2020

U.S. DURUM WHEAT

Regional Quality Report

U.S. DURUM Wheat

MONTANA | NORTH DAKOTA

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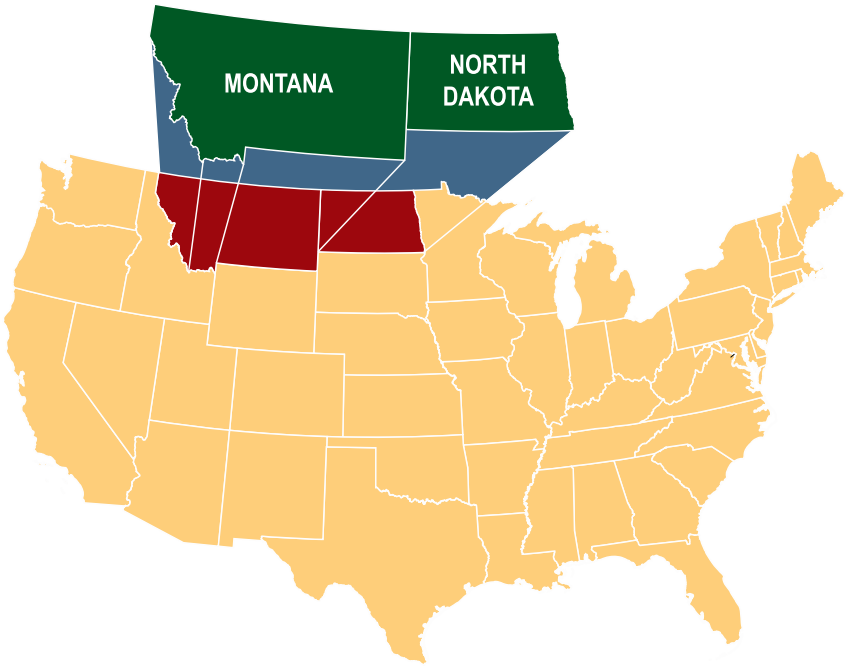
MAKING PREMIUM PASTA

DURUM is the hardest of all wheats. Its density, combined with its high protein content and gluten strength, make durum the wheat of choice for producing premium pasta and couscous products. Pasta made from durum is firm with consistent cooking quality. Durum kernels are amber colored and larger than those of other wheat classes. Also unique to durum is its yellow endosperm which gives pasta its golden hue and the best color for couscous.

When durum is milled, the endosperm is ground into a granular product called semolina. A mixture of water and semolina forms a stiff dough. Pasta dough is then forced through dies, or metal discs with holes, to create hundreds of different shapes.

Durum production is geographically concentrated to the Northern Plains because it demands a special agronomic environment. In most years, the states of North Dakota and Montana produce 80 percent of the U.S. durum crop.



OVERVIEW

The **2020 DURUM CROP** produced in North Dakota and Montana is larger with marked improvements in quality compared to a year ago. Regional production is estimated at 62 mil bu (1.7 MMT), up nearly 30% from 2019. The higher production was driven by a 25% expansion in planted area but more significantly by a 43% increase in harvested area. Despite an early season drought, timely and beneficial rains mid-season enabled yields to reach trend-line, and dry weather late season limited disease pressures. A warm, dry harvest season allowed for little to no adverse weather impact, and secured a sound crop with excellent kernel qualities.

PRODUCTION DATA

	2020	2019	2015-19 AVERAGE
MILLION BUSHELS			
Montana	26.7	21.7	21.6
North Dakota	35.3	25.9	39.6
U.S. Total	**68.8**	**54.0**	**73.9**
MILLION METRIC TONS			
Montana	0.73	0.59	0.59
North Dakota	0.96	0.70	1.08
U.S. Total	**1.87**	**1.29**	**2.01**

Source: USDA 2020 Small Grains Summary

The average **GRADE** of the survey samples is U.S. No. 1 Hard Amber Durum (HAD); 87% of them graded U.S. No. 1 or 2 Hard Amber Durum (HAD), up markedly from just 37% a year ago. Just 8% of the samples were a No. 3 grade or lower, compared to 43% of the samples in 2019. Average test weight of 62.2 lb/bu (80.9 kg/hl) is well above both last year and the 5-year average. Nearly one-half of the samples recorded a test weight of 62 lb/bu (80.7 kg/hl) or higher. The total kernel defects average of 1.5% is lower than 2019, with a notable decrease in damaged kernels, as disease pressures were relatively low, and harvest weather was near ideal. The dry harvest period also led to very low kernel moisture.

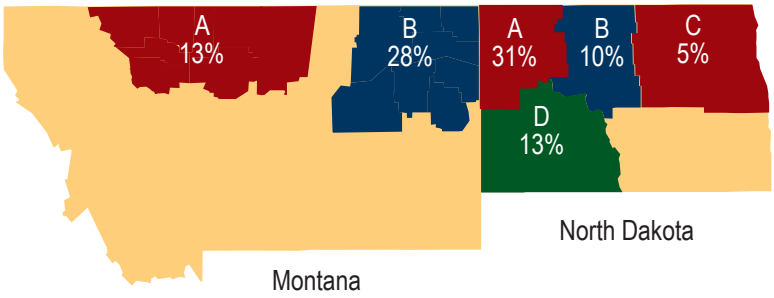
The average **VITREOUS KERNEL** (HVAC) content is 88%, up sharply from just 64% in 2019, and also higher than the 5-year average. Nearly two-thirds of the samples were above 90% HVAC. Protein averages 13.4% (12% mb), lower than both 2019 and the 5-year average. Distribution data shows nearly 70% of the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

The crop average **THOUSAND KERNEL WEIGHT** (TKW) is exceptionally high at 46.7 grams, above last year's high level and nearly 6 grams higher than the 5-year average, due to excellent conditions during kernel development. The average falling number of 419 seconds, is well above 2019 and also higher than the 5-year average. Two-thirds of the surveyed crop registered a falling number of 400 seconds or higher, and only 1% fell below 300 seconds. 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, down from both last year and the 5-year average.

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 the 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 average.

SEMOLINA color values are higher than a year ago, for both brightness and yellowness, and

APPROXIMATE SHARE OF REGIONAL PRODUCTION



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more similar to the 5-year average. Cooked spaghetti evaluations show lower values compared to last year and the 5-year average 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 average.

BUYERS will find the 2020 crop to be of exceptionally high quality for factors routinely valued in contract specifications. The crop boasts historically high thousand kernel weights, above average vitreous kernel levels, high falling numbers, low kernel moisture, and a much lower incidence of DON compared to recent years. The excellent quality parameters are broader and balanced across the entire region in 2020, thanks to low disease pressures during the growing season and favorable harvest period.

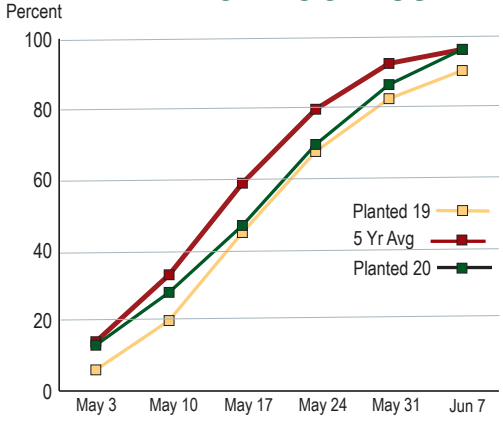
SEASONAL CONDITIONS

PLANTING of the 2020 Northern durum crop began in early May and was a bit slower than average initially, due to cool soil temperatures, but dry soils allowed for progress to proceed at a fairly steady pace which accelerated by mid-month. By the end of May, 85 percent of the durum had been planted, near normal, and planting was fully complete by the first week of June.

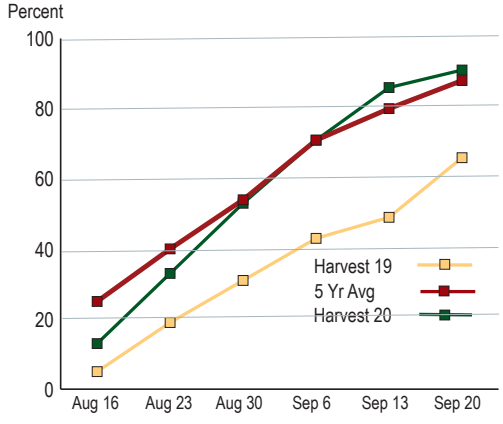
THE GROWING SEASON began with well below average precipitation, frequent winds and warmer than normal temperatures, over a large part of the region, leading to short-term drought conditions by late June. This negatively impacted crop stands, emergence and yield potential, especially on the early planted crop. Fairly ample subsoil moisture did help mitigate the negative effects of lack of rain. Timely rains returned to the region in late June and early July, stabilizing the condition of the early planted crop, and boosting yield potential on later plantings. More frequent rain and moderate temps prevailed through much of July, supporting crop condition ratings. The latter part of the growing season turned warmer and drier, accelerating crop maturity, and keeping disease pressures to a minimum.

HARVEST began in early August and was half completed by the end of the month. Harvest progress was steady and rapid, and well ahead of 2019 with very few rain delays and mostly ideal conditions. The excellent harvest conditions resulted in very good kernel quality factors and soundness. The bulk of harvest was finished by the third week of September, slightly ahead of average.

PLANTING PROGRESS



HARVEST PROGRESS



WHEAT CHARACTERISTICS

WHEAT GRADES

as defined by the Federal Grain Inspection Service (FGIS) of the USDA Grain Inspection, Packers and Stockyards Administration (GIPSA), reflect the general quality and condition of a representative sample. U.S. grades are based on test weight and include limits on damaged kernels, foreign material, shrunken and broken kernels, and wheat of contrasting classes. Each determination is made on the basis of the grain when free from dockage and shrunken and broken kernels.

SUBCLASS is as separate marketing factor based on the weight percentage of kernels with a complete, hard and vitreous endosperm, the portion that makes semolina. For durum wheat, the subclasses are:

- Hard Amber Durum (HAD) – at least 75 percent more hard, vitreous kernels;
- Amber Durum (AD) –between 60 and 74 percent hard, vitreous kernels;
- Durum (D) –less than 60 percent hard, vitreous kernels.

GRADING FACTORS	U.S. GRADES 1	2	3	4	5
DURUM – MINIMUM TEST WEIGHTS					
Pounds per bushel	60.0	58.0	56.0	54.1	51.0
Kilograms per hectoliter	78.2	75.6	73.0	70.4	66.5
MAXIMUM PERCENT LIMITS OF:					
Damaged kernels					
Heat (part of total)	0.2	0.2	0.	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/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 class[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 OF:					
Other material					
Animal filth	1	1	1	1	1
Castor beans	1	1	1	1	1
Crotalaria seeds	2	2	2	2	2
Glass	0	0	0	0	0
Stones	3	3	3	3	3
Unknown foreign material	3	3	3	3	3
Total[4]	4	4	4	4	4
Insect-damaged kernels	31	31	31	31	31

U.S. sample grade is wheat that:

a. Does not meet the requirements for U.S. Nos. 1, 2, 3, 4 or 5; or
b. Has a musty, sour or commercially objectionable foreign odor (except smut or garlic odor); or
c. Is heating or of distinctly low quality.

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 percent of wheat of other classes.
3. Includes contrasting classes.
4. Includes any combination of animal filth, castor beans, crotalaria seeds, glass, stones or unknown foreign substance.

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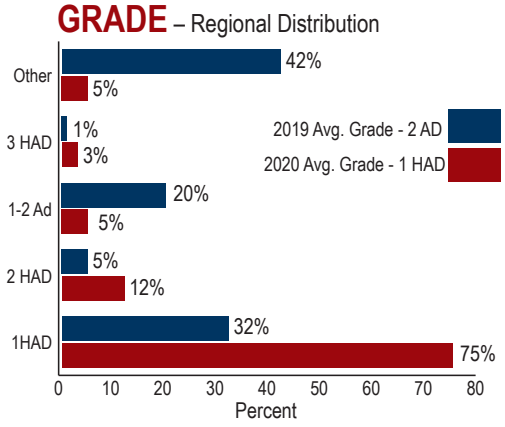
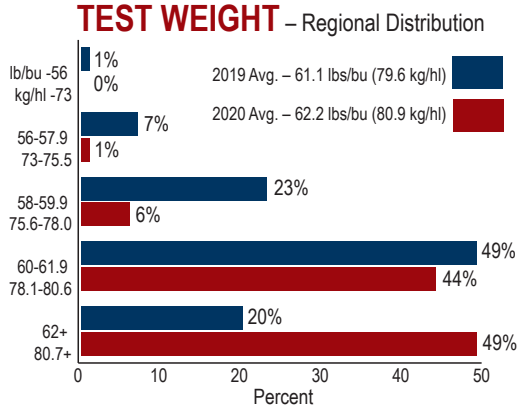
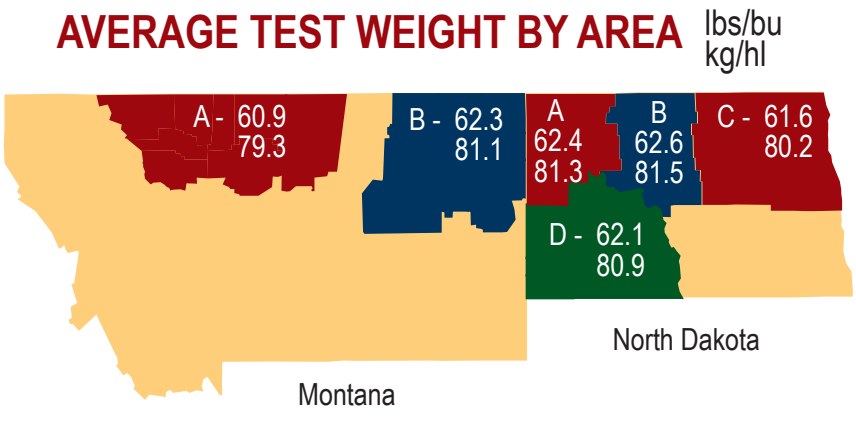
WHEAT GRADING DATA

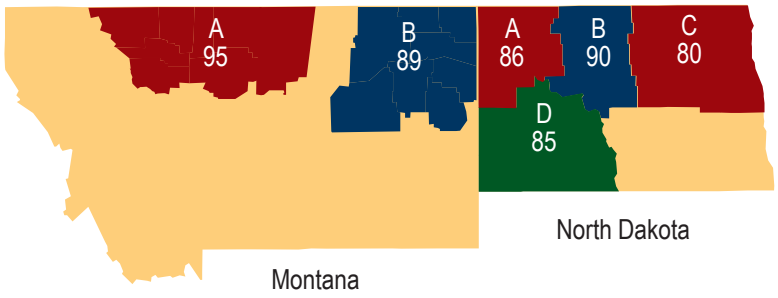
STATE AND CROP REPORTING AREA	TEST WEIGHT LBS/BU	TEST WEIGHT KG/HL	DAMAGE %	SHRUNKEN/ BROKEN KERNELS %	TOTAL DEFECTS %	CONTRASTING CLASSES %	U.S. GRADE	VITREOUS KERNELS %
MONTANA								
Area A	60.9	79.3	0.2	0.5	0.7	0.0	1 HAD	95
Area B	62.3	81.1	0.7	0.5	1.3	0.6	1 HAD	89
State Avg 2020	62.0	80.7	0.6	0.5	1.2	0.5	1 HAD	90
State Avg 2019	60.8	79.2	0.6	0.7	1.3	0.0	1 AD	70
NORTH DAKOTA								
Area A	62.4	81.3	1.0	0.6	1.6	0.0	1 HAD	86
Area B	62.6	81.5	1.1	0.6	1.7	0.4	1 HAD	90
Area C	61.6	80.2	2.1	0.5	2.6	0.3	2 HAD	80
Area D	62.1	80.9	1.2	0.6	1.9	1.5	2 HAD	85
State Avg 2020	62.3	81.1	1.2	0.6	1.8	0.4	1 HAD	86
State Avg 2019	61.4	80.0	3.4	0.6	4.1	0.0	2 D	59
TWO-STATE AVERAGE								
Avg 2020	62.2	80.9	0.9	0.6	1.5	0.4	1 HAD	88
Avg 2019	61.1	79.6	2.3	0.7	3.0	0.0	2 AD	64
Five-Year Avg	60.9	79.3	0.6	0.9	1.6	0.3	1 HAD	85



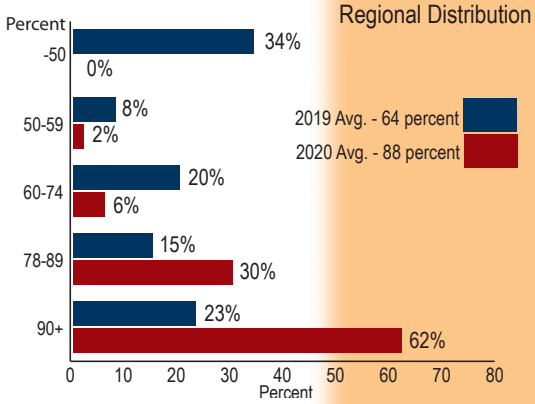




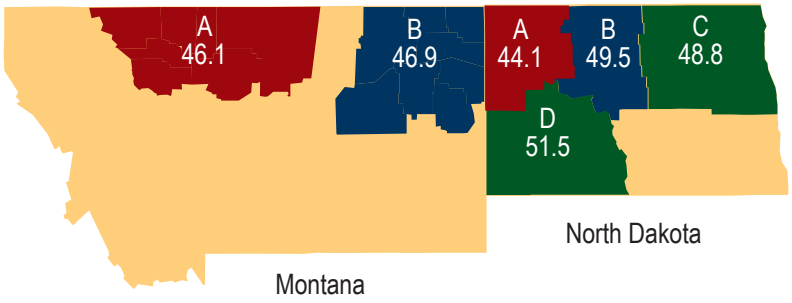
AVERAGE VITREOUS KERNEL BY AREA
(Percent)



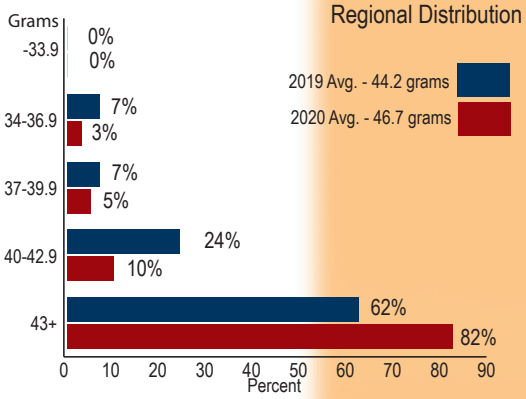
VITREOUS KERNEL
Regional Distribution



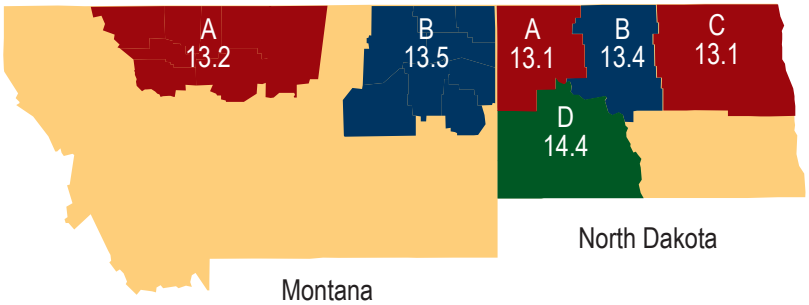
AVERAGE 1000 KERNEL WEIGHT BY AREA
(Grams)



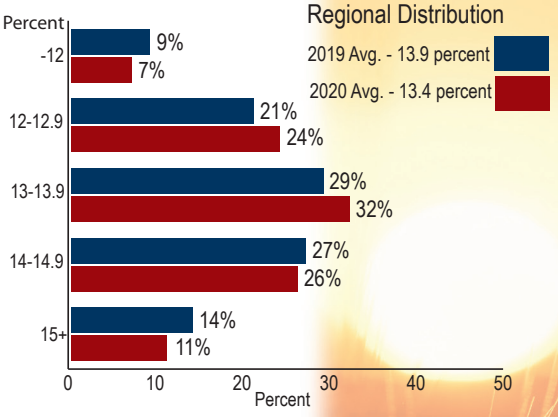
1000 KERNEL WEIGHT
Regional Distribution



AVERAGE PROTEIN BY AREA
12% Moisture Basis - Percent



PROTEIN - 12% MOISTURE
Regional Distribution



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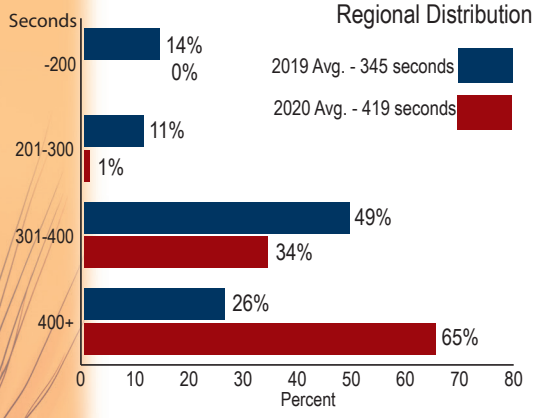
OTHER KERNEL QUALITY DATA

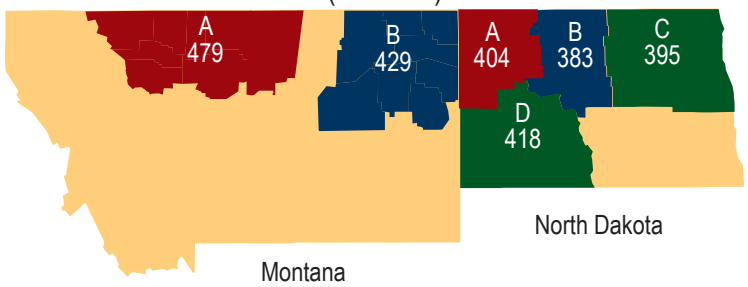
STATE AND CROP REPORTING AREA	DOCKAGE %	MOISTURE %	1000 KERNEL WEIGHT G	KERNEL DIST. MED/LGE %	PROTEIN 12%/0% MOISTURE BASIS %	DON (PPM)	WHEAT ASH %	FALLING NUMBER (SEC)	MICRO SED (CC)
MONTANA									
Area A	0.5	9.5	46.1	37/61	13.2/15.0	0.1	1.53	479	79
Area B	0.9	9.9	46.9	41/57	13.5/15.3	0.2	1.59	429	54
State Avg 2020	0.8	9.8	46.7	40/58	13.4/15.3	0.1	1.58	441	60
State Avg 2019	1.4	11.6	43.8	42/55	14.0/15.9	0.1	1.50	421	64
NORTH DAKOTA									
Area A	0.8	11.3	44.1	40/57	13.1/14.9	0.1	1.52	404	63
Area B	0.6	11.7	49.5	38/59	13.4/15.2	0.4	1.58	383	60
Area C	0.9	12.1	48.8	37/61	13.1/14.9	1.2	1.67	395	76
Area D	1.0	10.9	51.5	41/56	14.4/16.4	0.3	1.67	418	65
State Avg 2020	0.8	11.4	46.8	40/58	13.4/15.3	0.3	1.57	402	64
State Avg 2019	1.2	12.6	44.5	35/63	13.9/15.8	1.0	1.51	293	60
TWO-STATE AVERAGE									
State Avg 2020	0.8	10.7	46.7	40/58	13.4/15.3	0.2	1.57	419	62
State Avg 2019	1.3	12.2	44.2	38/59	13.9/15.8	0.6	1.51	345	61
Five-State Avg	0.8	11.5	40.5	46/50	14.0/15.9	0.5	1.54	397	65

FALLING NUMBER



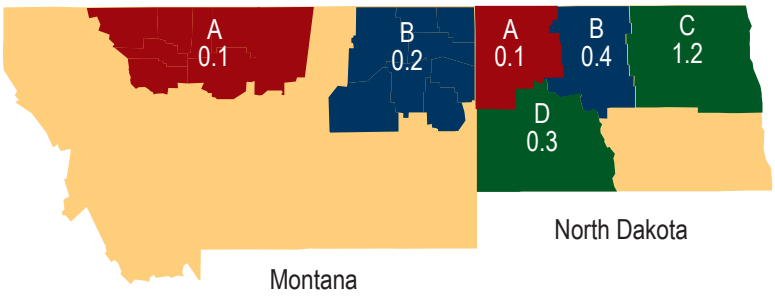
AVERAGE FALLING NUMBER BY AREA

(Seconds)



AVERAGE DON BY AREA

(PPM)



MILLING CHARACTERISTICS

TOTAL EXTRACTION represents the portion of the kernel that can be milled into flour and semolina.

SEMOLINA extraction is the portion milled into semolina only.

ASH CONTENT in the endosperm of durum is inherently higher than in the endosperm of other hard wheats, but can still be used as a relative measure of bran or mineral content in the flour and semolina.

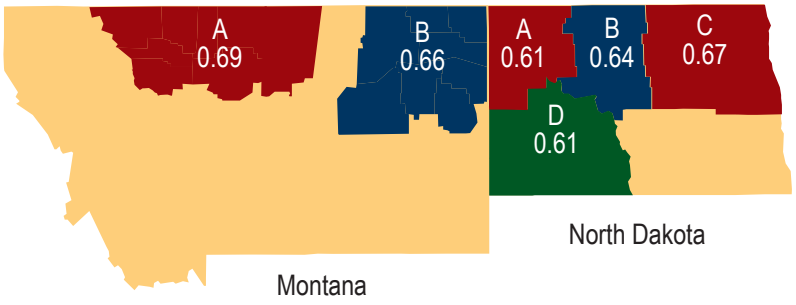
SPECKS appear in semolina when small particles of bran or other material escape the cleaning and purifying process. Millers can control speck count by selecting durum that is free of disease and foreign material, thoroughly cleaning the durum, properly tempering and conditioning the wheat before milling, and by using purifiers to remove small bran particles from the semolina.

PROTEIN CONTENT in semolina has a high correlation with gluten content and, in turn, mechanical strength and cooking quality. Wet gluten is a quantitative measure of the gluten forming proteins in semolina that are primarily responsible for its mechanical strength and pasta quality.

MIXOGRAM curves reveal important information about the dough quality of semolina and ultimately about the potential cooked firmness of pasta. Mixograms are rated on a scale of 1 to 8, with the higher values indicating stronger mixing characteristics.

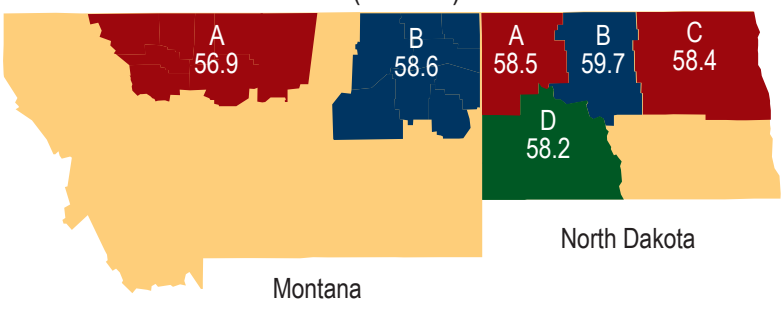
AVERAGE ASH CONTENT BY AREA

(Percent)



AVERAGE SEMOLINA EXTRACTION BY AREA

(Percent)



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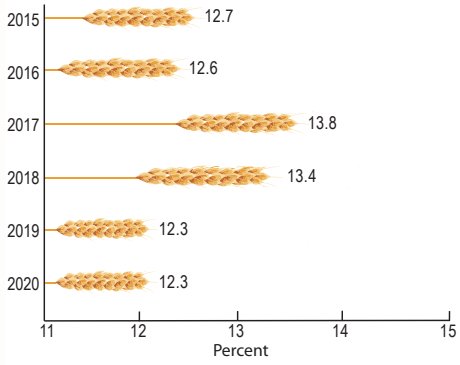
SEMOLINA QUALITY DATA

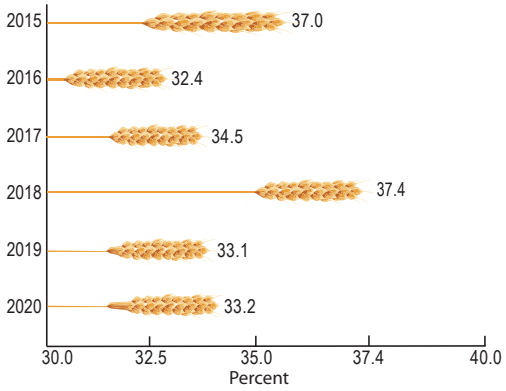
STATE AND CROP REPORTING AREA	TOTAL EXTRACTION[1] %	SEMOLINA EXTRACTION[1] %	ASH[1] %	SPECKS NO/10 SQ IN[1] %	PROTEIN (14% MOISTURE) %	WET GLUTEN %	GLUTEN INDEX %	MIXOGRAM CLASSIFICATION SCALE 1-8
MONTANA								
Area A	n/a	56.9	0.69	21	12.3	30.3	96	8.0
Area B	n/a	58.6	0.66	30	12.3	33.7	67	5.5
State Avg 2020	n/a	58.2	0.67	28	12.3	32.9	74	6.1
State Avg 2019	n/a	56.1	0.65	25	12.3	32.6	76	7.0
NORTH DAKOTA								
Area A	n/a	58.8	0.61	30	12.1	33.0	71	5.8
Area B	n/a	59.7	0.64	37	12.3	34.2	70	6.0
Area C	n/a	58.4	0.67	37	11.9	30.3	92	7.0
Area D	n/a	58.2	0.61	32	13.2	35.8	82	6.0
State Avg 2020	n/a	58.8	0.62	32	12.3	33.4	75	6.0
State Avg 2019	n/a	58.5	0.56	36	12.2	33.5	61	5.9
TWO-STATE AVERAGE								
State Avg 2020	n/a	58.5	0.64	30	12.3	33.2	74	6.0
State Avg 2019	n/a	57.5	0.60	31	12.3	33.1	67	6.4
Five-Year Avg	72.7	65.7	0.67	28	12.9	34.4	64	5.5

1. The 2019 & 2020 samples were milled on a Quad Junior Mill. Prior years were milled on a Buhler Lab Mill. As a result, no total extraction data is available, and comparison for semolina extraction and ash values is limited in reference to 5 year average values.

SEMOLINA PROTEIN – Regional Average

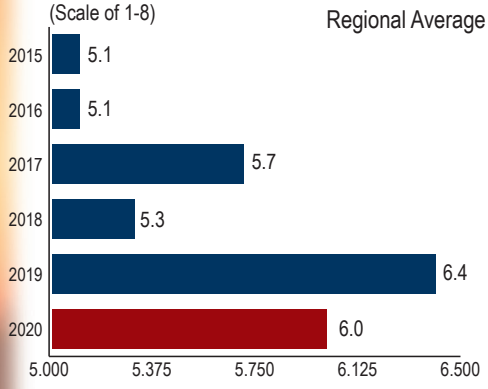


WET GLUTEN – Regional Average



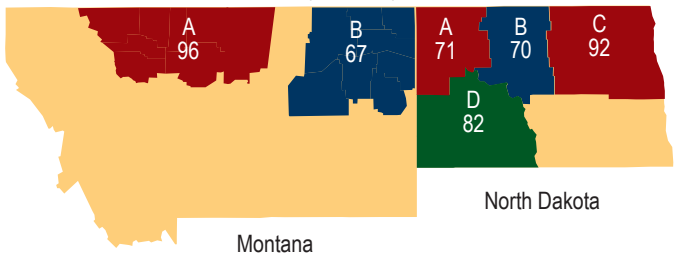
MIXOGRAM CLASSIFICATION

(Scale of 1-8) Regional Average



AVERAGE GLUTEN INDEX BY AREA

(Percent)



SEMOLINA & SPAGHETTI DATA

STATE AND CROP REPORTING AREA	SEMOLINA COLOR L (BLACK-WHITE)	SEMOLINA COLOR A (GREEN-RED)	SEMOLINA COLOR B (BLUE-YELLOW)	SPAGHETTI COLOR SCORE (1-12)	SPAGHETTI COOKED WEIGHT G	SPAGHETTI COOKING LOSS %	SPAGHETTI COOKED FIRMNESS G CM
MONTANA							
Area A	83.1	-2.2	33.1	9.0	31.0	7.4	3.9
Area B	83.8	-2.3	29.9	8.5	30.9	7.0	3.5
State Avg 2020	83.6	-2.3	30.6	8.6	30.9	7.1	3.6
State Avg 2019	83.0	-2.4	30.2	8.2	31.9	6.7	4.1
NORTH DAKOTA							
Area A	83.9	-2.6	30.1	8.5	31.4	7.3	3.6
Area B	83.6	-2.5	30.3	8.5	30.6	7.2	3.6
Area C	83.6	-2.6	29.9	8.5	31.1	7.7	3.6
Area D	83.9	-2.5	30.3	8.5	30.5	7.0	3.9
State Avg 2020	83.8	-2.6	30.2	8.5	31.1	7.2	3.6
State Avg 2019	82.8	-2.4	28.7	7.5	32.5	7.4	3.7
TWO-STATE AVERAGE							
State Avg 2020	83.7	-2.4	30.4	8.5	31.0	7.2	3.6
State Avg 2019	82.9	-2.4	29.3	7.8	32.2	7.1	3.8
Five-Year Avg	83.6	-2.6	29.8	8.5	31.1	6.2	4.4

PASTA CHARACTERISTICS

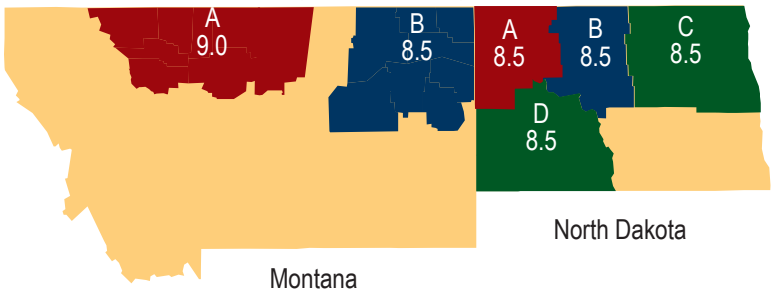
DRY PASTA PROCESSORS want a finished product that is visually appealing, elastic and strong enough to resist breakage during cutting, packaging, handling and shipping, able to withstand the rigors of cooking, and satisfying to the consumer palate.

Yellow color in semolina and pasta is a traditional, rather than functional, mark of quality. In the early days of the pasta industry, before sophisticated testing evolved, consumers assumed that a yellow pasta was made from durum wheat, which is known to make pasta with superior cooking quality compared to that made from other hard wheats.

Most consumers prefer pasta that is “al dente,” meaning it has some firmness to the bite. Good quality pasta that is cooked according to package directions should not be sticky or mushy when eaten.

AVERAGE COLOR SCORE BY AREA

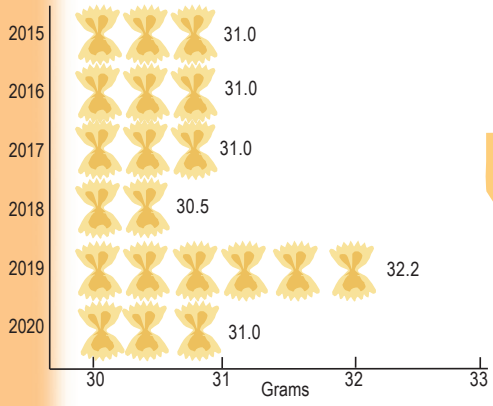
(Scale of 1-12)



U.S. DURUM WHEAT

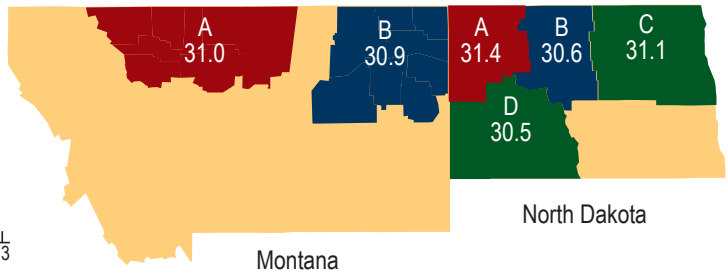
MONTANA | NORTH DAKOTA

COOKED WEIGHT – Regional Average

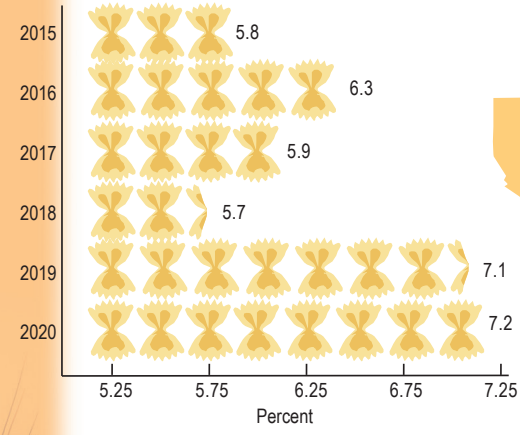


AVERAGE COOKED WEIGHT BY AREA

(Grams)

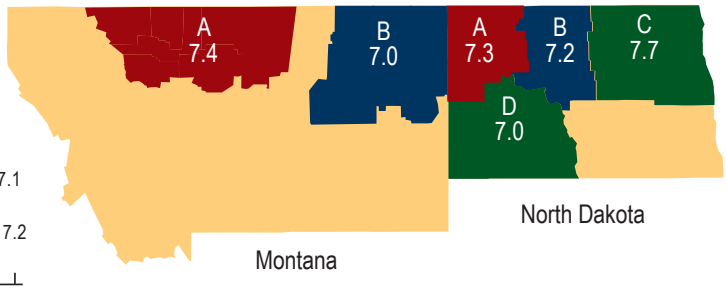


COOKING LOSS – Regional Average

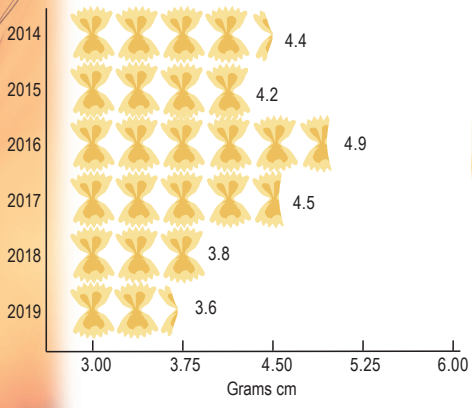


AVERAGE COOKING LOSS BY AREA

(Percent)

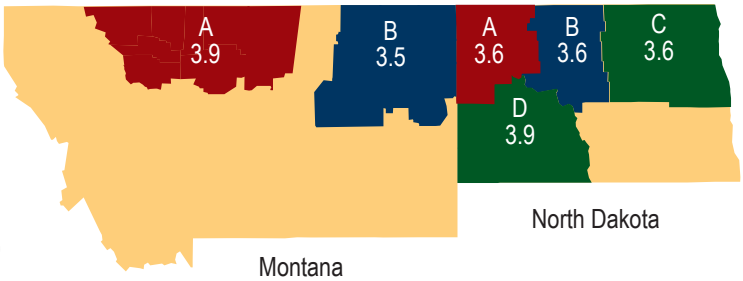


COOKED FIRMNESS – Regional Average



AVERAGE COOKED FIRMNESS BY AREA

(G CM)



RECENT QUALITY TRENDS

	2020	2019	2018	2017	2016	2015	FIVE-YEAR AVERAGE
GRADING AND WHEAT DATA							
Test Weight (lbs/bu)	62.2	61.1	61.4	60.9	61.2	60.6	60.9
Test Weight (kg/hl)	80.9	79.6	79.9	79.4	79.7	78.9	79.3
Total Defects (%)	1.5	3.0	1.0	1.2	1.2	1.3	1.6
Vitreous Kernels (%)	88	64	90	88	90	91	85
Grades	1 HAD	2 AD	1 HAD	1 HAD	1 HAD	1 HAD	1 HAD
OTHER WHEAT DATA							
Dockage (%)	0.8	1.3	0.7	1.1	0.2	0.9	0.8
Protein: 12% moisture	13.4	13.9	14.5	14.5	13.4	13.9	14.0
1000 Kernel Weight (gm)	46.7	44.2	41.2	38.4	40.0	38.5	40.5
Moisture (%)	10.7	12.2	11.2	11.3	11.4	11.2	11.5
DON		0.6	0.2	<0.5	1.0	0.8	0.5
Ash (%)	1.57	1.51	1.54	1.46	1.61	1.57	1.54
Falling Number (sec)	419	345	425	380	423	414	397
Sedimentation (cc)	62	61	61	87	54	62	65
SEMOLINA DATA							
Total Extraction (%)	n/a	n/a	74.0	72.2	73.6	70.6	72.7
Semolina Extraction (%)	58.5	57.5	69.3	68.5	67.9	65.1	65.7
Ash (%)	0.64	0.60	0.73	0.69	0.71	0.64	0.67
Wet Gluten (%)	33.2	33.1	37.4	34.5	32.4	37.0	34.4
Specks (no/10 sq in)	30	31	29	26	30	24	28
Protein (%)	12.3	12.3	13.4	13.8	12.6	12.7	12.9
Gluten Index (%)	74	67	57	86	61	50	64
Mixograph Classification	6.0	6.4	5.3	5.7	5.1	5.1	5.5
*Color: L (black-white)	83.7	82.9	83.6	83.3	84.3	84.4	83.6
*a (green-red)	-2.4	-2.4	-2.5	-2.3	-2.8	-3.1	-2.6
*b (blue-yellow)	30.4	29.3	29.9	29.4	30.3	30.1	29.8
SPAGHETTI PROCESSING DATA							
Color Score (scale of 1-12)	8.5	7.8	8.3	9.0	8.5	8.9	8.5
*L (black-white)	54.4	51.8	52.8	54.4	53.5	54.5	53.4
*b (blue-yellow)	26.5	24.2	25.6	27.1	26.4	27.3	26.1
Cooked Weight (gm)	31.0	32.2	30.5	31.0	31.0	31.0	31.1
Cooking Loss (%)	7.2	7.1	5.7	5.9	6.3	5.8	6.2
Cooked Firmness (g cm)	3.6	3.8	4.5	4.9	4.2	4.4	4.4

* Semolina color performed on CIE color scale. Granulation size is approximately 40 percent above 425 microns and 12 percent below 180 microns. Spaghetti color is performed on Hunter color scale.

U.S. DURUM WHEAT

MONTANA | NORTH DAKOTA

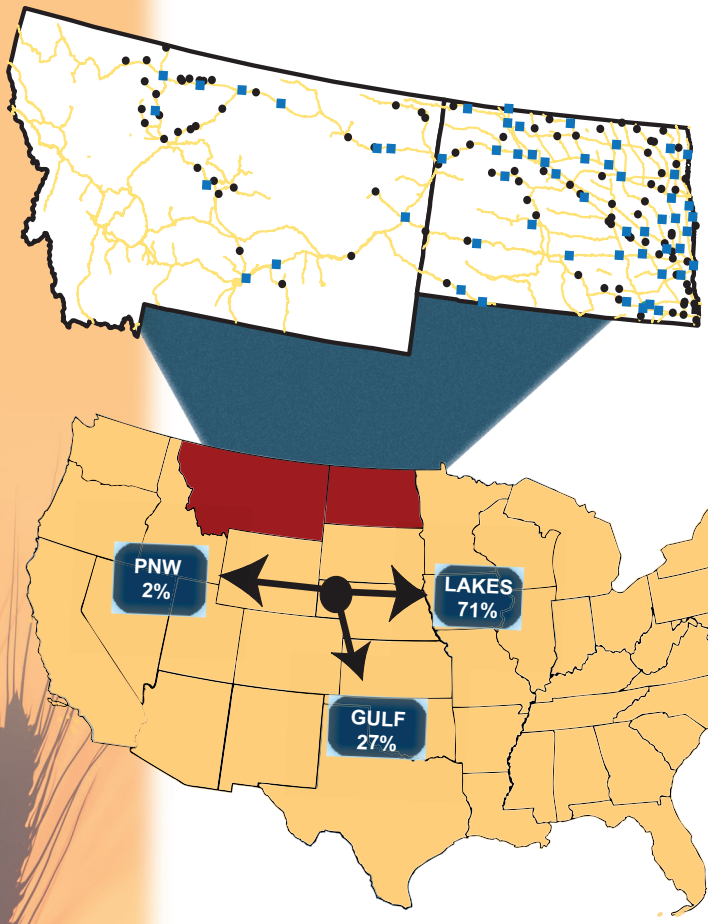
HANDLING & TRANSPORTATION

The durum wheat growing region in the Northern Plains has a vast network of country elevators to facilitate efficient and precise movement to domestic and export markets. On average, nearly 80 percent of the region's wheat moves to markets by rail. Duluth is the only export market easily serviced by trucks. Shipments to the Pacific Northwest and Gulf export markets are almost entirely by rail, with some barge movement to the Gulf. The dominant railroad is the Burlington Northern Santa Fe, followed by the Canadian Pacific.

A growing number of elevators in the region are investing to ship 100-110 car units in "shuttle" trains. Each rail car holds approximately 3,500 bushels (95 metric tons) of wheat. Shuttle-equipped facilities receive the lowest rates, sharing volume and transaction efficiencies with the railroad.

The diverse rail shipping capacities and widespread network of elevators are strengths buyers can capitalize on, especially as their demand heightens for more precise quality specifications and consistency between shipments. Buyers are encouraged to explore origin-specific shipments to optimize quality and value.

The rail and elevator network in the U.S. northern grown durum region is well suited for meeting the increasing quality demands of both domestic and international customers.



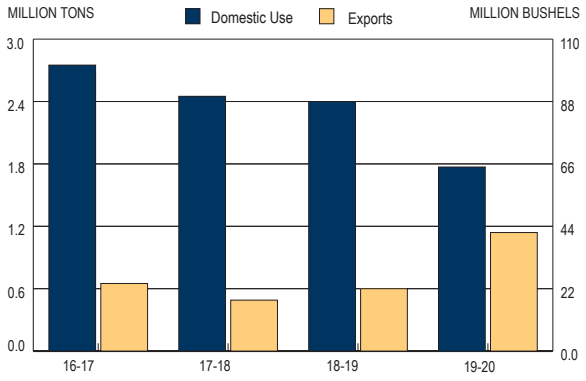
AVERAGE SHARE OF U.S. DURUM EXPORTS BY PORT (2016-2019)

● Track for 50 to 99 rail cars
■ Track for 100 or more cars

Source: Upper Great Plains Transportation Institute

Grain Handling and Transportation Facilities in the Two-State Region

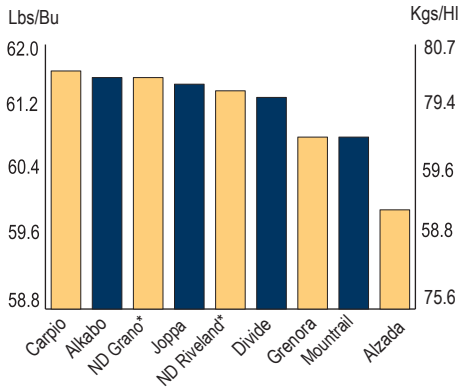
2016-19 U.S. DURUM DOMESTIC USE AND EXPORTS



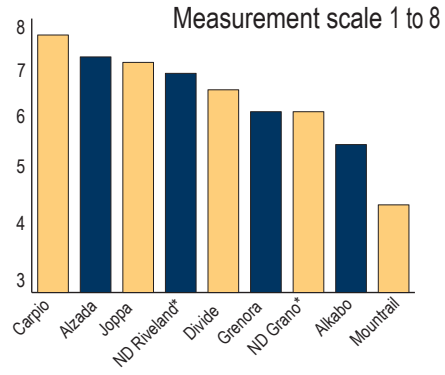
Marketing Year (June - May)

VARIETAL INFORMATION

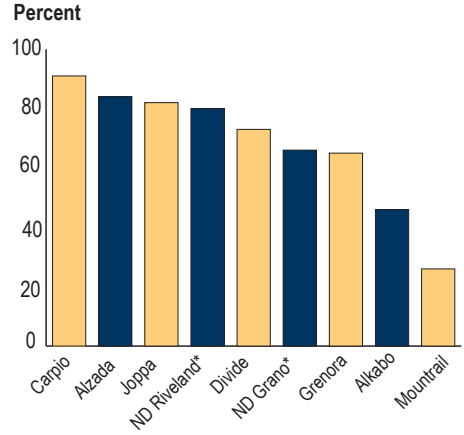
TEST WEIGHT



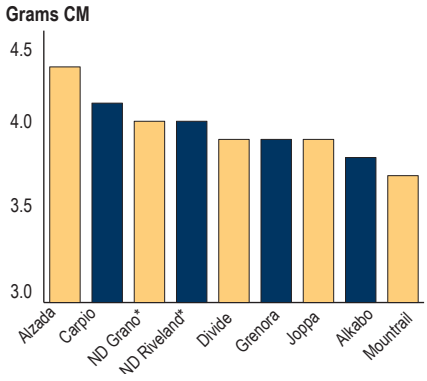
MIXOGRAPH



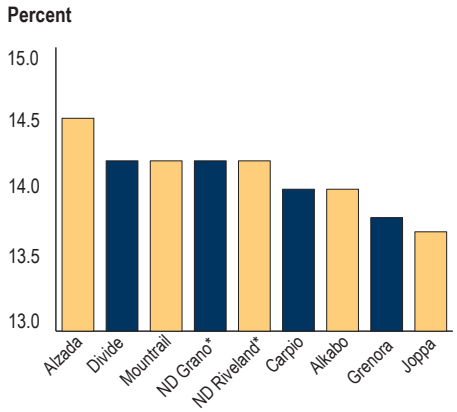
GLUTEN INDEX



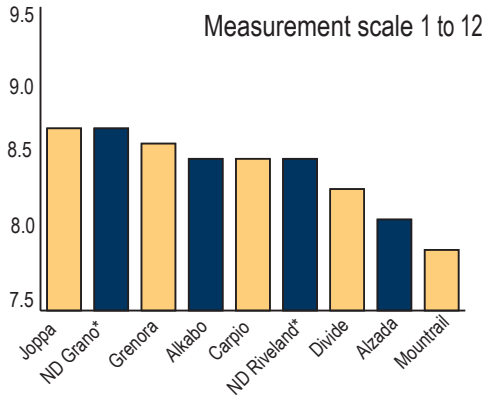
COOKED FIRMNESS



KERNEL PROTEIN



PASTA COLOR



THESE TABLES illustrate the quality evaluation of some of the most popular varieties (cultivars), for key kernel and end-use parameters during the 2015-2019 growing seasons. A commitment to extensive end-use quality testing of new cultivars during the development stages is a major priority for producers in the region. The goal is to develop and release cultivars that excel in numerous kernel, milling and end-product parameters, across a broad environment.

* Low Cadmium Varieties

U.S. DURUM WHEAT

MONTANA | NORTH DAKOTA

MAJOR VARIETIES PRODUCED IN REGION • AGRONOMIC FACTORS

	AGRONOMIC DESCRIPTION					AVERAGE YIELD[3]	
VARIETY	AGENT or ORIGIN[1]	YEAR RELEASED	STRAW STRENGTH (1-9)	PLANT HEIGHT INCHES	FOLIAR DISEASE[2] (1-9)	BU/PER ACRE	MT/PER HECTARE
Alkabo	ND	2005	2	31	5	54.9	3.69
Alzada	WB	2004	6	27	8	44.2	2.97
Carpio	ND	2012	5	32	5	57.4	3.85
Divide	ND	2005	5	33	5	57.2	3.84
Grenora	ND	2005	5	30	5	55.7	3.74
Joppa	ND	2013	5	33	5	58.2	3.91
Mountrail	ND	1998	5	32	5	57.1	3.84
ND Grano*	ND	2017	5	32	7	57.9	3.89
ND Riveland*	ND	2017	4	33	5	58.8	3.95

GROWN AND TESTED ACROSS NORTH DAKOTA • QUALITY & END-USE FACTORS

	QUALITY FACTORS[4]								
VARIETY	TEST WEIGHT LB/BU	TEST WEIGHT KG/HL	WHEAT PROTEIN %	WHEAT FALLING # SECONDS	MIXOGRAM SCORE (SCALE 1-8)	PASTA COLOR (SCALE 1-12)	GLUTEN INDEX %	COOKED FIRMNESS G CM	OVERALL PASTA QUALITY RATING[5]
Alkabo	61.5	80.1	13.8	415	5.7	8.5	46	3.8	good
Alzada	59.5	77.6	14.5	505	7.3	8.1	84	4.3	excellent
Carpio	61.6	80.2	14.0	480	7.7	8.5	91	4.1	excellent
Divide	61.2	79.7	14.2	473	6.7	8.3	73	3.9	good
Grenora	60.6	78.9	14.0	436	6.3	8.6	65	3.9	good
Joppa	61.4	80.0	13.7	461	7.2	8.7	82	3.9	good
Mountrail	60.6	78.9	14.2	456	4.6	7.9	25	3.7	average
ND Grano*	61.5	80.1	14.2	477	6.3	8.7	66	4.0	excellent
ND Riveland*	61.3	79.8	14.2	466	7.0	8.5	80	4.0	good
Strongfield	60.6	78.9	14.8	468	6.8	8.0	66	4.1	good

* Low Cadmium

Source: 2020 North Dakota Durum Wheat Variety Performance Descriptions

1. ND – North Dakota State University , CAN – Canada and WB – Westbred.
2. Foliar Disease includes tan spot and septoria: 1 to 9 scale, with 1 = resistant and 9 very susceptible.
3. Yield trials 2015-19 crop years grown at Carrington, Casselton, Dickinson, Langdon, Minot and Williston, North Dakota.
4. Based on NDSU Durum Quality Lab testing of 2015-19 samples grown at Carrington, Casselton, Dickinson, Langdon, Minot and Williston, North Dakota.
5. Based on kernel attributes, milling and semolina processing, pasta color and spaghetti cooking performance. Ratings can be excellent, good, average, fair and poor.

NORTH DAKOTA AND MONTANA

THE TOP five durum varieties planted in North Dakota in 2020 are Joppa, Divide, ND Riveland, VT Peak, and Carpio, accounting for nearly three-fourths of the acres. In Montana, the top three varieties in 2020 are Alzada, Joppa, and Tioga accounting for nearly 70 percent of the acres.

JOPPA has been the leading variety in North Dakota for four straight years, accounting for 29 percent of the acres in 2020. In Montana, it ranks second with 22.5 percent of the acres. Released from NDSU in 2013, Joppa is popular with producers for its high-end yield potential and positive agronomic characteristics. It is noted for very good end-use quality traits with especially high pasta color scores.

DIVIDE remains in second place in North Dakota with a 20 percent share, and is fourth in Montana with 9 percent of the acres. Divide was released in 2005 from NDSU, and remains popular with producers for its high yield potential and higher ratings for disease tolerance. It is rated good for end-use quality.

ND RIVELAND holds third position in North Dakota with 11 percent of the acres, up sharply from just 2.4 percent in 2019. Released from NDSU in 2017, it is a variety with elite yield potential and very good agronomic characteristics. ND Riveland is a variety with low cadmium (cd) uptake trait, along with good end-use quality characteristics.

VT PEAK is the fourth most popular variety in North Dakota with nearly 9 percent of the acres. A 2010 release from Viterra, it is a medium maturity variety with shorter height and high yield potential.

CARPIO accounts for nearly 7 percent of the acreage in North Dakota in 2020. Carpio was released from NDSU in 2012, and is rated excellent for end-use quality with strong gluten properties, and high scores for color and cooked firmness.

NORTH DAKOTA VARIETY SHARE OF 2020 PLANTED ACRES BY CROP DISTRICT

VARIETY	NORTH WEST	WEST CENTRAL	SOUTH WEST	COMBINED DISTRICTS[1]	TOTAL STATE
	PERCENTAGE (%)[2]				
Joppa	26.4	31.5	56.5	22.2	29.3
Divide	20.4	12.2	8.0	28.5	20.0
ND Riveland	13.3	18.9	0.0	6.9	11.0
VT Peak	7.4	5.2	0.0	17.3	8.6
Carpio	8.9	11.2	4.5	0.4	6.7
Alkabo	8.0	12.7	0.0	2.2	6.3
Lebsock	3.2	2.0	1.1	5.6	3.4
ND Grano	4.3	0.0	3.2	0.7	2.9
Tioga	1.5	1.1	14.7	0.0	2.5
Other[3]	6.6	5.2	12.2	16.2	9.3
	1,000 ACRES (1 ACRE = 0.4 HECTARES)				
Total Acres[4]	343.0	87.0	101.0	169.0	700[4]

1. Data from North Central, Northeast, Central, East Central, South Central and Southeast districts are combined to avoid disclosure of individual operations..
2. Percentages may not add to 100 due to rounding
3. Includes varieties with less than 1% acreage in 2020 and unknown varieties.
4. September 30, 2020 small grain estimate was 910,000 acres, up from 700,000 in June survey

NORTH DAKOTA VARIETY SHARE OF PLANTED ACRES[3]

VARIETY	2020%[1]	2019%[1]
Joppa	29.3	30.7
Divide	20.0	21.5
ND Riveland	11.0	2.4
VT Peak	8.6	6.1
Carpio	6.7	6.2
Alkabo	6.3	7.9
Lebsock	3.4	0.7
ND Grano	2.9	1.7
Tioga	2.5	1.4
Other[2]	9.3	21.4

1. Percentage may not add to 100 due to rounding.
2. Includes varieties with less than 1% of acreage in 2020 and unknown varieties.
3. 1,000 acres (1 acre = 0.405 hectares)
   2020 – 910,000 acres
   2019 – 720,000 acres

MONTANA VARIETY SHARE OF PLANTED ACRES[3]

VARIETY	2020%[1]	2019%[1]
Alzada	35.2	22.8
Joppa	22.5	20.5
Tioga	10.9	4.8
Divide	8.8	16.7
Kyle	6.1	0.8
Mountrail	4.7	19.4
Other[2]	7.3	18.5

1. Percentage may not add to 100 due to rounding.
2. Includes varieties with less than 1% of acreage in 2020 and unknown varieties.
3. 1,000 acres (1 acre = 0.405 hectares)
   2020 – 690,000 acres
   2019 – 550,000 acres

ALZADA remained the most popular variety in Montana for a second straight year with 35 percent of the acres up from 23 percent in 2019. It is the dominant variety produced in the North Central region where it is primarily grown under contracted production. Alzada is a 2004 release from Westbred. It has good yield and agronomic traits with uniquely strong gluten properties and excellent cooking quality.

TIOGA is the third most popular variety in Montana with 11 percent of the acres, up from 5 percent in 2019. It is a 2010 release from NDSU and is popular with producers for its balance of yield, strong straw and good end-use quality.

U.S. DURUM WHEAT

MONTANA | NORTH DAKOTA

LABORATORY ANALYSIS

All quality data contained in this report is the result of testing and analysis conducted by or under the supervision of Dr. Frank Manthey, professor, James Perleberg, chemist, and Yu Liu, food technologist of the Durum Wheat Quality and Pasta Processing Laboratory in the Department of Plant Science at North Dakota State University, Fargo, North Dakota, USA.

COLLECTION • The North Dakota and Montana state offices of the National Agricultural Statistics Service obtained durum wheat samples during harvest directly from growers, farm bins and local elevators. These samples reflect the condition of the grain at the point of origin. Collection began in mid August and continued through early October. A total of 188 samples were collected from Montana (66) and North Dakota (122). The goal for collection was 220 total samples.

ANALYSIS • Half of the total wheat samples collected were analyzed for grade and other physical kernel characteristics. The data obtained from the analyses was used to generate frequency distributions as a percentage of the harvested crop. Distribution results may differ from data presented in the various tables, because the latter are derived from production adjusted averages, rather than simple averages.

All samples received in the laboratory were sub-sampled to obtain one composite sample for each of the four areas in North Dakota and one composite each of two areas for Montana. These were analyzed for grade and physical characteristics as well as milling performance and spaghetti processing qualities. Again, all state and regional averages have been adjusted to reflect production as opposed to simple averaging.

METHODS, TERMS, SYMBOLS

WHEAT

SAMPLE COLLECTION • Each sample contained approximately 2 to 3 pounds of wheat, stored in securely closed, moisture proof plastic bags.

MOISTURE • Official USDA procedure using Motomco Moisture Meter.

GRADE • Official United States Standards for Grain, as determined by a licensed grain inspector. North Dakota Grain Inspection Service, Fargo, ND, provided grades for composite wheat samples representing each crop reporting area.

VITREOUS KERNELS • Approximate percentage of kernels having vitreous endosperm, based on weights.

DOCKAGE • Official USDA procedure. All matter other than wheat which can be removed readily from a test portion of the original sample by use of an approved device (Carter Dockage Tester). Dockage may also include underdeveloped, shriveled and small pieces of wheat kernels removed in properly separating the material other than wheat and which cannot be recovered by properly rescreening or recleaning.

TEST WEIGHT • American Association of Cereal Chemists Method 55-10.01 approved April 1961, revised October 1999. Measured as pounds per bushel (lb/bu), kilograms per hectoliter (kg/hl) = (lbs/bu X 1.292) + 0.630. Approved Methods of the American Association of Cereal Chemists, Cereal Laboratory Methods (10th Edition), St. Paul, MN (2000).

THOUSAND KERNEL WEIGHT • Based on 10 gram sample of cleaned wheat (free of foreign material and broken kernels) counted by electronic seed counter.

KERNEL SIZE DISTRIBUTION • Determinations made according to the procedure described in Cereal Science Today 5:(3), 71 (1960). Kernels remaining over a Tyler No. 7 (2.92 mm opening) are classified as “large;” kernels passing through the top sieve but remaining on a Tyler No. 9 (2.24 mm opening) are classified as “medium” size kernels. Kernels passing through the second sieve are classed as “small.” Size is reported as percentage of large, medium, and small kernels.

PROTEIN • American Association of Cereal Chemists (AACC) Method: 46-30.01 (Combustion Method), expressed on dry basis and 12 percent moisture basis.

ASH • American Association of Cereal Chemists Method 08-01.01, approved April 1961, revised October 1999; expressed on a 14 percent moisture basis.

DON • Analysis was done on ground wheat using a gas chromatograph with an electron capture detector as described in J. Assoc. Official Anal. Chem 79,472 (1996)

FALLING NUMBER • American Association of Cereal Chemists Method 56-81.03, approved November 1972, revised September 1999; units of seconds (14 percent moisture basis).

MICRO SEDIMENTATION • Determined as described by Dick, J.W. and Quick, J.S. Cereal Chem. 60(4):315-318, 1983.

WET GLUTEN • American Association of Cereal Chemists Method 38-12.01, approved October 1999; expressed on a 14 percent moisture basis determined with the glutomatic instrument.

GLUTEN INDEX • American Association of Cereal Chemists Method 38-12.02, approved October 1999; determined with the glutomatic instrument as an indication of gluten strength.

SEMOLINA

EXTRACTION • Durum tempered to 15.5% moisture and milled on a Brabender Quadrumat Jr mill configured to mill semolina.

ASH • AACC Method 08-01.01, approved April 1961, revised October 1999; expressed on a 14 percent moisture basis.

PROTEIN • AACC Method 46-30.01 (combustion method), approved September 1995, revised October 1999, N x 5.7, expressed on a 14 percent moisture basis.

SPECKS • The number of specks in semolina was determined on a flat surface under a constant light source, and counting the visible specks (brown and black particles) in three different one-inch square areas. The average of the three readings was converted to the number of specks per 10 square inches.

MIXOGRAPH • Mixograph evaluation of semolina was performed according to the AACC Method 54-40.02 with some modifications: Ten grams of semolina (weighed on 14 percent moisture basis) were mixed for 8 min at constant water absorption of 5.8 ml, using a spring setting of 8. The mixograms were scored by comparing them to reference mixograms. A scale of 1 to 8 is employed, higher values indicate strong mixing characteristics (see reference mixogram chart).

SPAGHETTI

PROCESSING • Pasta was made using the laboratory procedure described by Walsh, Ebeling, and Dick, Cereal Sci. Today: 16(11) 385, 1971. A 1-Kg semolina was mixed with the appropriate amount of water that gave a dough consistency of 32 percent total water absorption. The other processing conditions used were: Water temperature, 40 C, extruder shaft speed, 25 rpm and vacuum, 18 in. Hg; the dough was pressed through an 84-strand teflon-coated spaghetti die with 0.157 cm openings. The extruded spaghetti samples were dried at high temperature for 12 hrs, using maximum temperature and relative humidity of 73 C and 83 percent, respectively.

COLOR • Color scores were determined by light reflectance (AACC Method 14-22.01, 1983), using a Minolta Color Difference Meter (Model CR 410, Minolta Camera Co., Japan). The scores were generated according to the new color map designed by Debbouz (Pasta J. vol 6, No 6, 1994). A spaghetti sample with a score of 8.0 or higher is considered to have good color.

COOKED WEIGHT • 10 g of dry spaghetti were placed in 300 ml boiling distilled water and cooked for 12 min. The cooked and drained spaghetti sample was weighed and the results were reported in grams.

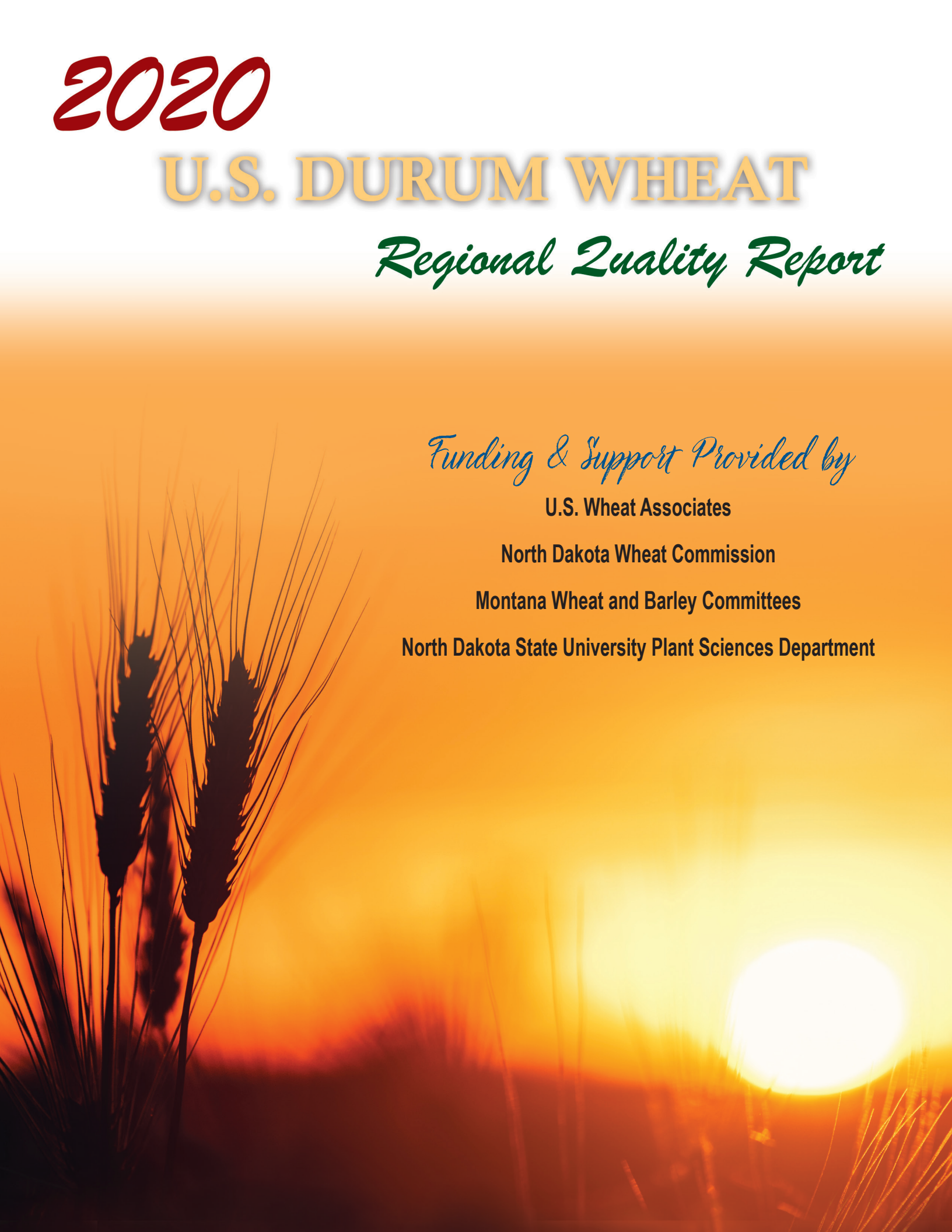
COOKING LOSS • AACC Method 66-50.01. Solids lost to the cooking water. After drying the residue was weighed and reported as percentage of the original dry sample.

FIRMNESS • AACC Method 66-50.01 with a Plexiglas tooth attached to a Texture Analyzer (Model TA-XT2, Texture Technology Corp., Scarsdale, New York).

2020

U.S. DURUM WHEAT

Regional Quality Report



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