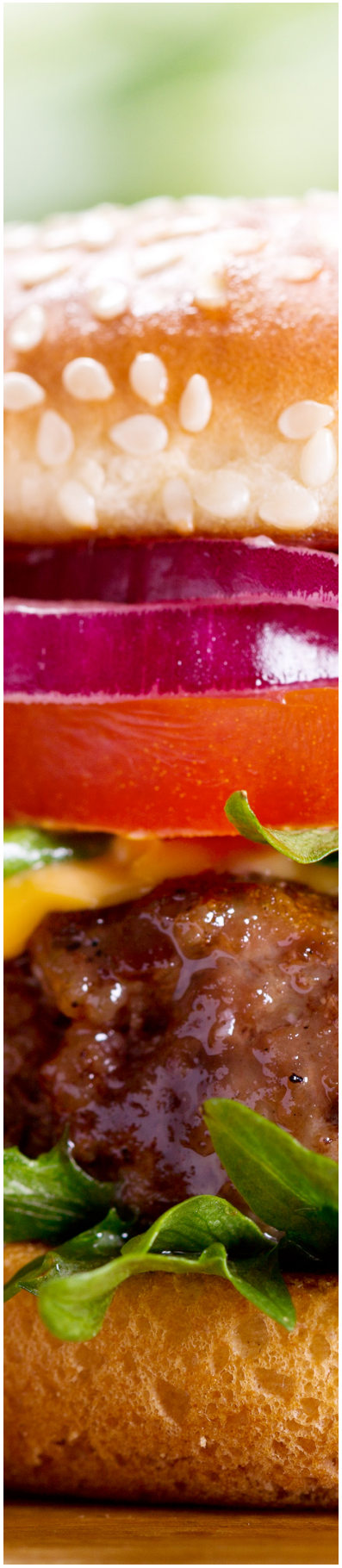
The average loaf volume is 973, smaller than 1026 in 2019, but similar to 5-year averages; Western area averages 975 cc and Eastern area averages 972 cc. Average bake absorption is 67.4%, higher than 5-year averages, with Western area at 69.3% and Eastern area at 65.7%. Bread scores are similar in both regions in 2020, with Western area slightly lower than a year ago while the Eastern area is slightly higher.

HARVEST DATA

	COMPOSITE					
	2020 BY PROTEIN[1]			2020	2019	5-Year
	Low	Med	High	Avg	Avg	Avg
WHEAT GRADE DATA:						
Test Weight (lb/bu)	62.2	61.9	61.6	61.8	60.7	61.5
(kg/hl)	81.8	81.4	81.0	81.3	79.8	80.9
Damaged Kernels (%)	0.1	0.0	0.0	0.0	1.0	0.1
Foreign Material (%)	0.0	0.0	0.0	0.0	0.0	0.0
Shrunken & Broken (%)	0.9	0.6	0.9	0.8	0.8	0.9
Total Defects (%)	1.1	0.6	0.9	0.9	1.7	1.0
Vitreous Kernels (%)	65	67	76	71	52	74
Grade	1 NS	1 NS	1 DNS	1 NS	1 NS	1 NS
WHEAT NON-GRADE DATA:						
Dockage (%)	0.6	0.5	0.6	0.6	0.6	0.5
Moisture (%)	11.6	12.0	11.9	11.9	12.7	12.1
Wheat Protein (%) 12%/0% mb	12.6/14.3	14.0/15.9	15.4/17.5	14.3/16.3	14.4/16.3	14.2/16.1
Wheat Ash (%) 14%/0% mb	1.54/1.79	1.58/1.84	1.62/1.88	1.59/1.85	1.55/1.80	1.51/1.76
1000 Kernel Weight (g)	31.4	32.2	31.2	31.5	31.0	31.2
Kernel Size (%) lg/md/sm	50/47/2	53/45/2	47/50/3	50/48/3	49/48/3	46/51/3
Single Kernel: Hardness	72	67	67	68	68	79
Weight (mg)	33.8	34.7	35.9	35.0	33.0	32.3
Diameter (mm)	2.77	2.76	2.87	2.81	2.73	2.42
Sedimentation (cc)	62.2	63.2	66.6	64.6	66.4	64.9
Wheat Falling Number (sec)	377	372	374	374	339	374
DON (ppm)	<0.5	<0.5	<0.5	<0.5	0.6	<0.5
FLOUR DATA:						
Lab Mill Extraction (%)	67.8	68.2	66.7	67.4	68.4	67.9
Color: L*	91.0	90.8	90.4	90.7	89.9	90.5
a*	-1.3	-1.2	-1.2	-1.2	-2.0	-1.1
b*	9.6	9.4	9.6	9.6	9.2	9.5
Flour Protein (%) 14%/0% mb	11.7/13.6	12.98/15.09	14.29/16.62	13.3/15.46	13.45/15.64	13.18/15.3
Flour Ash (%) 14%/0% mb	0.50/0.58	0.51/0.59	0.52/0.61	0.51/0.60	0.54/0.63	0.51/0.59
Wet Gluten (%)	28.5	32.7	36.4	33.4	34.0	34.2
Gluten Index	97	91	88	91	90	92
Flour Falling Number (sec)	386	394	385	388	361	393
Amylograph Viscosity: 65g (BU)	679	624	635	642	406	617
Damaged Starch (%)	7.6	7.1	6.8	7.1	7.3	7.3
SRC: Water/50% Sucrose	73/118	72/118	71/118	72/118	75/121	72/121
5% Lactic Acid/5% Na_2CO_3	142/107	146/102	150/98	147/102	149/107	145/103
GPI	0.63	0.66	0.69	0.67	0.65	0.66
DOUGH PROPERTIES:						
Farinograph: Peak Time (min)	6.8	7.8	8.5	7.9	8.0	7.4
Stability (min)	11.3	11.9	12.6	12.1	10.1	10.8
Absorption (%)	60.6	61.2	62.8	61.8	62.8	62.9
Alveograph: P (mm)	92	84	77	83	81	89
L (mm)	113	134	158	140	132	127
P/L Ratio	0.82	0.63	0.48	0.59	0.61	0.70
W (10^{-4} J)	351	367	377	368	342	375
Extensograph: Resistance (BU)	495/690	501/744	528/1008	513/856	458/639	481/835
(45/135 min) Extensibility (cm)	16.0/14.0	15.6/13.3	15.4/11.9	15.6/12.8	17.9/15.6	16.5/13.1
Area (cm^2)	103/128	103/129	104/157	103/142	108/132	104/143
BAKING EVALUATION:						
Pan Bread: Bake Absorption (%)	66.5	66.5	68.4	67.4	67.6	66.3
Crumb Grain and Texture (1-10)	7.5	7.8	7.6	7.7	7.7	7.9
Loaf Volume (cc)	856	935	1055	973	1026	969
PRODUCTION OF 7 STATES (%):	**24%**	**29%**	**47%**	**100%**		

[1]Protein Range: Low, <13.5%; Med, 13.5 - 14.5%; High, >14.5%.

HARVEST DATA



	WESTERN REGIONAL					
	2020 BY PROTEIN[1]			2020	2019	5-Year
	Low	Med	High	Avg	Avg	Avg
WHEAT GRADE DATA:						
Test Weight (lb/bu)	62.7	62.8	62.0	62.4	60.9	61.4
(kg/hl)	82.5	82.6	81.5	82.0	80.2	80.8
Damaged Kernels (%)	0.1	0.0	0.0	0.0	0.6	0.3
Foreign Material (%)	0.0	0.0	0.0	0.0	0.0	0.0
Shrunken & Broken (%)	1.0	0.6	1.0	0.9	0.9	1.1
Total Defects (%)	1.1	0.6	1.0	0.9	1.5	1.4
Vitreous Kernels (%)	81	87	81	82	61	80
Grade	1 DNS	1 DNS	1 DNS	1 DNS	1 NS	1 DNS
WHEAT NON-GRADE DATA:						
Dockage (%)	0.6	0.4	0.7	0.6	0.6	0.6
Moisture (%)	10.7	11.1	11.3	11.1	12.2	11.5
Wheat Protein (%) 12%/0% mb	12.6/14.3	14.1/16.1	15.6/17.7	14.4/16.4	14.4/16.4	14.5/16.5
Wheat Ash (%) 14%/0% mb	1.49/1.73	1.51/1.76	1.59/1.85	1.54/1.80	1.50/1.74	1.51/1.76
1000 Kernel Weight (g)	31.5	33.1	31.3	31.8	30.6	30.3
Kernel Size (%) lg/md/sm	42/55/3	47/50/3	43/54/3	44/53/3	44/53/3	38/59/3
Single Kernel: Hardness	75	68	65	68	68	75
Weight (mg)	34.1	34.9	37.0	35.7	33.1	32.1
Diameter (mm)	2.73	2.73	2.88	2.81	2.72	2.44
Sedimentation (cc)	62.6	64.0	66.6	65.0	66.4	65.9
Wheat Falling Number (sec)	379	365	371	372	375	383
DON (ppm)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
FLOUR DATA:						
Lab Mill Extraction (%)	67.2	67.9	66.3	66.9	68.3	68.0
Color: L*	91.0	90.8	90.6	90.7	89.9	90.4
a*	-1.4	-1.3	-1.3	-1.3	-2.1	-1.3
b*	10.0	9.7	9.8	9.8	9.5	9.7
Flour Protein (%) 14%/0% mb	11.69/13.59	13.04/15.17	14.43/16.78	13.38/15.56	13.52/15.72	13.52/15.74
Flour Ash (%) 14%/0% mb	0.50/0.58	0.49/0.57	0.51/0.60	0.51/0.59	0.53/0.61	0.53/0.62
Wet Gluten (%)	28.5	34.0	37.1	34.1	34.3	35.4
Gluten Index	95	90	82	87	88	88
Flour Falling Number (sec)	397	393	395	395	388	398
Amylograph Viscosity: 65g (BU)	752	681	698	708	510	614
Damaged Starch (%)	7.8	7.4	6.8	7.2	7.2	7.2
SRC: Water/50% Sucrose	75/121	75/123	72/121	74/122	76/123	72/122
5% Lactic Acid/5% Na_2CO_3	144/113	149/109	152/101	149/106	150/110	145/103
GPI	0.61	0.64	0.68	0.65	0.64	0.65
DOUGH PROPERTIES:						
Farinograph: Peak Time (min)	7.3	7.9	8.7	8.1	8.5	7.9
Stability (min)	10.6	10.6	12.4	11.5	9.9	10.2
Absorption (%)	61.8	62.9	64.3	63.3	63.6	63.7
Alveograph: P (mm)	100	91	82	89	85	86
L (mm)	100	125	149	130	130	132
P/L Ratio	1.00	0.73	0.55	0.68	0.65	0.65
W (10^{-4} J)	350	364	375	366	351	363
Extensograph: Resistance (BU)	447/682	435/804	469/1007	455/873	449/667	454/826
(45/135 min) Extensibility (cm)	16.5/13.2	14.2/12.1	15.3/11.6	15.4/12.1	17.8/15.8	16.7/13.4
Area (cm^2)	95/120	81/126	94/153	91/138	107/138	101/144
BAKING EVALUATION:						
Pan Bread: Bake Absorption (%)	68.1	68.8	70.1	69.3	68.6	69.0
Crumb Grain and Texture (1-10)	7.5	8.0	7.8	7.7	8.1	8.0
Loaf Volume (cc)	855	940	1055	975	1004	983
PRODUCTION OF 7 STATES (%):	**13%**	**11%**	**24%**	**48%**		

[1]Protein Range: Low, <13.5%; Med, 13.5 to 14.5%; High, >14.5%.

HARVEST DATA

	EASTERN REGIONAL					
	2020 BY PROTEIN[1]			2020	2019	5-Year
	Low	Med	High	Avg	Avg	Avg
WHEAT GRADE DATA:						
Test Weight (lb/bu)	61.5	61.3	61.3	61.3	60.4	61.6
(kg/hl)	80.9	80.6	80.6	80.7	79.4	81.0
Damaged Kernels (%)	0.1	0.0	0.1	0.1	1.3	0.4
Foreign Material (%)	0.1	0.0	0.0	0.0	0.0	0.0
Shrunken & Broken (%)	0.8	0.6	0.7	0.7	0.6	0.7
Total Defects (%)	1.0	0.6	0.8	0.8	1.9	1.1
Vitreous Kernels (%)	46	55	70	60	44	69
Grade	1 NS	1 NS	1 NS	1 NS	1 NS	1 NS
WHEAT NON-GRADE DATA:						
Dockage (%)	0.7	0.5	0.5	0.5	0.5	0.5
Moisture (%)	12.6	12.6	12.5	12.5	13.1	12.7
Wheat Protein (%) 12%/0% mb	12.5/16.5	13.9/15.8	15.2/17.3	14.2/16.2	14.3/16.3	14.2/16.1
Wheat Ash (%) 14%/0% mb	1.59/1.85	1.62/1.89	1.65/1.92	1.63/1.89	1.60/1.86	1.55/1.80
1000 Kernel Weight (g)	31.2	31.7	31.0	31.3	31.5	31.8
Kernel Size (%) lg/md/sm	60/39/1	57/41/2	51/46/3	55/43/2	55/43/2	52/46/2
Single Kernel: Hardness	69	67	69	68	68	77
Weight (mg)	33.5	34.5	34.7	34.4	32.9	33.4
Diameter (mm)	2.81	2.78	2.86	2.82	2.75	2.56
Sedimentation (cc)	61.7	62.6	66.6	64.2	66.5	64.1
Wheat Falling Number (sec)	374	376	378	376	307	368
DON (ppm)	<0.5	<0.5	<0.5	<0.5	0.9	<0.5
FLOUR DATA:						
Lab Mill Extraction (%)	68.5	68.3	67.2	67.9	68.6	68.7
Color: L*	91.0	90.8	90.3	90.6	89.8	90.3
a*	-1.2	-1.2	-1.1	-1.2	-1.9	-1.2
b*	9.2	9.2	9.5	9.3	8.9	9.2
Flour Protein (%) 14%/0% mb	11.71/13.61	12.93/15.04	14.15/16.46	13.22/15.37	13.38/15.56	13.22/15.3
Flour Ash (%) 14%/0% mb	0.51/0.59	0.52/0.60	0.53/0.62	0.52/0.61	0.55/0.63	0.53/0.62
Wet Gluten (%)	28.5	31.9	35.6	32.8	33.7	33.9
Gluten Index	99	91	94	94	93	94
Flour Falling Number (sec)	374	394	374	381	336	385
Amylograph Viscosity: 65g (BU)	597	587	572	582	309	581
Damaged Starch (%)	7.5	7.0	6.7	7.0	7.4	7.4
SRC: Water/50% Sucrose	71/114	70/115	70/115	70/115	74/119	71/119
5% Lactic Acid/5% Na_2CO_3	139/100	145/98	148/96	145/97	147/104	142/99
GPI	0.65	0.68	0.70	0.68	0.66	0.66
DOUGH PROPERTIES:						
Farinograph: Peak Time (min)	6.2	7.8	8.2	7.6	7.5	7.4
Stability (min)	12.0	12.7	12.9	12.6	10.3	11.7
Absorption (%)	59.2	60.1	61.3	60.4	62.1	62.3
Alveograph: P (mm)	84	80	71	77	77	83
L (mm)	127	139	168	149	134	133
P/L Ratio	0.66	0.58	0.42	0.51	0.57	0.62
W (10^{-4} J)	353	369	380	371	333	366
Extensograph: Resistance (BU)	549/698	544/705	588/1009	565/840	467/614	515/794
(45/135 min) Extensibility (cm)	15.5/14.9	16.5/14.1	15.5/12.2	15.8/13.4	18.0/15.5	16.9/14.7
Area (cm^2)	112/138	117/131	114/161	115/146	108/126	113/141
BAKING EVALUATION:						
Pan Bread: Bake Absorption (%)	64.6	65.0	66.7	65.7	66.8	67.5
Crumb Grain and Texture (1-10)	7.5	7.8	7.5	7.6	7.4	7.8
Loaf Volume (cc)	858	933	1055	972	1046	986
PRODUCTION OF 7 STATES (%):	**11%**	**18%**	**24%**	**52%**		

[1]Protein Range: Low, <13.5%; Med, 13.5 to 14.5%; High, >14.5%.

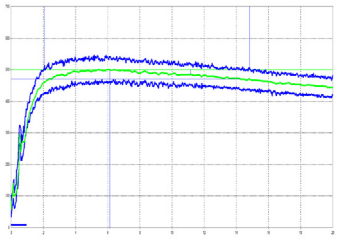
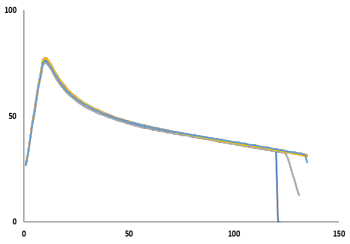
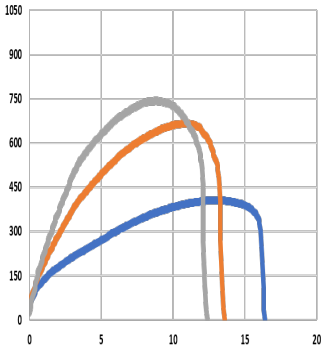
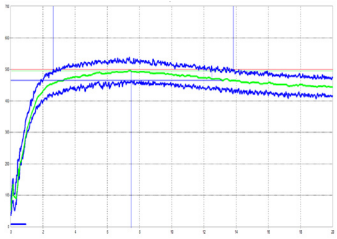
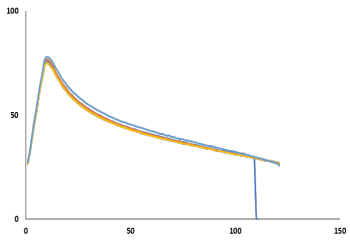
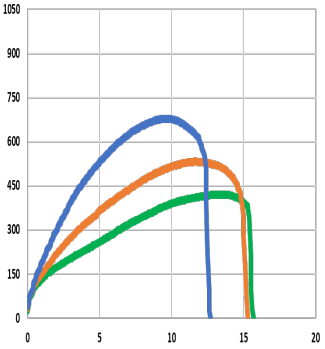
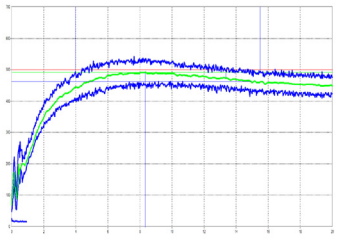
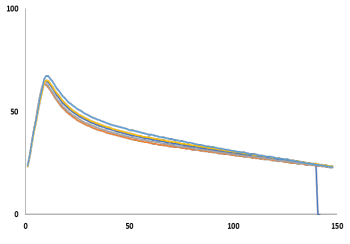
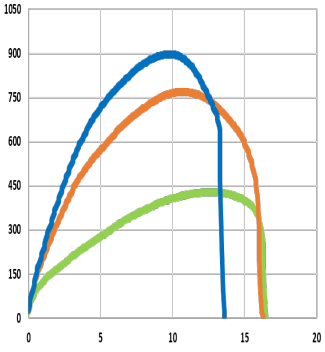
HARD RED SPRING PRODUCTION

FOR THE MAJOR PRODUCING STATES (MMT)

	2020	2019	2018	2017	2016
Idaho	0.42	0.43	0.58	0.50	0.02
Minnesota	1.96	2.17	2.52	2.06	2.02
Montana	3.39	2.75	2.61	1.31	2.02
North Dakota	7.51	7.93	8.65	5.64	7.32
Oregon	0.00	0.00	0.09	0.07	0.05
South Dakota	0.97	0.69	1.10	0.57	1.29
Washington	0.18	0.18	0.41	0.30	0.26
Seven-State Total	**14.43**	**14.15**	**15.96**	**10.44**	**12.97**
Total HRS Production	**14.43**	**14.15**	**15.98**	**10.46**	**13.37**

Based on USDA crop estimates as of September 30, 2020.

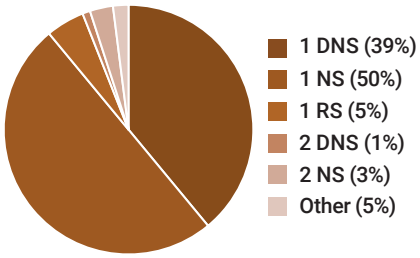
COMPOSITE DOUGH PROPERTIES

	FARINOGRAMS	ALVEOGRAMS	EXTENSOGRAMS
LOW PROTEIN			
MEDIUM PROTEIN			
HIGH PROTEIN			

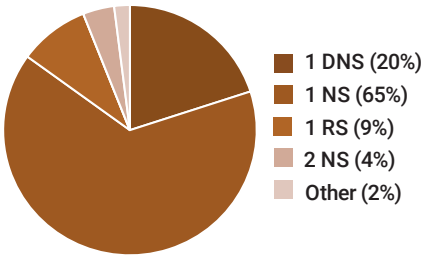
DISTRIBUTIONS BY GRADE

PROTEIN RANGE, 12% MB, DENOTED IN PARENTHESES: LOW, <13.5%; MED, 13.5-14.5%; HIGH, >14.5%

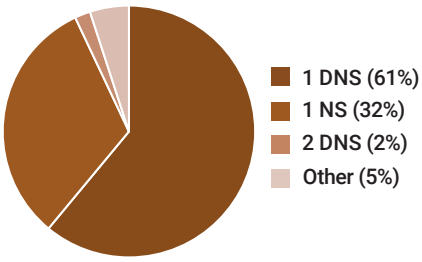
OVERALL



EASTERN REGION

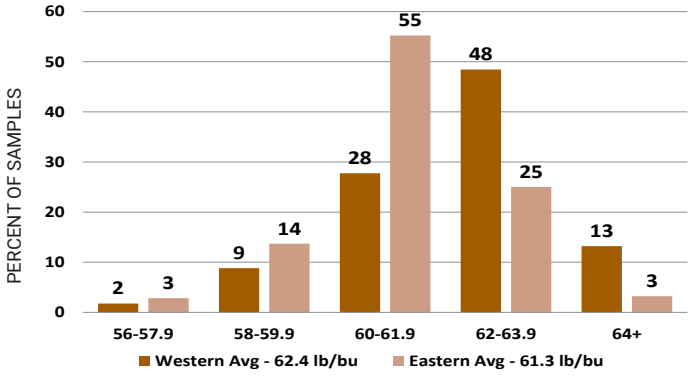


WESTERN REGION

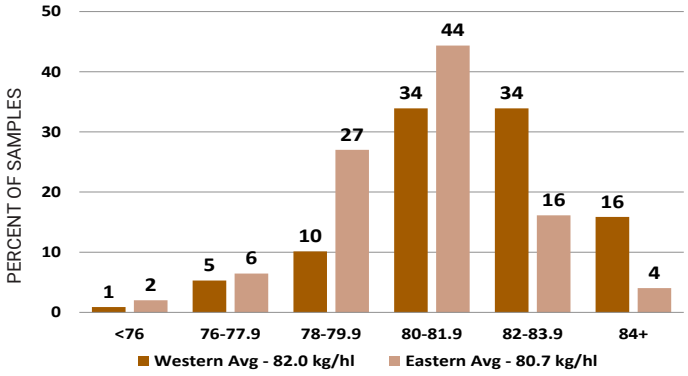


DISTRIBUTIONS

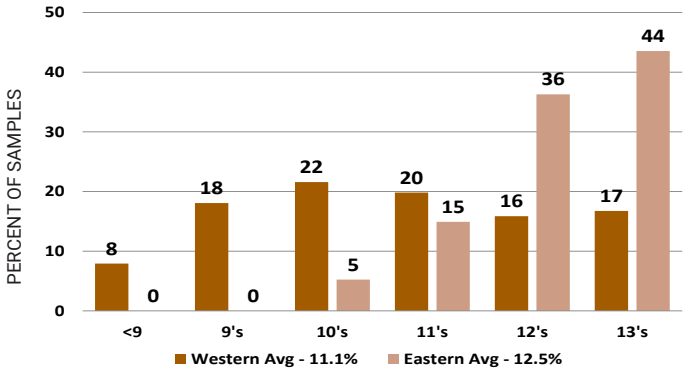
TEST WEIGHT *(Pounds/Bushel)*



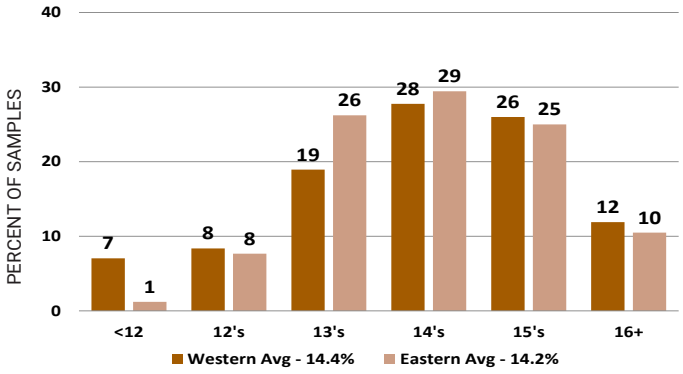
TEST WEIGHT *(Kilograms/Hectoliter)*



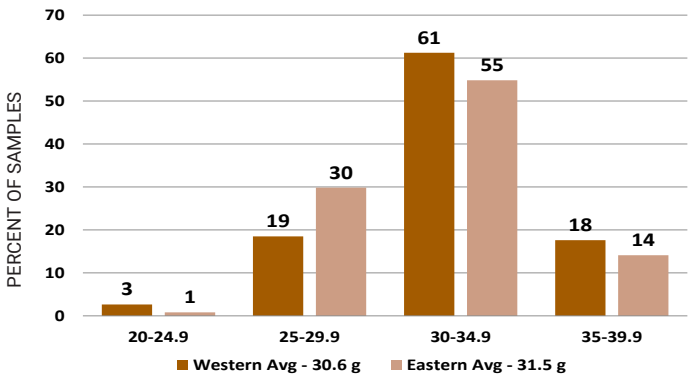
WHEAT MOISTURE *(Percent)*



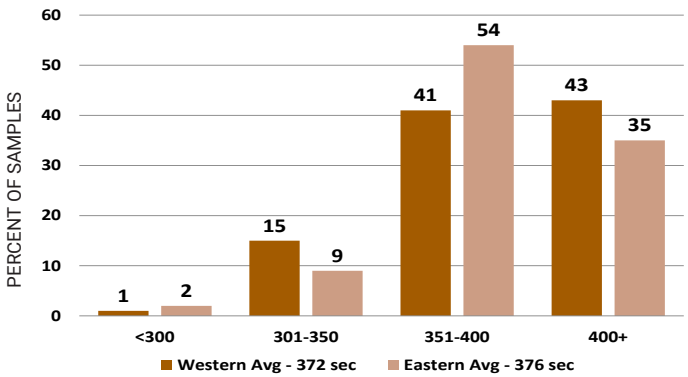
PROTEIN (12% MB) *(Percent)*



1000 KERNEL WEIGHT *(Grams)*



FALLING NUMBER *(Seconds)*



HARD WHITE

U.S. hard white (HW) wheat receives enthusiastic reviews when used for Asian noodles, whole wheat or high extraction applications, pan breads or flat breads.

For the miller, HW delivers whiter flour at higher extraction levels due to its lighter bran color. HW is a true hard wheat creating excellent granulation, maximizing course semolina production and low ash flour.

For the baker, the greatest advantage of HW wheat flour is the whiter color of the products produced. Higher extraction rates generally improve water absorption. By using ultra fine, white whole wheat flour, whole wheat bread can be produced with the color and texture of traditional bread. HW wheat flour is also lower in polyphenol oxidase (PPO), an enzyme that can cause dough browning. Lower PPO content improves the color of wet noodles and Asian steamed bread products.

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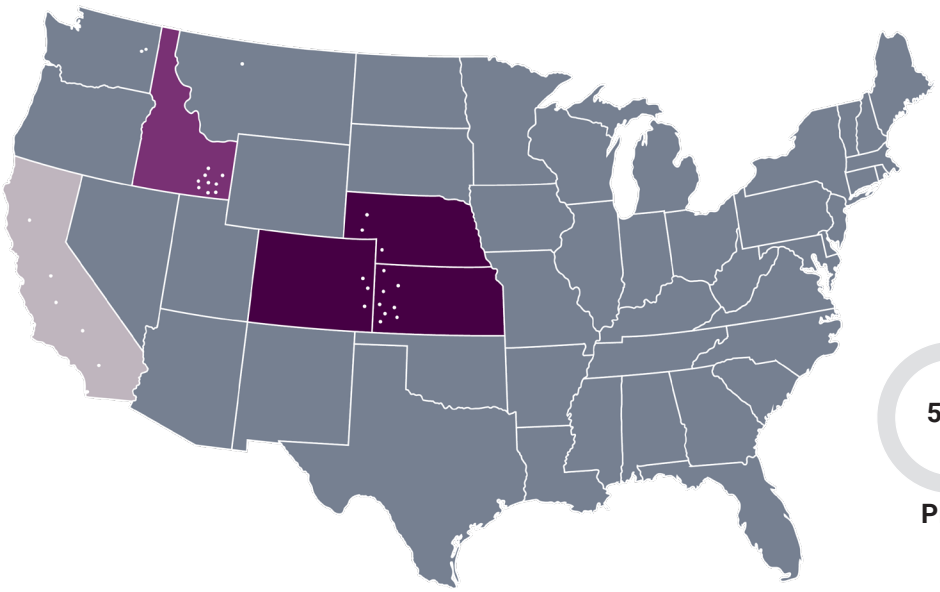
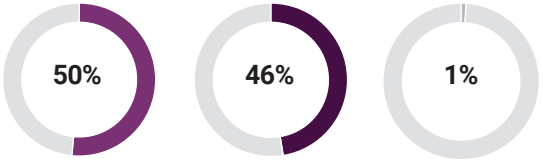
Samples collected by state and private inspection agencies; commercial wheat handlers; Plains Grains, Inc.; and state wheat commissions.

The Wheat Marketing Center (WMC) conducted the quality analyses. The Federal Inspection Service (FGIS) graded the samples. Official grade factors were determined on each sample. Non-grade factors and functionality tests were conducted on 6 composite samples categorized by growing region and protein ranges of <11.5%, 11.5 to 12.5%, 12.6 to 13.5% and >13.5%. The growing regions are highlighted on the map below. The methods are described in the Analysis Methods section of this booklet.



5
STATES SURVEYED

97%
OF TOTAL HW PRODUCTION REPRESENTED



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PERCENTAGE OF TOTAL U.S. HW PRODUCTION BY EXPORT TRIBUTARY

HARVEST SURVEY

OVERVIEW: The 2020 HW samples show good quality performance in milling, dough properties and finished products, including pan breads, Asian noodles and steamed breads. The Pacific Northwest (PNW), California and Southern Plains composites all show good bread baking potential. For Asian noodle applications, using 60% extraction patent flour is recommended to improve noodle color while maintaining noodle texture. For steamed breads, it is recommended that high protein HW flour be blended with a small portion of soft white (SW) flour to improve product quality.

HARVEST SURVEY: The 2020 HW crop was grown primarily in Idaho, Kansas, Colorado, California and Nebraska. Other states including Montana, North Dakota and South Dakota had limited production. U.S. Wheat Associates estimates 2020 HW production at 894,483 metric tons (MT), down from 2019's 979,321 MT reported by USDA.

WHEAT AND GRADE DATA: Five composites graded U.S. No. 1 with test weight ranging from 61.0 to 64.1 lb/bu (80.2 to 84.2 kg/hl). The medium protein Southern Plains graded U.S. No. 3 due to 2.1% wheat of contrasting classes. The ranges of values found in the composites are wheat moisture 8.9 to 11.0%; wheat protein 11.3 to 13.2% (12% mb); wheat ash 1.43 to 1.62% (14% mb); kernel hardness 59.0 to 81.5; and kernel diameters 2.47 to 2.86 mm. The 1000 kernel weight values of the Southern Plains medium- and high-protein composites are 29.3 and 27.5 g, respectively. All others are greater than or equal to 31.9 g. Falling number values are 396 sec or higher for all composites.

FLOUR, DOUGH AND BAKING DATA: Laboratory mill straight-grade flour extractions range 70.6 to 74.2%, L* values (whiteness) 90.7 to 92.0, flour protein 10.8 to 12.7% (14% mb), and flour ash 0.45 to 0.50% (14% mb). These values are within the historical ranges of HW flour considering the wide production area.

Flour wet gluten contents range 24.8 to 40.8% depending on flour protein content. Amylograph peak viscosities are between 714 and 1039 BU for all composites. Damaged starch values are in the range of 3.1 to 5.5%. Lactic acid SRC values range 144 to 157%, indicating medium to strong gluten strength.

Farinograph water absorptions range 55.0 to 62.4% and stability times 9.0 to 37.0 min, exhibiting medium to strong dough characteristics. HW farinograph water absorption is usually similar to that of HRW, but historically stability time is longer, indicating more tolerance to overmixing. The ranges of alveograph values are: P (59 to 108 mm); L (99 to 135 mm); and W (240 to 395 (10^{-4} J)). Extensograph data at a 135 min rest shows maximum resistance in the range of 740 to 1013 BU, extensibility 15.6 to 23.2 cm and area 153 to 246 cm^2.

All composites show good baking performance relative to protein content, with bake absorptions in the range of 59.9 to 67.4%, loaf volumes of 796 to 942 cc, and crumb grain and texture scores of 7.0 to 8.0 points.

NOODLE EVALUATION: HW flours and a control flour were evaluated for both Chinese raw noodles (white salted) and Chinese wet noodles (yellow alkaline). For Chinese raw noodles, the L* values at 0 hr of production and after 24 hr of storage at room temperature are acceptable for all samples (72 is the minimum value at 24 hr). The sensory color stability scores for PNW and Southern Plains samples are similar to or better than the control noodle of 7.0. Cooked noodle texture is softer for California composites. For Chinese wet noodles, sensory color stability scores are acceptable for parboiled noodles from all composites. The cooked noodle texture is softer for PNW composites. Overall, this year's HW samples will produce noodles with acceptable color and texture if low ash patent flour is used.

STEAMED BREAD EVALUATION: HW flours were evaluated for Asian steamed breads in comparison with a control flour. Results show all composites are acceptable for steamed bread with total scores equivalent to or better than the control flour. Blending 25% SW flour with high protein HW flour would improve overall steamed bread quality.

HARVEST DATA

	PACIFIC NORTHWEST 2020 BY PROTEIN[1]		CALIFORNIA 2020 BY PROTEIN[1]		SOUTHERN PLAINS 2020 BY PROTEIN[1]	
	Med	High	Low	High	Med	High
WHEAT GRADE DATA:						
Test Weight (lb/bu)	63.2	63.0	64.1	63.2	61.0	61.0
(kg/hl)	83.1	82.8	84.2	83.1	80.2	80.2
Damaged Kernels (%)	0.0	0.0	0.0	0.0	0.0	0.0
Foreign Material (%)	0.0	0.0	0.0	0.0	0.0	0.2
Shrunken & Broken (%)	0.4	0.2	0.5	0.5	0.3	1.5
Total Defects (%)	0.4	0.2	0.5	0.5	0.3	1.7
Grade	1 HW	1 HW	1 HW	1 HW	3 HW	1 HW
WHEAT NON-GRADE DATA:						
Dockage (%)	0.5	0.4	0.1	0.0	0.3	0.2
Moisture (%)	9.1	8.9	9.2	9.1	11.0	10.3
Wheat Protein (%) 12%/0% mb	12.2/13.9	13.2/15.0	11.3/12.8	12.6/14.3	12.1/13.8	12.7/14.4
Wheat Ash (%) 14%/0% mb	1.53/1.78	1.59/1.84	1.47/1.71	1.43/1.66	1.49/1.73	1.62/1.80
1000 Kernel Weight (g)	31.9	35.9	33.5	34.1	29.3	27.5
Kernel Size (%) lg/md/sm	81/18/1	84/16/0	81/19/0	76/23/1	61/37/2	45/52/3
Single Kernel: Hardness	69.8	67.3	81.5	78.7	59.0	67.3
Weight (mg)	33.4	39.9	33.2	34.6	28.5	28.5
Diameter (mm)	2.6	2.9	2.7	2.7	2.5	2.5
Sedimentation (cc)	35.3	38.5	26.8	33.7	33.8	39.1
Wheat Falling Number (sec)	437	428	396	445	467	429
FLOUR DATA:						
Lab Mill Extraction (%)	73.0	74.2	71.7	72.7	71.3	70.6
Color: L*	91.6	91.6	92.0	91.7	91.1	90.7
a*	-1.8	-1.6	-1.8	-1.7	-1.9	-2.0
b*	8.8	8.5	8.3	8.4	8.6	9.4
Flour Protein (%) 14%/0% mb	11.4/13.3	12.7/14.7	10.8/12.6	12.2/14.2	11.0/12.7	11.8/13.7
Flour Ash (%) 14%/0% mb	0.48/0.56	0.5/0.58	0.46/0.54	0.47/0.55	0.45/0.52	0.45/0.52
Wet Gluten (%)	24.8	29.5	29.4	40.8	28.3	28.4
Gluten Index	96	94	98	87	90	92
Flour Falling Number (sec)	426	399	421	473	457	440
Amylograph Viscosity 65 g (BU)	967	857	714	1020	1029	1039
Damaged Starch (%)	5.3	4.7	5.5	4.9	4.3	3.1
SRC: Water/50% Sucrose	63/111	63/111	68/111	69/117	56/93	59/93
5% Lactic Acid/5% Na_2CO_3	148/82	150/80	144/94	157/99	147/69	151/73
GPI	0.73	0.77	0.68	0.89	0.84	0.87
DOUGH PROPERTIES:						
Farinograph: Peak Time (min)	7.5	6.9	2.8	6.4	5.8	9.3
Stability (min)	10.5	11.0	13.2	37.0	9.0	24.9
Absorption (%)	60.4	61.6	60.6	62.4	55.0	55.9
Alveograph: P (mm)	87	77	93	108	59	74
L (mm)	127	128	99	119	135	114
P/L Ratio	0.69	0.60	0.94	0.91	0.44	0.65
W (10^{-4} J)	327	295	304	395	240	285
Extensograph: Resistance (BU)	546/930	517/912	546/740	538/841	481/811	632/1013
(45/135 min) Extensibility (cm)	19.3/17.4	20.3/20.2	22.3/17.9	25.0/23.2	18.2/15.6	22.8/15.9
Area (cm^2)	136/197	132/221	161/166	171/246	110/153	183/192

[1]Protein Range: Low, <11.5%; Med, 11.5 - 12.5%; High, 12.6 - 13.5%; Very high, >13.5%.

	PACIFIC NORTHWEST 2020 BY PROTEIN[1]		CALIFORNIA 2020 BY PROTEIN[1]		SOUTHERN PLAINS 2020 BY PROTEIN[1]	
	Med	High	Low	High	Med	High
BAKING EVALUATION:						
Pan Bread: Bake Absorption (%)	65.4	66.4	65.6	67.4	59.9	60.9
Crumb Grain and Texture (1-10)	7.5	8.0	7.0	7.0	7.0	7.0
Loaf Volume (cc)	932	942	796	798	876	924
CHINESE RAW NOODLE-MAKING QUALITY:						
Color at 0/24 hr: L*	83.0/74.9	81.8/72.8	84.5/73.6	81.6/69.9	83.6/74.4	84.6/76.8
a*	-0.1/0.9	0.4/1.3	-0.2/0.1	0.0/0.5	-0.1/0.5	-0.1/0.3
b*	20.8/26.2	20.0/24.4	18.1/21.3	21.8/21.7	19.4/23.4	19.3/24.9
Change in L* (0-24 hr)	8.1	9.0	10.9	11.7	9.2	7.8
Cooking Yield (5 min, %)	114	113	117	122	124	111
Sensory Color Stability Score	7.2	6.8	6.0	5.0	7.2	7.5
Instrumental Texture:						
Firmness (g)	1180	1158	1091	1097	1124	1357
Springiness (%)	94.8	94.9	96.2	95.7	95.1	95.4
Cohesiveness	0.67	0.67	0.69	0.69	0.65	0.65
Chewiness (g)	746	738	720	719	692	840
CHINESE WET NOODLE-MAKING QUALITY:						
Uncooked Color at 0/24 hr: L*	81.1/72.9	78.7/68.0	80.7/69.3	82.3/71.6	80.3/70.6	81.1/71.5
a*	-1.7/-0.9	-1.5/-0.6	-2.1/-1.1	-1.7/-1.4	-1.7/-0.7	-1.7/-0.9
b*	23.6/25.1	23.8/22.5	21.9/22.5	19.6/20.6	23.4/24.3	24.0/25.4
Change in L* (0-24 hr)	8.2	10.7	11.4	10.7	9.7	9.6
Parboiled Color at 0/24 hr: L*	78.6/79.1	77.5/77.5	78.5/77.9	79.8/78.9	79.2/79.5	79.4/79.7
a*	-1.9/-2.9	-1.2/-2.4	-2.0/-2.9	-1.9/-3.1	-2.1/-2.7	-2.0/-2.8
b*	29.2/27.0	27.7/25.1	27.7/25.2	28.0/25.3	28.0/26.3	29.3/27.4
Cooking Yield (1.5 min, %)	39	42	40	38	38	35
Uncooked Color Stability Score	7.2	6.2	6.0	5.3	6.8	6.9
Parboiled Color Stability Score	7.2	6.8	7.1	7.1	7.3	7.4
Instrumental Texture:						
Firmness (g)	930	942	1030	1108	1069	1073
Springiness (%)	96.6	97.3	95.7	96.5	98.7	99.2
Cohesiveness	0.62	0.64	0.64	0.67	0.58	0.59
Chewiness (g)	556	585	634	716	760	650
ASIAN-TYPE STEAMED BREAD EVALUATION:						
Specific Volume (ml/g)	2.9	2.0	2.5	3.0	2.9	2.1
Total Score	72.0	69.9	71.6	74.0	72.3	69.9

[1]Protein Range: Low, <11.5%; Med, 11.5 - 12.5%; High, 12.6 - 13.5%; Very high, >13.5%.

HARD WHITE PRODUCTION

FOR THE MAJOR PRODUCING STATES (MMT)

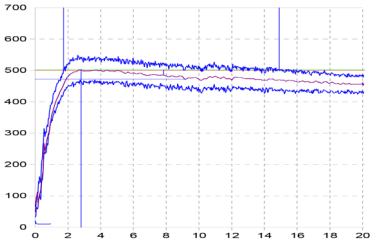
	2020	2019	2018	2017	2016
California	0.01	0.01	0.02	0.01	0.02
Colorado	0.03	0.16	0.17	0.26	0.20
Idaho	0.33	0.31	0.36	0.23	0.20
Kansas	0.23	0.28	0.23	0.27	0.38
Nebraska	0.04	0.09	0.09	0.09	0.08
Five-State Total	**0.63**	**0.85**	**0.87**	**0.87**	**0.88**
Total HW Production	**0.65**	**0.87**	**0.89**	**1.01**	**0.61**

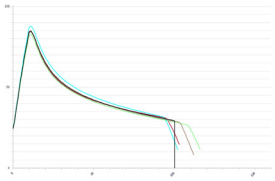
Based on USDA crop estimates as of September 30, 2020.

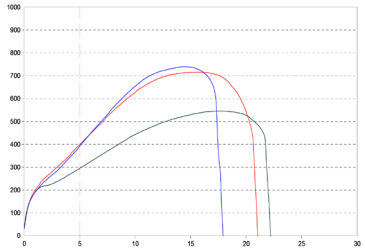
DOUGH PROPERTIES

FARINOGRAMS | **ALVEOGRAMS** | **EXTENSOGRAMS**

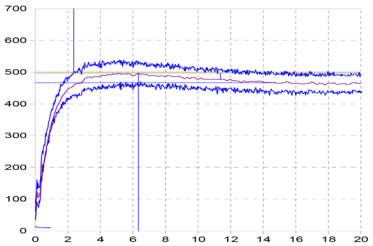
CALIFORNIA LOW

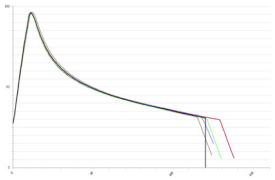


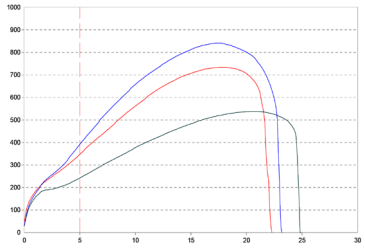




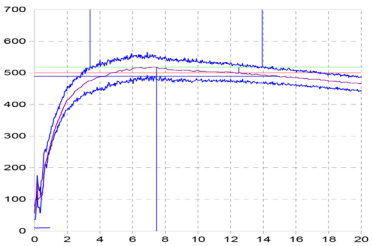
CALIFORNIA HIGH

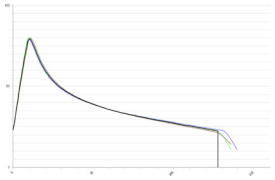


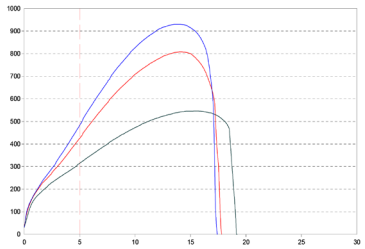




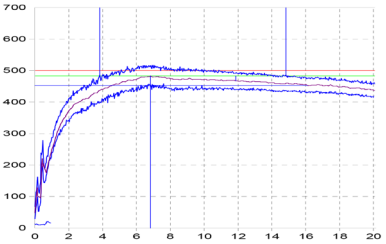
PNW MED

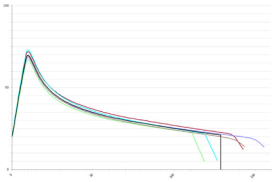


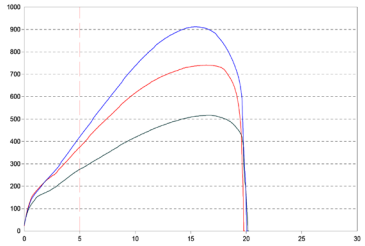


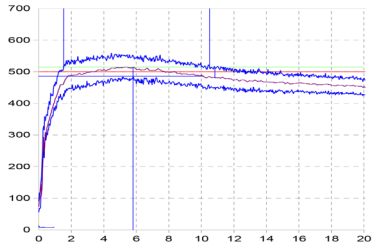
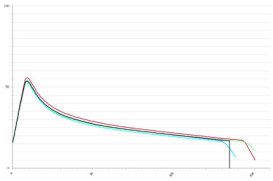
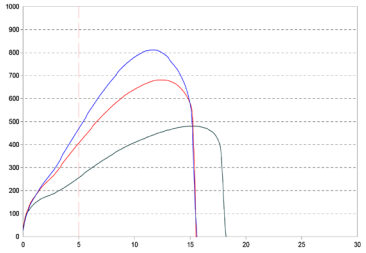
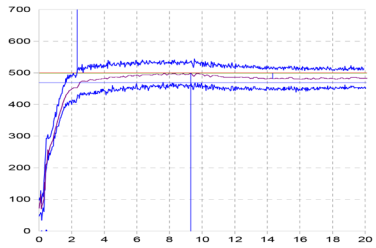
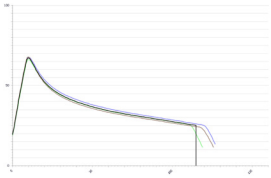
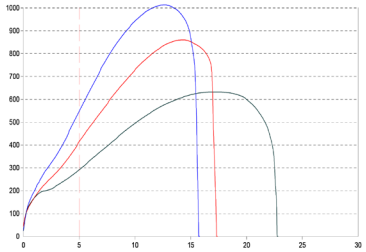


PNW HIGH







	FARINOGRAMS	ALVEOGRAMS	EXTENSOGRAMS
SOUTHERN PLAINS MEDIUM			
SOUTHERN PLAINS HIGH			

SOFT WHITE

From specialty products such as sponge cakes or Asian noodles to blending with HRS for improving bread color, U.S. soft white (SW) wheat flour has the versatility to improve the quality of a wide variety of products.

For the miller, SW delivers excellent results. Arriving at the mill with an average moisture of less than 10%, an average test weight of more than 80 hectoliter mass and a low quantity of screenings, SW wheat provides the millers every opportunity for high flour extraction.

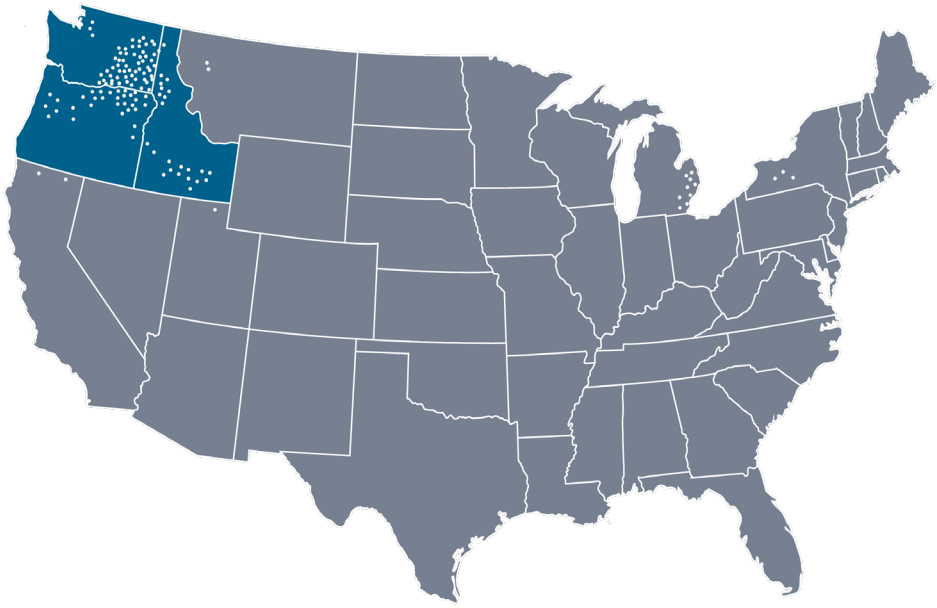
For the baker, low moisture content creates an advantage by increasing added water volume while optimizing water absorption and product quality to the consumer. The finer particle size may increase the rate of water absorption, decreasing mix time and improving production efficiencies. With the fine particle size and starch characteristics, SW flour creates a unique and tender texture for many end-products.

389 SOFT WHITE

95 WHITE CLUB

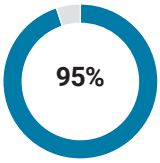
Samples collected from state, private grain inspection agencies and commercial wheat handling operations.

Wheat Marketing Center (WMC) conducted wheat and flour quality testing and analyses. Federal Grain Inspection Service (FGIS) graded and tested wheat protein content Official grade, protein, moisture, 1000 kernel weight and falling number tests were determined on each sample. The remaining tests were conducted on 3 composite samples categorized by protein ranges of <9.0%, 9.0 to 10.5%, >10.5% and one composite of all White Club (Club) samples. The growing region is highlighted on the map below. The methods are described in the Analysis Methods section of this booklet.



3
STATES SURVEYED

95%
OF TOTAL SW PRODUCTION REPRESENTED



PNW

PERCENTAGE OF TOTAL U.S. SW PRODUCTION BY EXPORT TRIBUTARY

HARVEST SURVEY

OVERVIEW: The 2020 Pacific Northwest (PNW) SW wheat and Club harvest produced another fine crop with good test weight and finished product characteristics. SW is especially suited for use in cakes, pastries, cookies and snack foods. The high protein segment of the SW crop provides opportunities in blends for crackers, Asian noodles, steamed breads, flat breads and pan breads. Club is typically used in a Western White blend with SW and is used for cakes and delicate pastries.

WEATHER AND HARVEST: The PNW had excellent growing conditions for the 2020 SW crop. There was adequate soil moisture at planting, and while most of the area received above average rainfall during winter and spring, some areas had less moisture. Spring planting conditions were ideal leading to excellent spring wheat growing conditions. Timely May/June rains produced generally excellent yields. Yields for both spring and winter wheat were above average in Washington and Idaho and average for Oregon. USDA estimates total 2020 PNW SW production at a record 7.2 million metric tons (MMT). Of that, Club is estimated to account for 0.26 MMT, higher than last year.

WHEAT AND GRADE DATA: The overall average grade of the 2020 SW and Club crops is U.S. No. 1. SW test weights range from 61.5 to 62.3 lb bu (80.9 to 81.9 kg/hl) with an average of 61.9 lb/bu (81.4 kg/hl); Club average test weight is 61.6 lb/bu (81.0 kg/hl). The range of values found for SW composites are: wheat moisture 9.1 to 9.5%; wheat protein 8.4 to 11.4% (12% mb); wheat ash 1.31 to 1.40% (14% mb); kernel hardness 29.9 to 34.0; kernel diameters 2.74 to 2.80 mm; 1000 kernel weights (TKW) 35.4 to 36.9 g; and falling number values of 317 sec or higher for all protein composites. The Club averages are wheat moisture 8.5%; wheat protein 9.8% (12% mb); wheat ash 1.27% (14% mb); kernel hardness 31.4; kernel diameter 2.61 mm; TKW 32.3 g; and a falling number value of 322 sec.

FLOUR, DOUGH AND BAKE DATA: Laboratory mill straight-grade flour extractions for SW range 71.6 to 73.0%, L* values (whiteness) 91.7 to 93.0, flour protein 7.6 to 10.4% (14% mb), and flour ash 0.42 to 0.44% (14% mb). These values are within the historical ranges of SW flour. Club flour has an average laboratory mill straight-grade flour extraction of 74.7%, L* value of 92.6, flour protein of 8.9% (14% mb), and flour ash of 0.48% (14% mb).

SW flour wet gluten contents range 17.0 to 27.4% depending on flour protein content with amylograph peak viscosities between 401 and 511 BU. Damaged starch values are in the range of 3.8 to 4.6%. Lactic acid SRC values range 99 to 116%, indicating weak to medium gluten strength. Water SRC values range 53 to 56%, indicating low water holding capacity. Club averages are wet gluten content 13.1%; amylograph peak viscosity 439 BU; damaged starch 3.8%; lactic acid SRC value 79%; and water SRC value 54%. The data shows Club to have very weak gluten strength and low water holding capacity.

SW farinograph water absorptions range 51.1 to 53.0% with stability times of 1.5 to 2.5 min, showing desirable weak dough characteristics. The low farinograph water absorptions are typical for SW and in line with the water SRC values. The ranges of alveograph values are: P values 35 to 38 mm; L values 95 to 143 mm; and W values 85 to 101 (10^{-4} J). Extensograph data at 45 min show maximum resistance in the range of 212 to 219 BU, extensibility 16.1 to 21.3 cm and area 56 to 68 cm^2. Average Club farinograph water absorption is 49.2% with a stability of 1.1 min, showing very weak dough characteristics typical for Club. Additional Club averages include: alveograph P, L and W values of 21 mm, 101 mm, and 37(10^{-4} J), respectively; and extensograph 45 min maximum resistance, extensibility, and area of 125 BU, 14.9 cm, and 23 cm^2, respectively.

SW sponge cake volumes range 1088 to 1171 cc, depending on protein content, with a weighted average of 1120 cc. Total sponge cake score is 39 to 55 with a weighted average of 45. Club sponge cake volume is 1129 cc with a total score of 47. SW cookie diameters are 8.7 to 9.2 cm with spread factors of 9.6 to 11.4. Club cookie diameter and spread factor are 8.7 and 10.2 cm, respectively.

CHINESE SOUTHERN-TYPE STEAMED BREAD: Each flour was made into southern-type steamed bread and compared to a control flour. SW specific volumes are 1.4 to 2.1 mL/g with total scores equivalent to or better than the control (the total score of the control is 70.0). Club specific volume is 2.1 mL/g with a total score below the control.

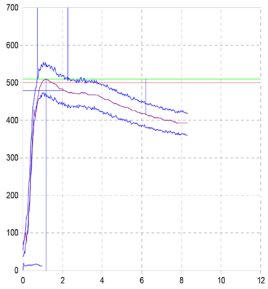
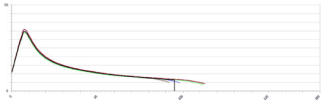
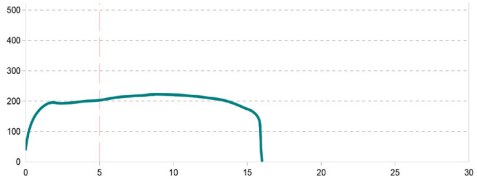
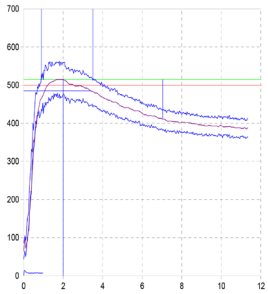
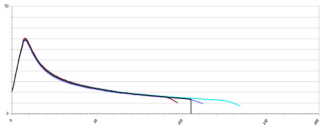
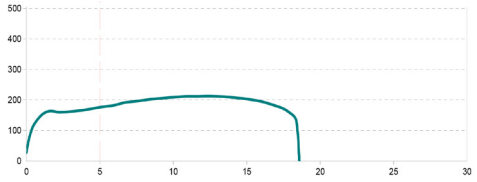
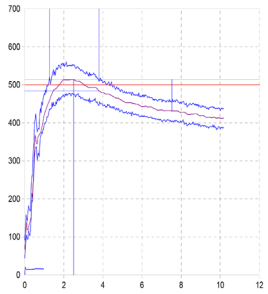
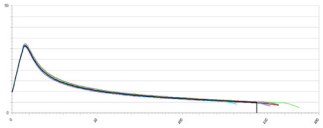
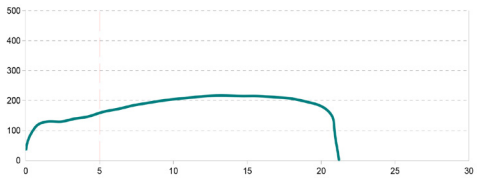
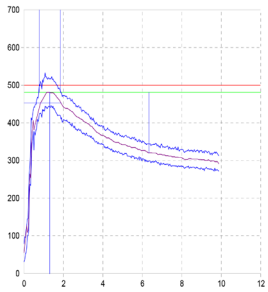
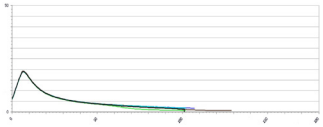
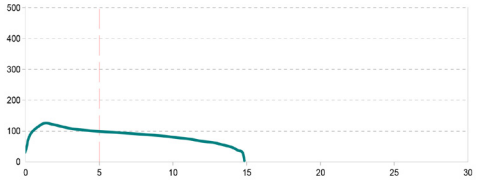
HARVEST DATA

	2020 SW BY PROTEIN[1]			2020		2019		5-Year Avg.	
	Low	Med	High	SW Avg	Club Avg	SW Avg	Club Avg	SW	Club
WHEAT GRADE DATA:									
Test Weight (lb/bu)	61.5	62.3	61.6	61.9	61.6	61.6	60.6	60.9	60.0
(kg/hl)	80.9	81.9	81.0	81.4	81.0	81.0	79.7	80.0	78.9
Damaged Kernels (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Foreign Material (%)	0.0	0.1	0.0	0.0	0.0	0.1	0.2	0.0	0.1
Shrunken & Broken (%)	0.4	0.4	0.6	0.4	0.8	0.5	0.2	0.6	1.1
Total Defects (%)	0.4	0.5	0.6	0.5	0.9	0.5	0.4	0.7	1.2
Grade	1 SW	1 SW	1 SW	1 SW	1 WC	1 SW	1 WC	1 SW	1 WC
WHEAT NON-GRADE DATA:									
Dockage (%)	0.5	0.4	0.5	0.5	0.5	0.4	0.6	0.5	0.6
Moisture (%)	9.5	9.1	9.1	9.2	8.5	9.9	9.5	9.2	8.5
Wheat Protein (%) 12%/0% mb	8.4/9.5	9.7/11.0	11.4/13.0	9.8/11.1	9.8/11.1	10.0/11.4	9.8/11.1	10.0/11.3	10.1/11.4
Wheat Ash (%) 14%/0% mb	1.33/1.55	1.31/1.52	1.40/1.63	1.35/1.57	1.27/1.44	1.35/1.57	1.29/1.50	1.36/1.58	1.30/1.52
1000 Kernel Weight (g)	36.9	36.4	35.4	36.3	32.3	36.4	31.4	34.9	30.8
Kernel Size (%) lg/md/sm	94/6/0	89/11/0	87/13/0	90/10/0	83/17/0	89/11/0	76/23/1	85/14/1	73/26/1
Single Kernel: Hardness	29.9	32.8	34.0	32.2	31.4	21.8	19.9	28.5	29.9
Weight (mg)	39.7	39.3	38.2	39.1	32.8	40.0	34.9	37.7	33.5
Diameter (mm)	2.8	2.8	2.7	2.8	2.6	2.8	2.6	2.7	2.5
Sedimentation (cc)	13.9	22.5	27.8	21.7	11.0	17.4	12.5	16.1	12.0
Wheat Falling Number (sec)	317	325	342	323	322	317	355	327	342
FLOUR DATA:									
Lab Mill Extraction (%)	72.9	73.0	71.6	72.6	74.7	72.1	72.8	73.1	73.9
Color: L*	91.7	93.0	92.8	92.6	92.6	92.9	92.6	92.5	92.2
a*	-2.2	-2.1	-2.0	-2.1	-2.0	-2.1	-2.0	-2.1	-2.1
b*	8.5	8.1	7.9	8.1	8.0	8.2	8.2	7.9	8.0
Flour Protein (%) 14%/0% mb	7.6/8.8	8.6/10.0	10.4/12.1	8.8/10.2	8.9/10.3	8.9/10.3	8.9/10.3	8.8/10.2	8.9/10.3
Flour Ash (%) 14%/0% mb	0.43/0.50	0.42/0.49	0.44/0.51	0.43/0.50	0.48/0.56	0.45/0.52	0.47/0.55	0.43/0.50	0.43/0.52
Wet Gluten (%)	17.0	22.3	27.4	22.3	13.1	24.5	21.2	23.6	21.5
Gluten Index	93	83	79	84	38	76	58	70	42
Flour Falling Number (sec)	349	360	388	364	365	330	347	358	372
Amylograph Viscosity 65 g (BU)	401	465	511	461	439	485	523	497	524
Damaged Starch (%)	4.6	4.3	3.8	4.3	3.8	3.7	3.2	3.9	3.5
SRC: Water/50% Sucrose	53/98	53/102	56/100	54/101	54/96	52/91	50/90	54/97	52/93
5% Lactic Acid/5% Na_2CO_3	99/78	105/77	116/76	106/77	79/74	110/92	81/87	105/79	80/76
GPI	0.56	0.59	0.66	0.60	0.47	0.60	0.46	0.60	0.48
DOUGH PROPERTIES:									
Farinograph: Peak Time (min)	1.2	2.0	2.5	1.9	1.3	1.7	1.2	2.5	1.6
Stability (min)	1.5	2.6	2.5	2.3	1.1	2.6	1.5	2.8	1.4
Absorption (%)	51.1	52.3	53.0	52.2	49.2	52.2	50.2	52.8	51.2
Alveograph: P (mm)	38	38	35	37	21	30	18	37	26
L (mm)	95	105	143	112	101	129	102	101	76
P/L Ratio	0.40	0.36	0.24	0.23	0.21	0.23	0.18	0.39	0.37
W (10^{-4} J)	85	95	101	94	37	85	35	91	43
Extensograph: Resistance (BU)	219	212	216	215	125	238	142	208	114
(45 min) Extensibility (cm)	16.1	18.7	21.3	18.7	14.9	20.5	20.1	18.0	17.0
Area (cm^2)	56	61	68	62	23	74	40	57	28
BAKING EVALUATION:									
Sponge Cake: Volume (cc)	1171	1112	1088	1120	1129	1104	1141	1148	1186
Score	55	44	39	45	47	44	53	46	49
Cookie: Diameter (cm)	8.7	8.7	8.7	8.7	9.2	8.8	9.0	8.8	9.2
Spread Ratio (width/height)	10.2	10.2	9.6	10.0	11.4	10.2	11.9	9.7	11.5
Pan Bread: Bake Absorption (%)[2]			58.0						
Crumb Grain and Texture (1-10)[2]			6.5						
Loaf Volume (cc)[2]			754						
CHINESE SOUTHERN-TYPE STEAMED BREAD EVALUATION:									
Specific Volume (ml/g)	1.4	2.1	1.7	1.8	2.1	2.0	2.1	2.1	2.2
Total Score	69.3	73.3	70.0	71.5	65.6	69.0	62.0	67.0	64.4
PRODUCTION OF 3 STATES (%)	**24%**	**51%**	**25%**	**100%**					

[1]Protein Range: Low, <9.0%; Medium, 9.0 - 10.5%; High, >10.5%.

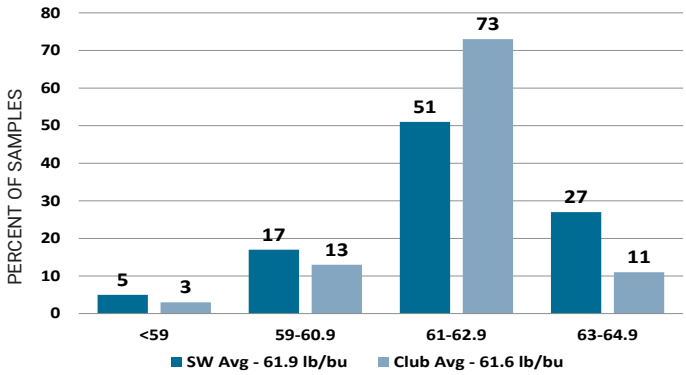
[2]Bread Bake for High Protein SW only.

DOUGH PROPERTIES

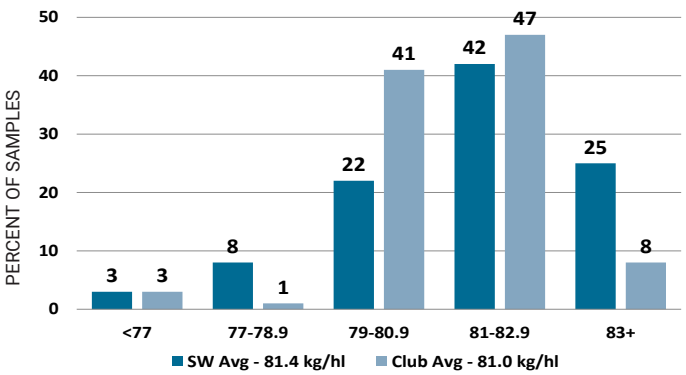
	FARINOGRAMS	ALVEOGRAMS	EXTENSOGRAMS
LOW PROTEIN			
MEDIUM PROTEIN			
HIGH PROTEIN			
CLUB			

DISTRIBUTIONS

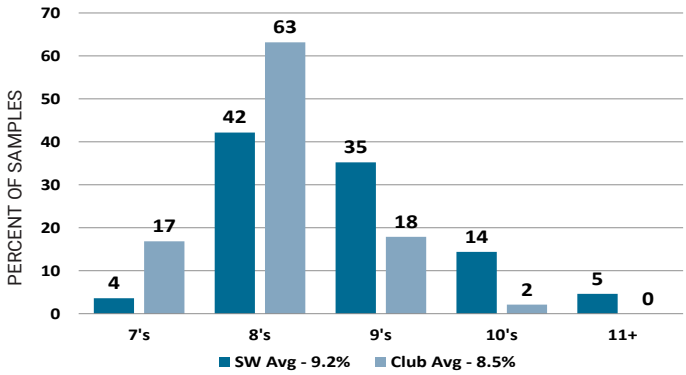
TEST WEIGHT *(Pounds/Bushel)*



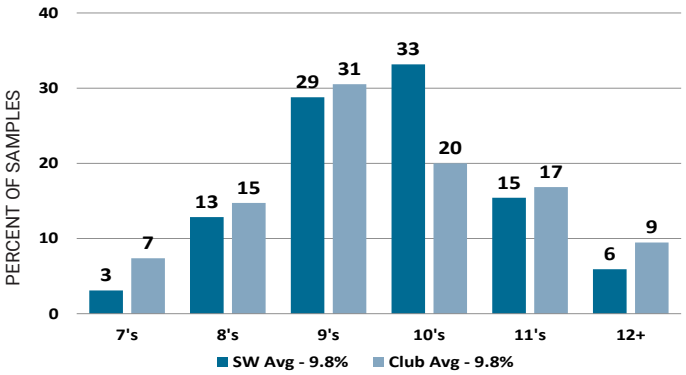
TEST WEIGHT *(Kilograms/Hectoliter)*



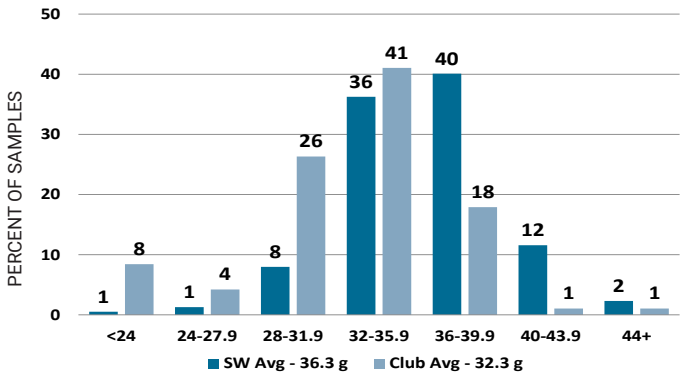
WHEAT MOISTURE *(Percent)*



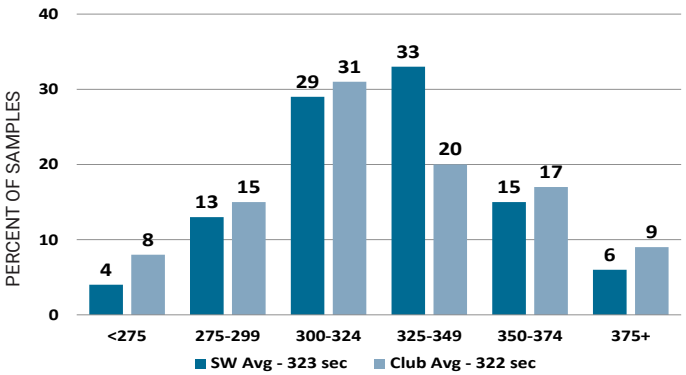
PROTEIN (12% MB) *(Percent)*



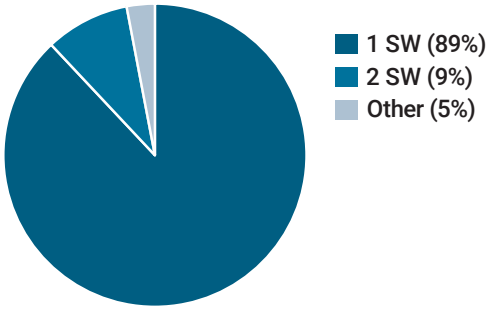
1000 KERNEL WEIGHT *(Grams)*



FALLING NUMBER *(Seconds)*



DISTRIBUTION BY GRADE



SOFT WHITE PRODUCTION

FOR THE MAJOR PRODUCING STATES (MMT)

	2020		2019		2018		2017		2016	
	SW	CLUB	SW	CLUB	SW	CLUB	SW	CLUB	SW	CLUB
Washington	3.79	0.20	3.10	0.13	2.96	0.31	2.79	0.30	3.09	0.40
Oregon	1.19	0.01	1.17	0.01	1.17	0.04	1.13	0.02	0.95	0.02
Idaho	1.96	0.04	1.60	0.02	1.53	0.02	1.37	0.04	1.72	0.05
Three-State Total	**6.94**	**0.26**	**5.87**	**0.17**	**5.67**	**0.37**	**5.28**	**0.36**	**5.76**	**0.46**
Three-State Total SW	**7.20**		**6.04**		**6.04**		**5.64**		**6.22**	
Total SW Production	**7.60**		**6.60**		**6.50**		**6.20**		**6.90**	

Based on USDA crop estimates as of September 30, 2020.

SOFT RED WINTER

U.S. soft red winter (SRW) wheat, commonly used for specialty products such as sponge cakes, cookies, crackers and other confectionary products, adds value to the miller and baker as a blending wheat.

For the miller, SRW helps diversify types of flour produced to improve the quality of many products.

For the baker, the lower moisture content of the flour produced with SRW creates an advantage by increasing the added water volume while optimizing water absorption and product quality to the consumer.

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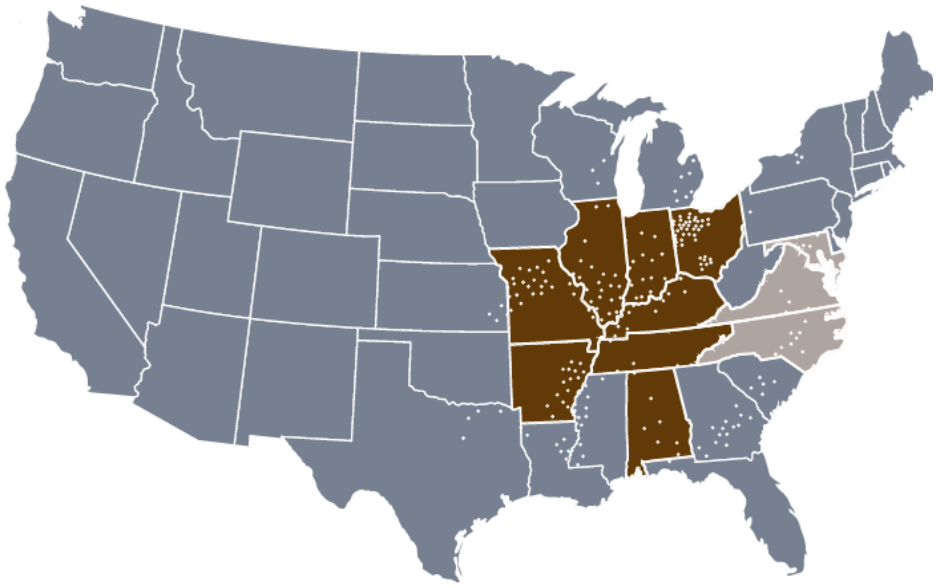
Samples collected from elevators in 18 reporting areas.

Great Plains Analytical Laboratory in Kansas City, Missouri, collected the samples and conducted the quality analyses. Test weight, moisture, protein, 1000 kernel weight, wheat ash and falling number were determined on each sample, and DON on a portion of the samples. The remaining tests were determined on 18 composite samples. Results were weighted by estimated production for each reporting area and combined into Composite, East Coast and Gulf averages. Gulf states and East Coast states are highlighted on the map below. The methods are described in the Analysis Methods section of this booklet.

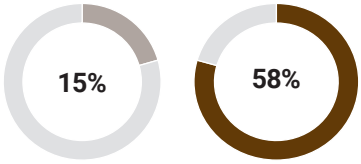


11

STATES SURVEYED

73%

OF TOTAL SRW PRODUCTION REPRESENTED



PERCENTAGE OF TOTAL U.S. SRW PRODUCTION BY EXPORT TRIBUTARY

HARVEST SURVEY

OVERVIEW: The SRW production region experienced generally good growing conditions in the 2020 crop year. There were pockets of lower falling numbers from the East Coast, but overall, buyers should be extremely happy with the quality of the entire 2020 SRW crop, especially the excellent characteristics for soft wheat products in Gulf supplies. Buyers are encouraged to review their quality specifications to ensure that their purchases meet their expectations.

WEATHER AND HARVEST:
SRW is grown over a wide area of the eastern United States. The area seeded to SRW in fall 2019 for the 2020 harvest is estimated by USDA at 5.63 million acres (2.28 million hectares), up from 5.54 million acres (2.24 million hectares) seeded for the 2019 harvest and below the 5-year average. The 2020 SRW production, estimated at 7.54 million metric tons (MMT), is up from 6.50 MMT in 2019 but below the five-year average of 8.28 MMT.

Planting started at a normal pace the first week of September 2019 with similar progress as the five-year average. Crop emergence was slightly ahead of the prior year and about equal to the 5-year average. In the six SRW survey states where USDA estimates wheat crop conditions, by late fall the winter wheat crop was rated 51% good to excellent and 88% fair to excellent. Much of the SRW growing area received plentiful moisture through the winter and spring; late spring freezes impacted yields in Ohio, Kentucky and the East Coast states. Harvest began slowly at the end of May due to a cool, wet spring. By mid-June, however, hot, dry conditions prevailed, and harvest proceeded rapidly, finishing in most areas somewhat ahead of the five-year average pace.

WHEAT AND GRADE DATA: The overall average grade of the samples collected for the 2020 SRW harvest survey is U.S. No. 2. The average test weight for the Gulf of 59.8 lb/bu (78.7 kg/hl) and East Coast of 59.3 lb/bu (78.0 kg/hl) are both higher than 2019 and 5-year averages.

Total Defects for the East Coast average of 1.5% is lower than last year and above the 5-year average, indicating that damaged and shrunken and broken kernels are slightly higher than usual in that portion of the crop. The Gulf Total Defects is 0.6%, significantly lower than 2019 and 5-year averages. Dockage and moisture for both regions are lower than last year and 5-year average values.

The Composite average wheat protein content of 9.4% (12% mb) is lower than last year and the 5-year average. The Gulf protein average of 9.4% is equal to 2019 but slightly below the 5-year average. The East Coast average of 9.4% is significantly below the 2019 and 5-year average. The Composite and Gulf falling number averages of 319 and 329 sec, respectively, are significantly higher than 2019 and 5-year averages. The East Coast average of 283 sec is equal to 2019 but below the 5-year average. Vomitoxin (DON) averages for Composite (0.5 ppm), East Coast (0.2 ppm) and Gulf (0.6 ppm) are significantly below 2019 and 5-year averages, despite a rainy spring and early summer, indicating that the crop sampled is relatively free of DON.

FLOUR AND BAKING DATA:
The Buhler laboratory mill flour extraction averages for Composite (66.8%), East Coast (67.0%) and Gulf (66.7%) are below 2019 and the 5-year averages. The farinograph peak and absorption values are similar to 5-year averages, but the stability values are all below the 5-year averages. Dough properties suggest that this crop has slightly stronger protein qualities than last year.

The SRC values generally indicate excellent quality for cookies, cakes, pretzels and crackers. The alveograph L averages for Composite (78), East Coast (75) and Gulf (78) are lower than last year and the 5-year average and indicate low extensibility. The Gulf amylograph average of 760 BU is significantly higher than last year and the 5-year average. The East Coast average of 322 BU indicates relatively high levels of amylase activity in the crop and is consistent with low falling numbers. The cookie spread ratios for Composite (10.2), East Coast (9.7) and Gulf (10.3) are all higher than last year and the 5-year averages, indicating good spreadability. Average loaf volumes are significantly lower than last year and the 5-year averages.

HARVEST DATA

	COMPOSITE AVERAGE			EAST COAST			GULF		
	2020 Avg	2019 Avg	5-Year Avg	2020 Avg	2019 Avg	5-Year Avg	2020 Avg	2019 Avg	5-Year Avg
WHEAT GRADE DATA:									
Test Weight (lb/bu)	59.7	58.1	58.1	59.3	56.9	57.1	59.8	58.5	58.4
(kg/hl)	78.6	76.5	76.5	78.0	75.0	75.2	78.7	76.9	76.9
Damaged Kernels (%)	0.2	0.6	1.3	0.8	1.4	1.4	0.1	0.4	1.3
Foreign Material (%)	0.0	0.1	0.1	0.2	0.2	0.2	0.0	0.1	0.1
Shrunken & Broken (%)	0.5	0.8	0.6	0.5	1.5	0.8	0.5	0.6	0.5
Total Defects (%)	0.8	1.4	2.0	1.5	2.5	2.2	0.6	1.1	1.9
Grade	2 SRW	2 SRW	2 SRW	2 SRW	3 SRW	3 SRW	2 SRW	2 SRW	2 SRW
WHEAT NON-GRADE DATA:									
Dockage (%)	0.3	0.4	0.5	0.3	0.4	0.5	0.3	0.4	0.4
Moisture (%)	13.4	13.7	13.0	13.6	13.6	13.0	13.3	13.7	13.0
Wheat Protein (%) 12%/0% mb	9.4/10.7	9.5/10.8	9.7/11.0	9.4/10.6	9.7/11.0	10.0/11.3	9.4/10.7	9.4/10.7	9.6/10.9
Wheat Ash (%) 14%/0% mb	1.32/1.53	1.37/1.59	1.43/1.67	1.24/1.44	1.39/1.62	1.44/1.67	1.34/1.56	1.37/1.59	1.43/1.66
1000 Kernel Weight (g)	34.0	31.8	32.0	36.5	31.7	32.0	33.2	31.8	32.0
Kernel Size (%) lg/md/sm	88/11/01	85/14/01	83/16/01	91/09/00	84/14/02	82/16/02	87/12/01	85/14/01	83/16/01
Single Kernel: Hardness	24.7	18.7	20.6	25.2	17.5	18.1	24.5	19.0	21.2
Weight (mg)	34.4	33.7	34.1	37.0	34.0	34.4	33.7	33.7	34.0
Diameter (mm)	2.6	2.7	2.6	2.7	2.6	2.6	2.6	2.7	2.6
Sedimentation (cc)	11.0	10.5	11.9	11.2	10.5	12.5	11.0	10.5	11.7
Wheat Falling Number (sec)	319	288	305	283	283	306	329	289	305
DON (ppm)	0.5	1.3	1.0	0.2	0.5	0.8	0.6	1.5	1.1
FLOUR DATA:									
Lab Mill Extraction (%)	66.8	67.5	68.9	67.0	67.6	68.9	66.7	67.4	68.9
Color: L*	91.4	91.0	91.3	91.5	91.1	91.2	91.3	91.0	91.3
a*	-2.4	-2.4	-2.4	-2.3	-2.4	-2.4	-2.4	-2.4	-2.4
b*	9.2	9.1	8.7	8.9	8.9	8.8	9.3	9.1	8.7
Flour Protein (%) 14%/0% mb	7.5/8.7	7.5/8.7	8.0/9.3	7.6/8.8	7.7/9.0	8.2/9.6	7.5/8.7	7.4/8.6	7.9/9.2
Flour Ash (%) 14%/0% mb	0.41/0.47	0.44/0.51	0.46/0.53	0.42/0.49	0.44/0.51	0.45/0.53	0.40/0.47	0.44/0.51	0.46/0.53
Wet Gluten (%)	20.4	20.5	21.9	22.0	21.6	22.6	20.0	20.2	21.7
Gluten Index	89	88	84	95	88	82	87	88	84
Flour Falling Number (sec)	316	288	304	292	283	306	323	289	304
Amylograph Viscosity 65 g (BU)	662	406	463	322	462	418	760	392	475
Damaged Starch (%)	3.9	3.3	4.7	4.5	3.4	4.5	3.7	3.2	4.8
SRC: Water/50% Sucrose	54/74	54/99	57/110	57/83	52/96	58/109	53/72	55/99	57/108
5% Lactic Acid/5% Na_2CO_3	101/72	111/72	112/80	105/78	109/70	110/82	100/70	111/72	110/80
GPI	0.69	0.65	0.59	0.66	0.66	0.58	0.70	0.65	0.58
DOUGH PROPERTIES:									
Farinograph: Peak Time (min)	1.2	1.1	1.3	1.2	1.3	1.4	1.2	1.0	1.3
Stability (min)	1.6	1.7	2.2	1.5	1.9	2.1	1.6	1.6	2.2
Absorption (%)	52.4	52.5	52.7	53.6	52.2	53.0	52.0	52.6	52.7
Alveograph: P (mm)	39	37	37	44	39	38	38	37	36
L (mm)	78	81	90	75	81	91	78	81	90
P/L Ratio	0.51	0.46	0.41	0.59	0.48	0.42	0.48	0.46	0.41
W (10^{-4} J)	83	80	82	87	84	84	82	79	82
Extensograph: Resistance (BU)	188	151	174	164	158	169	195	149	175
(45 min) Extensibility (cm)	16.1	16.4	16.2	16.9	16.8	16.6	15.8	16.3	16.1
Area (cm^2)	53	43	49	48	46	49	54	42	48
BAKING EVALUATION:									
Cookie: Diameter (cm)	9.2	9.0	9.5	9.0	9.0	9.4	9.3	9.0	9.5
Spread Ratio (width/height)	10.2	9.9	9.4	9.7	9.6	8.8	10.3	10.0	9.5
Pan Bread: Bake Absorption (%)	54.4	54.3	54.6	55.6	54.0	54.7	54.0	54.3	54.5
Crumb Grain and Texture (1-10)	5.6	4.8	5.0	5.7	5.1	5.1	5.6	4.7	5.0
Loaf Volume (cc)	605	711	718	589	719	731	609	709	714
PRODUCTION OF 11 STATES (%):	**100%**			**22%**			**78%**		

[1]East Coast - Maryland, Virginia and North Carolina; Gulf Ports - Alabama, Arkansas, Illinois, Indiana, Kentucky, Missouri, Ohio and Tennessee.

SOFT RED WINTER PRODUCTION

FOR THE MAJOR PRODUCING STATES (MMT)

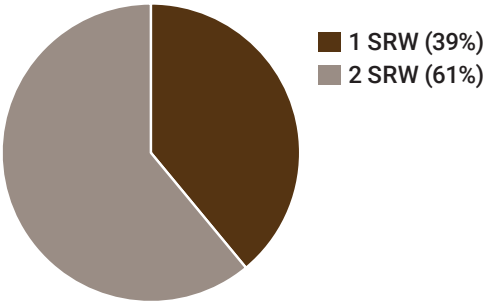
	2020	2019	2018	2017	2016
Alabama	0.14	0.16	0.21	0.21	0.32
Arkansas	0.11	0.07	0.14	0.18	0.17
Georgia	0.12	0.08	0.10	0.09	0.14
Illinois	0.96	1.00	1.01	0.97	0.95
Indiana	0.48	0.44	0.50	0.48	0.62
Kentucky	0.58	0.68	0.54	0.65	0.87
Maryland	0.30	0.30	0.34	0.36	0.45
Michigan	0.57	0.58	0.57	0.51	0.83
Missouri	0.62	0.66	0.83	0.99	1.08
North Carolina	0.57	0.34	0.57	0.56	0.40
New York	0.20	0.10	0.17	0.21	0.21
Ohio	0.95	0.59	0.92	0.88	1.22
Pennsylvania	0.37	0.28	0.25	0.29	0.27
Tennessee	0.37	0.39	0.50	0.52	0.67
Virginia	0.21	0.18	0.25	0.26	0.25
Wisconsin	0.23	0.26	0.37	0.31	0.52
Surveyed-States Total*	**5.29**	**4.82**	**5.82**	**6.06**	**6.99**
Sixteen-State Total	**6.77**	**6.11**	**7.29**	**7.46**	**8.96**
Total SRW Production	**7.25**	**6.53**	**7.77**	**7.77**	**9.40**

Based on USDA crop estimates as of September 30, 2020.

**Eleven states denoted by italices were surveyed accounting for 68% of 2020 SRW production.*

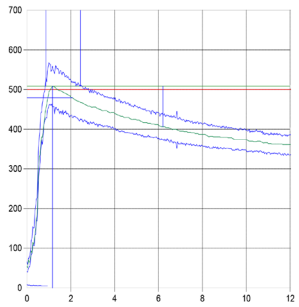
DISTRIBUTION BY GRADE

(BASED ON 18 COMPOSITE SAMPLES)

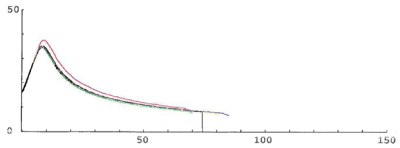


EAST COAST & GULF DOUGH PROPERTIES

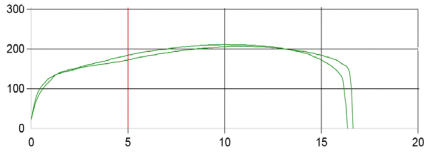
FARINOGRAMS



ALVEOGRAMS

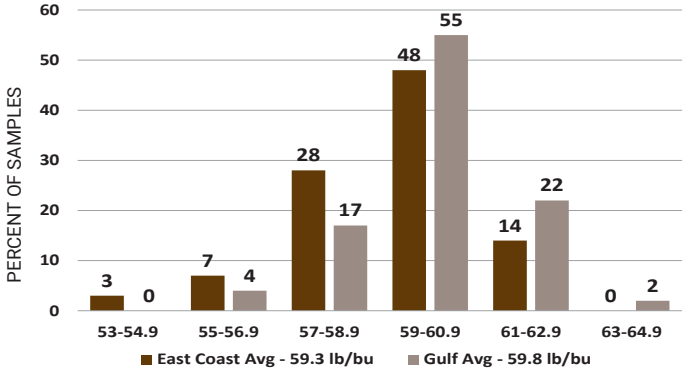


EXTENSOGRAMS

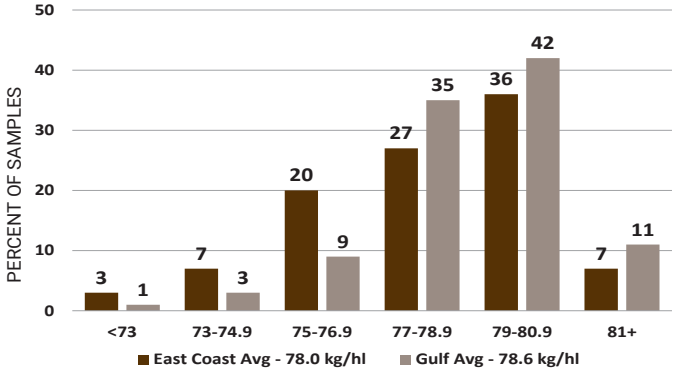


DISTRIBUTIONS

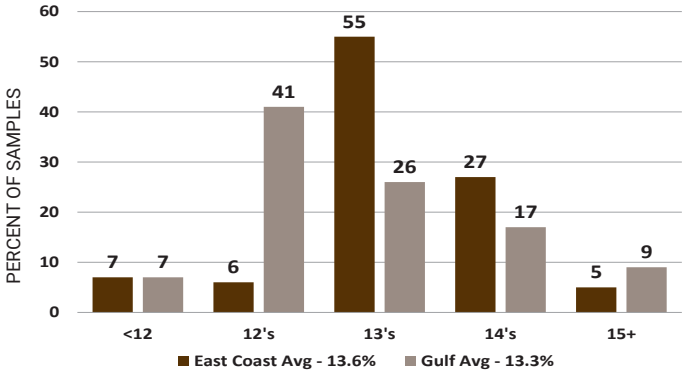
TEST WEIGHT *(Pounds/Bushel)*



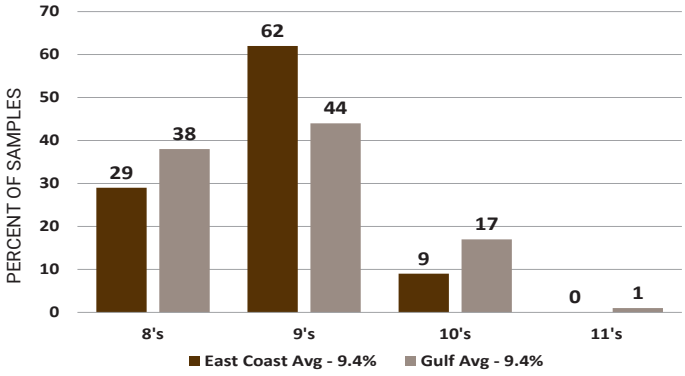
TEST WEIGHT *(Kilograms/Hectoliter)*



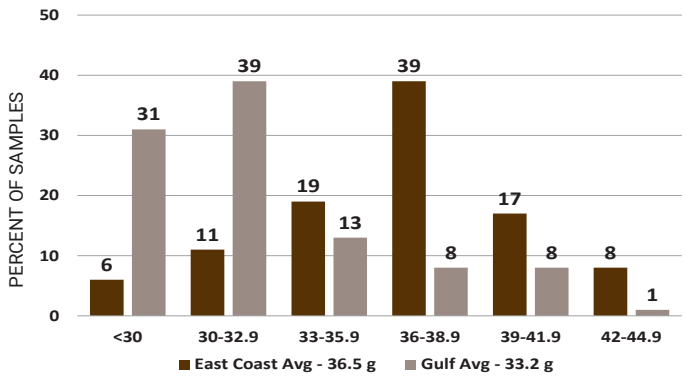
WHEAT MOISTURE *(Percent)*



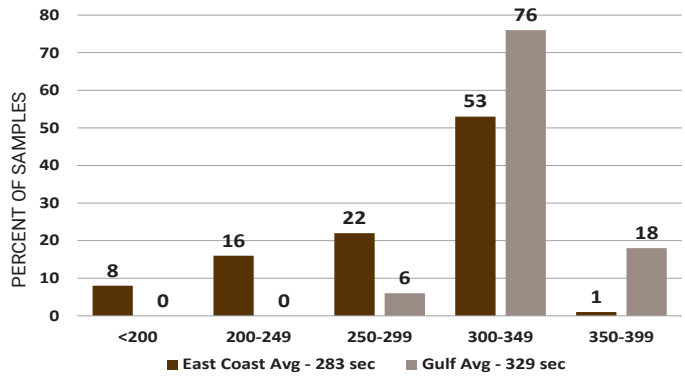
PROTEIN (12% MB) *(Percent)*

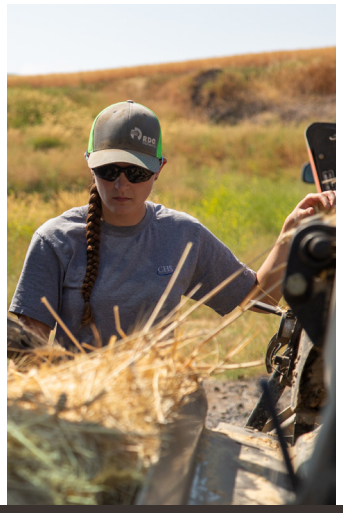


1000 KERNEL WEIGHT *(Grams)*



FALLING NUMBER *(Seconds)*





"We love what we do, we will continue to do it and we will try to make sure we have the safest, best quality product available to the end-user that we could possibly put out."

– Darren Padget, Oregon wheat farmer and USW 2020/21 Chairman

"I'm the third generation and I think it's really special to go beyond and leave something for the next generation. I think it is my responsibility to do it sustainably. I take a lot of pride in the fact that someone started it and they trust and believe in me to take it over."

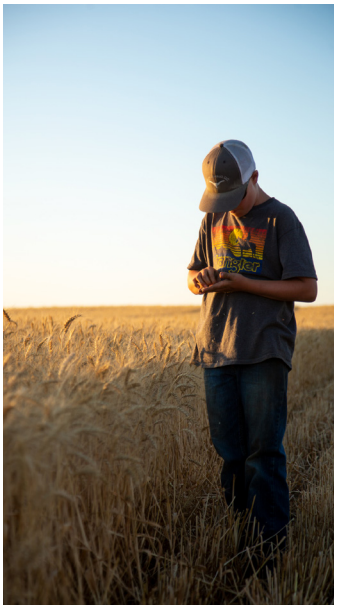
– Erin Bailey, Washington wheat farmer

"I really enjoy what I do, growing wheat and producing a crop. We know it's not always going to be easy, but it's that passion and love for the ground… it's a great feeling knowing you are a part of being able to feed people."

– Michael Peters, Oklahoma wheat farmer and USW 2020/21 Secretary-Treasurer

"We're just regular, ordinary people. We have children, we laugh, we cry. But we are farmers – we are agricultural producers. We take great pride in producing a product in order to feed North Dakota, the United States and also, the world."

– Lisa Volk, North Dakota wheat farmer

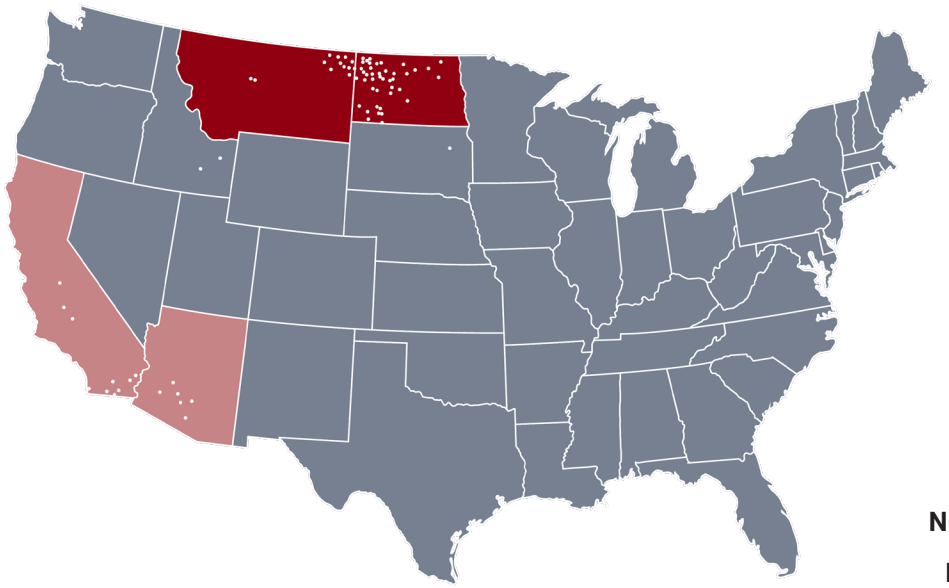


DURUM

The hardest of all U.S. wheat classes, U.S. durum has a rich amber color and high gluten content. Hard Amber Durum (HAD) sets the “gold standard" for premium pasta products, couscous and some Mediterranean breads.

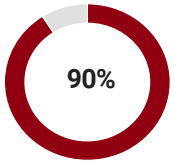
For the miller, durum is a large, very hard kernel with the potential for very high extraction of high quality, low ash semolina that is ideal for fine pasta.

For consumers of pasta and couscous, durum helps deliver excellent color and texture.

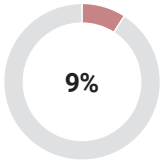


4
STATES SURVEYED

99%
OF TOTAL DURUM PRODUCTION REPRESENTED



NORTHERN DURUM



DESERT DURUM®

PERCENTAGE OF TOTAL U.S. DURUM PRODUCTION BY REGION

DURUM PRODUCTION

FOR THE MAJOR PRODUCING STATES (MMT)

	2020	2019	2018	2017	2016
Arizona	0.12	0.10	0.20	0.24	0.26
California	0.05	0.06	0.09	0.07	0.11
Montana	0.73	0.59	0.63	0.34	0.85
North Dakota	0.96	0.71	1.16	0.78	1.58
Four-State Total	**1.85**	**1.46**	**2.08**	**1.44**	**2.80**
Total Durum Production	**1.87**	**1.47**	**2.12**	**1.49**	**2.83**

Based on USDA crop estimates as of September 30, 2020.

NORTHERN DURUM HARVEST SURVEY

OVERVIEW: Northern durum production is notably larger than 2019 due to a significant increase in planted area with trendline yields, and a dry, steady harvest. Buyers will be pleased with the improved quality of the 2020 crop, especially on factors routinely valued in contract specifications. The crop boasts high test weights, high vitreous kernel contents and falling numbers, improved semolina color and a much lower incidence of DON compared with recent years.

WEATHER AND HARVEST: Planting began in early May with slow initial progress due to cool conditions, but dry soils allowed for steady, accelerating progress with planting nearly complete by early June. The first half of the growing season was characterized by lack of preciptation and above normal temperatures, with drought conditions in much of the region, impacting emergence, plant stands and yield potential on the early-planted crop. However, timely rains in late June into July helped stabilize conditions and boosted yield potential on the later-planted crop. Dry, warm conditions late-season accelerated crop maturity and limited disease pressures.

Harvest began in early August and progressed steadily on favorable weather. By the third week of September, harvest was completed, ahead of average and well ahead of last year. Regional production is estimated at 1.7 million metric tons (MMT), up nearly 30% from 2019.

WHEAT AND GRADE DATA: The average grade of the survey samples is U.S. No. 1 Hard Amber Durum (HAD); 87% of the crop grades U.S. No. 1 or 2 Hard Amber Durum (HAD), up markedly from 37% a year ago. Average test weight of 62.2 lb/bu (80.9 kg/hl) is well above last year and the 5-year averages. The total kernel defects average of 1.5% is lower than 2019, as disease pressures were relatively low and harvest weather was near ideal.

The average vitreous kernel (HVAC) content is 88%, up sharply from 64% in 2019, and also higher than the 5-year averages. Nearly two-thirds of the samples were above 90% HVAC. Protein averages 13.4% (12% mb), lower than both 2019 and the 5-year averages. Distribution data shows nearly 70% of the samples are above 13% protein, similar to a year ago, but less of the crop is above 14% protein.

The crop average 1000 kernel weight (TKW) is exceptionally high at 46.7 g, above last year and nearly 6 g higher than the 5-year average, due to excellent conditions during kernel development. The average falling number of 419 sec, is well above 2019 and higher than the 5-year averages. Disease pressures were minimal in 2020, although some areas were impacted by Fusarium to a greater degree than others. The crop average DON is 0.2 ppm, lower than both 2019 and the 5-year averages.

SEMOLINA AND PROCESSING DATA: Milling for the 2020 survey was performed on a Quadromat® Junior mill, the same as in 2019, limiting direct comparisons to the Buhler laboratory mill used for 5-year average values. Semolina extraction is 58.5%, up from 2019. Commercial mills will likely see a greater increase in extraction due to high HVAC levels and excellent kernel qualities. The milled semolina shows slightly higher ash than a year ago, at 0.64%, paralleling the increase in kernel ash. Speck counts were similar to a year ago. Gluten index values are 74.4%, higher than both 2019 and the 5-year averages.

Semolina color values are higher than a year ago, for both brightness and yellowness, and more similar to the 5-year average. Cooked spaghetti evaluations show lower values compared to last year and the 5-year averages with lower cooked weight and less cooked firmness. Mixing properties reveal a slightly weaker crop compared to a year ago, a 6 (scale 1-8), but stronger than the 5-year averages.

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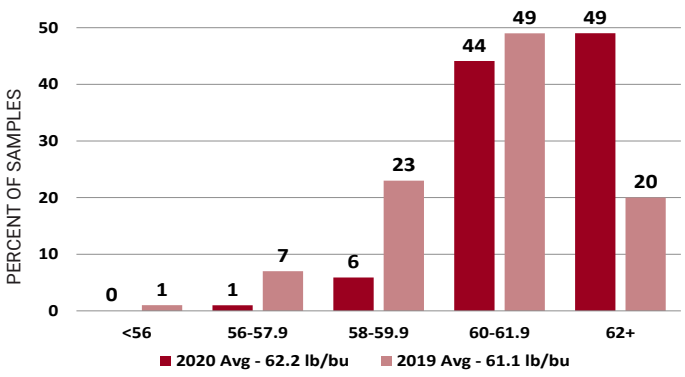
Collected from fields, farm bins and local elevators by the National Agricultural Statistics Service.

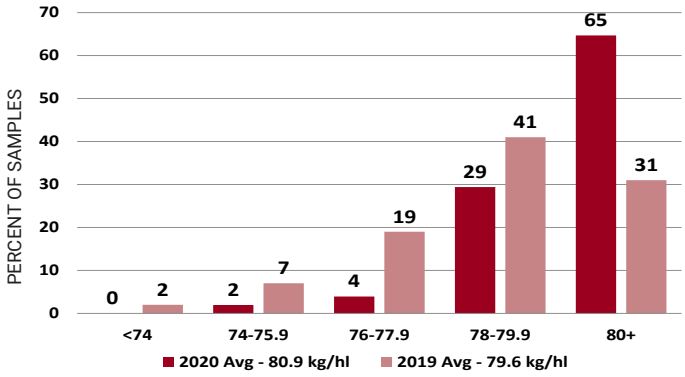
The Durum Quality Lab, North Dakota State University, Fargo, North Dakota, conducted the quality analyses. Official grade, test weight, vitreous kernel, 1000 kernel weight, protein and falling number were determined on each sample. The remaining tests were conducted on 6 composite samples categorized by growing region for Northern Durum. Northern Durum production area is highlighted on the map on page 42. The methods are described in the Analysis Methods section of this booklet.

NORTHERN DURUM DISTRIBUTIONS

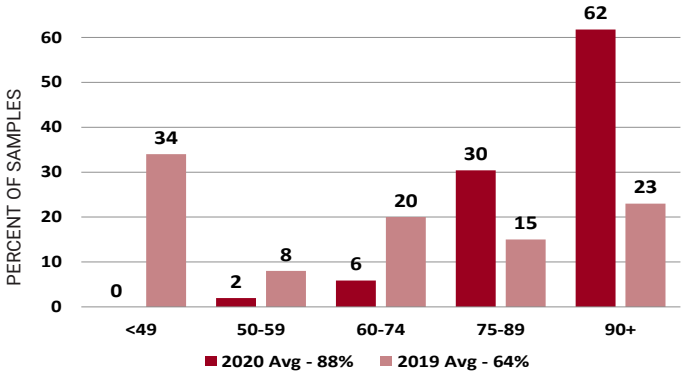
TEST WEIGHT *(Pounds/Bushel)*



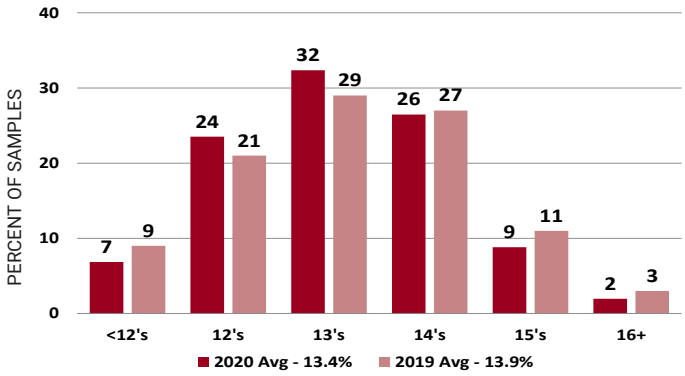
TEST WEIGHT *(Kilograms/Hectoliter)*



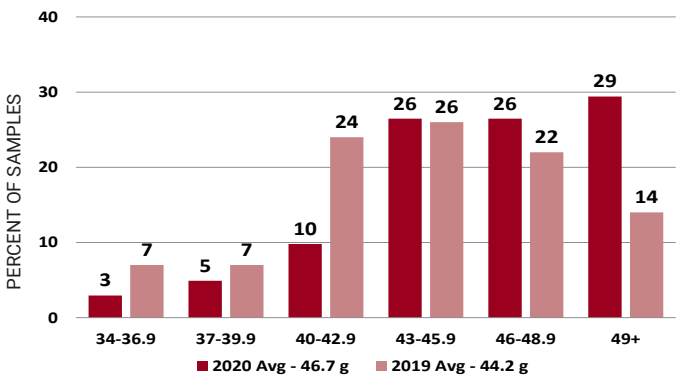
VITREOUS KERNELS *(Percent)*



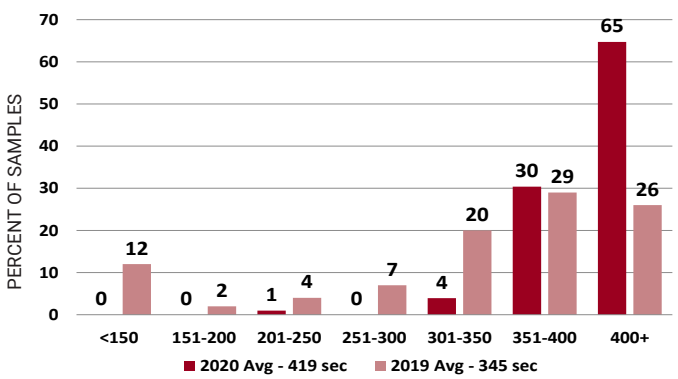
PROTEIN (12% MB) *(Percent)*



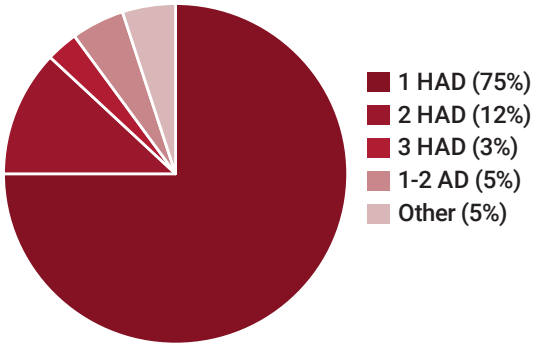
1000 KERNEL WEIGHT *(Grams)*



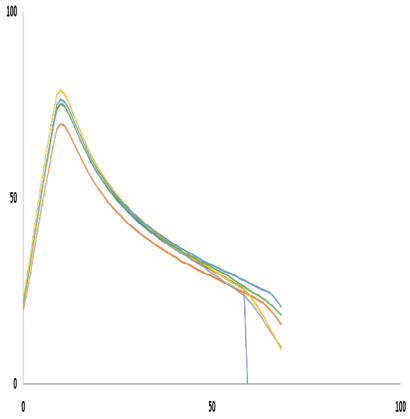
FALLING NUMBER *(Seconds)*



NORTHERN DURUM DISTRIBUTION BY GRADE



NORTHERN DURUM REGIONAL AVERAGE ALVEOGRAM



NORTHERN DURUM HARVEST DATA

	2020 Avg	2019 Avg	5-Year Avg
WHEAT GRADE DATA:			
Test Weight (lb/bu)	62.2	61.1	60.9
(kg/hl)	80.9	79.6	79.3
Damaged Kernels (%)	0.9	2.3	0.6
Foreign Material (%)	0.0	0.0	0.0
Shrunken and Broken (%)	0.6	0.7	0.9
Total Defects (%)	1.5	3.0	1.6
Contrasting Classes (%)	0.4	0.0	0.3
Vitreous Kernels (%)	88	64	85
Grade	1 HAD	2 AD	1 HAD
WHEAT NON-GRADE DATA:			
Dockage (%)	0.8	1.3	0.8
Moisture (%)	10.7	12.2	11.5
Wheat Protein (%) 12%/0% mb	13.4/15.3	13.9/15.8	14.0/15.9
Wheat Ash (%) 14%/0% mb	1.57/1.83	1.51/1.76	1.54/1.79
1000 Kernel Weight (g)	46.7	44.2	40.5
Kernel Size (%) lg/md/sm	58/40/2	59/38/3	50/46/4
Wheat Falling Number (sec)	419	345	397
Sedimentation (cc)	62	61	65
DON (ppm)	<0.5	0.6	<0.5
SEMOLINA DATA:			
Lab Mill Extraction (%)			
Semolina Extraction (%)	58.5	57.5	65.7
Color: L*	83.7	82.9	83.6
a*	-2.4	-2.4	-2.6
b*	30.4	29.3	29.8
Protein (%) 14%/0% mb	12.3/14.3	12.3/14.3	12.9/15.0
Ash (%) 14%/0% mb	0.64/0.74	0.60/0.70	0.67/0.78
Specks (no/10 in^2)	30	31	28
Wet Gluten (%)	33.2	33.1	34.4
Gluten Index	74	67	64
Mixograph: Classification	6.0	6.4	5.5
Peak Time (min)	3.2	3.2	3
Peak Height (MU)	4.6	5.0	5.8
Alveograph: P (mm)	79	101	66
L (mm)	61	72	90
P/L Ratio	1.30	1.50	0.90
W (10^{-4} J)	163	255	172
SPAGHETTI PROCESSING DATA:			
Color Score	8.8	7.8	8.5
Cooked Weight (g)	31.0	32.2	31.1
Cooking Loss (%)	7.2	7.1	6.2
Cooked Firmness (g cm)	3.6	3.8	4.4
SAMPLE COUNT:	187		

DESERT DURUM® HARVEST SURVEY

OVERVIEW: Desert Durum® is a registered certification mark of the Arizona Grain Research and Promotion Council and the California Wheat Commission, which authorize its use only to designate durum grown under irrigation in the desert valleys and lowlands of Arizona and California.

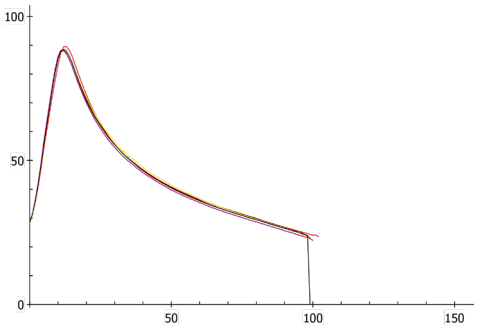
Desert Durum® can be produced and delivered "identity preserved" to domestic and export markets, which allows customers to purchase grain with quality traits specific to their processing needs. Annual requirements can be pre-contracted with grain merchandisers ahead of the fall-winter planting season for harvest in late May through early July. Varietal identity is maintained by experienced growers planting certified seed and merchandisers who store and ship according to customers' preferred delivery schedules.

Desert Durum® production acreage in 2020 was similar to 2019. According to USDA, yields were 3.06 metric tons/acre, and quality was uniformly good. Mohave was the most widely grown variety in California and Arizona. Alberto and Desert King were the two second most grown Desert Durum® varieties.

WHEAT AND GRADE DATA: In 2020, the average grade is No. 1 Hard Amber Durum (HAD). Test weight is 62.3 lb/bu (81.1 kg/hl). The average vitreous kernel content (HVAC) is 99.0%, a high average typical of Desert Durum®. Average damaged kernels are 0.2% and total defects are 0.6%. Desert Durum® is characterized by its low moisture content and this year's average is 6.9%. Protein content average is 14.5% (12% mb).

SEMOLINA AND PROCESSING DATA: The semolina b* value is 32.7, higher than 2019 b* value of 29.2. Wet gluten is 34.7% and gluten index is 87. Semolina Mixograph score is 7 and Alveograph W value is 294 (10^{-4} J), both of which indicate high strength. Pasta color b* value is 43 and score is 9.6. Pasta cooked firmness is 7.4, higher than 2019.

DESERT DURUM® REGIONAL AVERAGE ALVEOGRAM



SUMMARY: Desert Durum® exhibits consistently large kernels and low moisture, traits that contribute to efficient transportation costs and high extraction rates. The 2020 crop will deliver the valuable milling, semolina and pasta quality traits that customers have learned to expect and appreciate.

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Collected by a Federal Grain Inspection Service (FGIS) licensed inspection agency or submitted by handlers to a licensed agency.

California Wheat Commission Laboratory conducted the quality analyses. All tests were conducted on each sample. Production-weighted results are reported. The Desert Durum® production area is highlighted on the map above. The methods are described in the Analysis Methods section of this booklet.

DESERT DURUM® HARVEST DATA

	2020 Avg	2019 Avg	5-Year Avg
WHEAT GRADE DATA:			
Test Weight (lb/bu)	62.3	63.0	62.7
(kg/hl)	81.1	82.0	81.7
Damaged Kernels (%)	0.2	0.1	0.2
Foreign Material (%)	0.0	0.0	0.0
Shrunken and Broken (%)	0.4	0.5	0.5
Total Defects (%)	0.6	0.7	0.8
Contrasting Classes (%)	0.0	0.0	0.0
Vitreous Kernels (%)	99	98	97
Grade	1 HAD	1 HAD	1 HAD
WHEAT NON-GRADE DATA:			
Dockage (%)	0.4	0.3	0.4
Moisture (%)	6.9	6.6	6.9
Wheat Protein (%) 12%/0% mb	14.5/16.5	13.8/15.7	13.7/15.6
Wheat Ash (%) 14%/0% mb	1.74/2.02	1.70/1.93	1.71/1.96
1000 Kernel Weight (g)	43.3	47.8	49.1
Kernel Size (%) lg/md/sm	87/13/0	91/9/0	91/9/0
Wheat Falling Number (sec)	790	699	642
Sedimentation (cc)	63	62	62
DON (ppm)	-	-	-
SEMOLINA DATA:			
Lab Mill Extraction (%)	75.5	79.7	76.6
Semolina Extraction (%)	70.7	71.7	67.5
Color: L*	85.3	85.8	86.4
a*	-3.9	-3.2	-2.9
b*	32.7	29.2	29.0
Protein (%) 14%/0% mb	13.6/15.8	12.8/14.9	12.7/14.8
Ash (%) 14%/0% mb	0.86/1.00	0.90/1.05	0.85/0.99
Specks (no/10 in^2)	23	20	23
Wet Gluten (%)	34.7	34.7	33.6
Gluten Index	87	70	74
Mixograph: Classification	7.0	8.0	7.8
Peak Time (min)	3.3	3.0	3.4
Peak Height (MU)	4.8	5.5	6.0
Alveograph: P (mm)	95	105	106
L (mm)	103	54	62
P/L Ratio	0.90	2.10	1.79
W (10^{-4} J)	294	212	232
SPAGHETTI PROCESSING DATA:			
Color Score	9.6	8.9	8.8
Cooked Weight (g)	29.4	29.4	29.3
Cooking Loss (%)	5.6	5.5	5.4
Cooked Firmness (g cm)	7.4	6.7	6.4
SAMPLE COUNT:	10		

PHOTO COURTESY OF CALIFORNIA WHEAT LABORATORY

DEPENDABLE PEOPLE. RELIABLE WHEAT.

The U.S. farm families who produce the wheat and the industry that supplies it remain committed to operating a transparent and open market. Today, U.S. Wheat Associates (USW) and the entire U.S. wheat industry remain fixed on the mission of the farmers who created an enduring legacy of commitment and partnership to provide the highest quality wheat for almost every customer need, backed by transparent pricing, trusted third-party certification and unmatched service before and after the sale. Here are some of the reasons why our overseas customers know they can depend on the integrity of our supply chain, the quality of U.S. wheat and our unmatched reliability as a supplier.

THE U.S. WHEAT "STORE" IS ALWAYS OPEN.

U.S. farmers overcome significant risk every year to meet domestic wheat demand and still provide half their crop for export markets. Farmers and commercial warehouses can store and efficiently transport wheat in top condition to meet overseas demand when needed and throughout the marketing year.

PRICES ARE TRANSPARENT AND HONORED.

U.S. wheat export prices are discovered openly through futures exchanges and basis costs and are always available to customers. Private exporters use risk management tools to honor sales contract prices often made months in advance of vessel loading.

QUALITY IS ASSURED.

USW publishes weekly reports during harvest that summarize initial wheat quality findings. USW works with several organizations and laboratories to analyze hundreds of wheat samples for all six U.S. wheat classes and publishes all results in the annual Crop Quality Report. Our staff, farmers and industry experts then travel the world to present the results to our customers and end users.

THE SUPPLY CHAIN FOLLOWS UNIFORM GRAIN SEGREGATION AND INSPECTION PROCEDURES.

U.S. country elevators and export elevators inspects and tests wheat as it arrives and segregates each class by quality to meet customer requirements. The Federal Grain Inspection Service (FGIS) independently inspects wheat at vessel loading to certify that the quality loaded matches the customer's specifications. Those inspections yield valuable data down to the sub-lot level of 1,000 to 2,000 metric tons that customers can use, with assistance from USW, to get even more value from their purchases.

EXPORT LOGISTICS DEEMED ESSENTIAL.

In the COVID-19 outbreak, all farmers and food distribution industries were deemed essential. Export grain systems and FGIS inspections have continued operating with little or no interruption.

DIRECT GOVERNMENT EXPORT INTERVENTION IS BANNED.

Several U.S. federal laws protect the sanctity of all export contracts. The only exception is a declared national emergency. Export tariffs are forbidden in the U.S. Constitution, fully adhering to World Trade Organization disciplines, and the United States will not use food as a weapon.

BUYERS RECEIVE UNMATCHED TRADE SERVICING AND TECHNICAL SUPPORT.

With funding from U.S. wheat farm families and USDA's Foreign Agricultural Service, experienced USW staff and consultants add exceptional value to all U.S. wheat class imports.

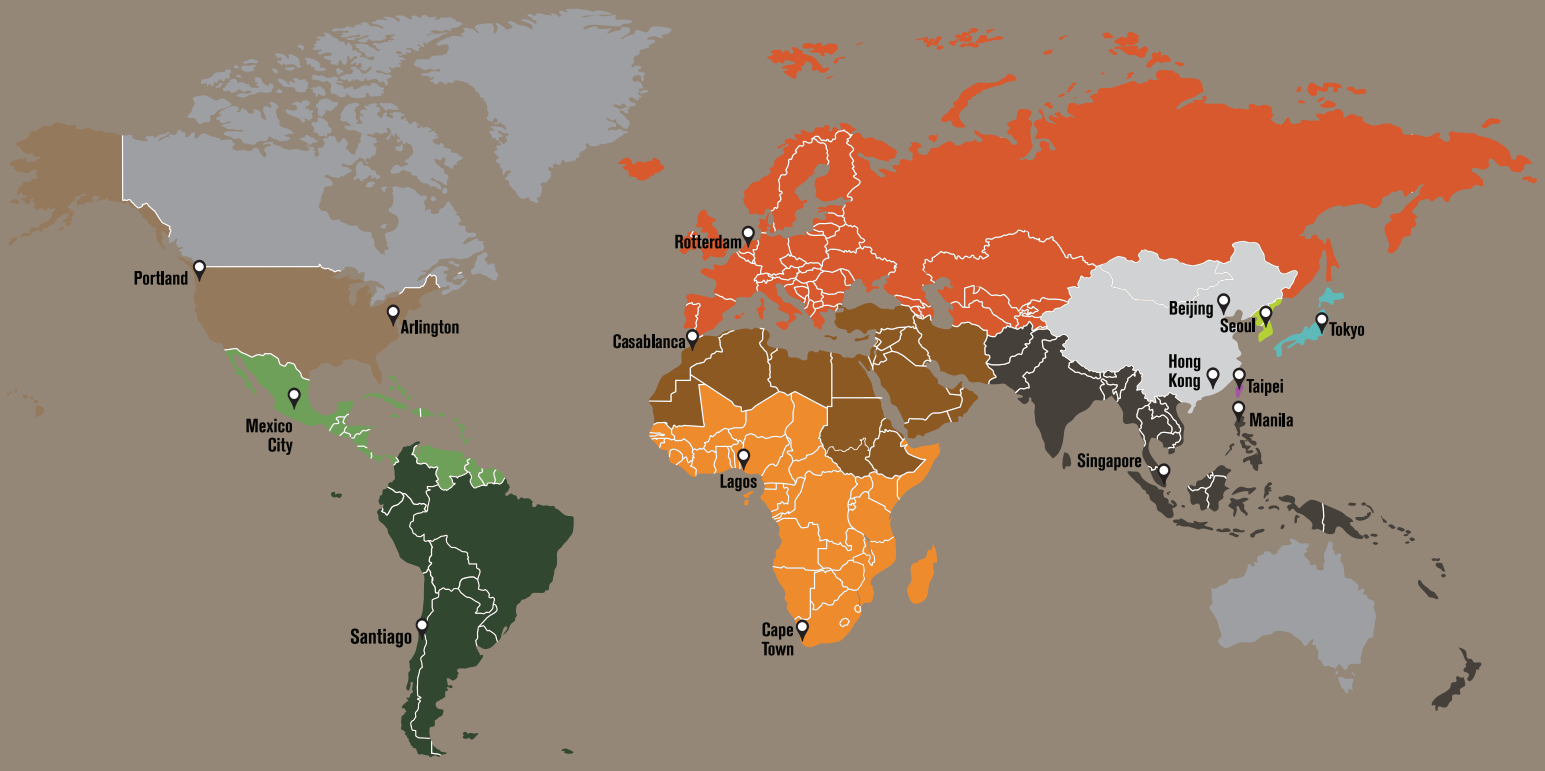
FOSTERING TRADE.

USW invests substantial funding from farmers and federal programs to help overcome trade or technical barriers that would otherwise keep end-users from realizing the highest value and most revenue from using U.S. wheat.

40 YEARS

U.S. WHEAT ASSOCIATES

WWW.USWHEAT.ORG



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U.S. Wheat Associates (USW) is the industry's market development organization working in more than 100 countries. Its mission is to "develop, maintain and expand international markets to enhance wheat's profitability for U.S. wheat producers and its value for their customers." USW activities are funded by producer checkoff dollars managed by 17 state wheat commissions and USDA Foreign Agricultural Service cost-share programs. For more information, visit www.uswheat.org or contact your state wheat commission.

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