

U.S. DURUM
WHEAT

REGIONAL QUALITY REPORT

17

U.S. DURUM WHEAT

MONTANA • NORTH DAKOTA

5-8

Grading & Kernel
Characteristics

9-10

Milling
Characteristics

11-12

Pasta
Characteristics

13

Summary
Information

14

Handling &
Transportation

15-17

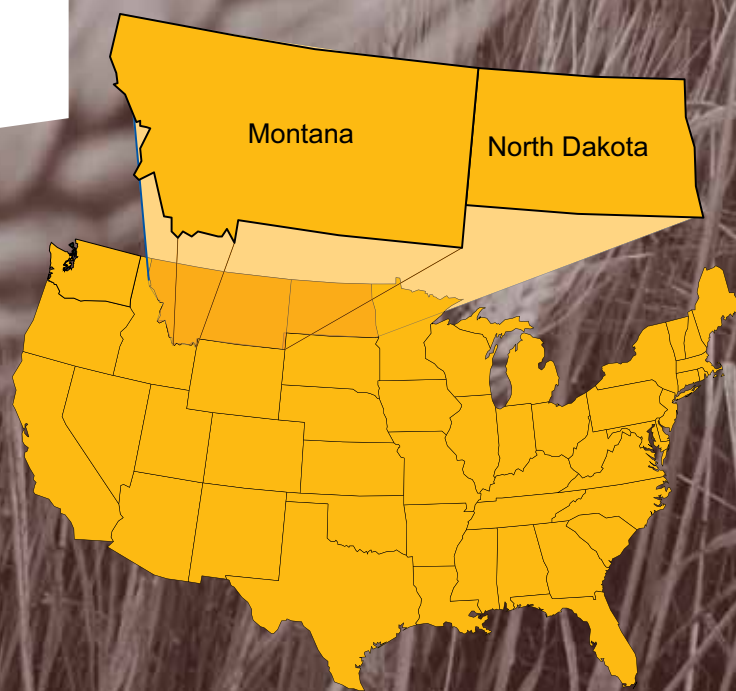
Varietal
Information

18

Laboratory
Analysis

18-19

Methods, Terms
and Symbols



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 agonomic environment. In most years, the states of North Dakota and Montana produce 80 percent of the U.S. durum crop.

2017 OVERVIEW

Durum production in Montana and North Dakota in 2017 is down significantly due to a small decline in acreage and to sharply lower yields as the region was afflicted with serious drought conditions. Durum production in the two states combined is 41.5 million bushels (1.13 MMT), less than half of 2016's production. While planted acreage was down only four percent, drought conditions persisted throughout most of the growing season in the Northern durum region, resulting in yields well below the near record levels of 2016. The dry conditions limited disease pressure, resulting in a high grading crop with very little damage. Drought affects are seen in the smaller kernel sizes and higher protein levels. Some sporadic rains during harvest affected falling number and vitreous kernel content on a small portion of the crop. Milling and processing quality parameters are stronger than last year.

The crop averages a No. 1 Hard Amber Durum (HAD), with an average test weight slightly lower than last year at 60.9 pounds per bushel (79.4 kg/hl). Forty-three percent of the crop grades a No. 1 HAD, below last year's level of 57 percent. The distribution data indicates that a larger portion of

the crop falls in the No. 1-2 Amber Durum category, due to color loss in some areas. Dry conditions led to very little disease pressure with damage at only 0.1 percent, lower than last year and the five-year average. Shrunken and broken kernels are a bit higher at 1.1 percent and account for the majority of the total defects of 1.2 percent. While a bit lower than last year, average vitreous kernel content is still above the five year average at 88 percent. Seventy percent of the crop has vitreous levels of 75 percent or higher and 45 percent is 90 percent vitreous or higher. A larger portion of the crop (25 percent versus 11 percent last year) falls in the 60-74 percent vitreous kernel range, reflecting the impact on some of the crop from rains at harvest.

The hot dry conditions pushed protein levels higher, with the regional average protein at 14.5 percent (12% moisture basis). The effects of the drought are evident in the lower thousand kernel weights and smaller kernel size. The average thousand kernel weight on the 2017 crop is 38.4 grams, compared to 40 grams in 2016. Thousand kernel weights by crop district range from 35.5 to 42.4 grams with

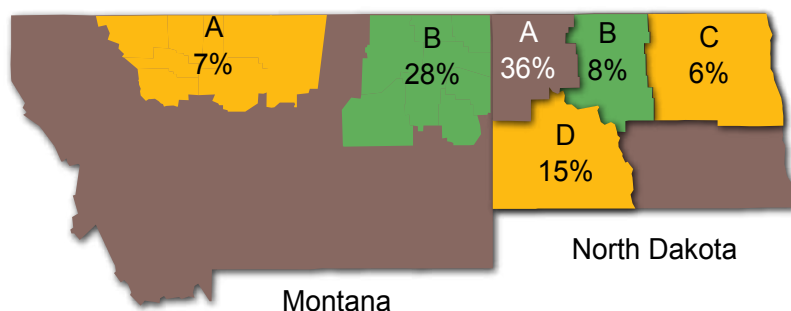
PRODUCTION DATA	2017	2016	2012-16 AVERAGE
MILLION BUSHEL			
Montana	12.6	31.4	18.8
North Dakota	28.9	58.1	40.2
U.S. Total	54.9	103.9	76.6
MILLION METRIC TON			
Montana	0.34	0.85	0.51
North Dakota	0.79	1.58	1.09
U.S. Total	1.49	2.83	2.08

Source: USDA 2017 Small Grains Summary

the most appreciable declines noted across Montana and ND area D. The medium to large kernel ratio for 2017 is 55/40, compared to 44/52 last year. Field-level dockage of 1.1% is higher than last year and the five-year average, related to more challenging threshing conditions and heavier weed pressures from thinner crop stands and late season rains. DON is nearly non-existent in this year's crop, a vast improvement over 2016 when DON had a broad impact on the crop. Average falling number for the region is 380 seconds, and crop average moisture is only 11.3%, reflective of mostly dry harvest conditions.

Milling performance, based on Buhler laboratory mill, shows a total extraction of 72.2 percent, slightly lower than last year, but above the five-year average. Semolina extraction, however, shows higher at 68.5 percent. The decline in total extraction can be contributed to overall smaller kernel size, while the good harvest conditions promoted kernel hardness and high HVAC, resulting in improved semolina extraction. The milled product shows lower ash levels at 0.69 percent, compared to 0.71 percent in 2016, and a lower

2016 Approximate Share of Regional Production by Crop Reporting Area



speck count. Wet gluten is higher than last year and similar to the five-year average at 34.5 percent. The average gluten index of 86.3 percent is notably higher than last year's level of 60.8 percent. This reflects a combination of varietal changes and good growing season conditions.

Semolina properties are quite similar to last year, with a slightly lower

b value score of 29.4. Mixing properties are stronger than last year and the five-year average. Evaluation of the cooked spaghetti shows lower cooking loss than last year and higher cooked firmness. Pasta color scores are also improved this year, with an average color score for the region of 9.

Buyers will be pleased with the excellent grading crop this year

that boasts strong protein levels, overall high vitreous kernel levels, higher semolina extraction, and improved mixing and pasta quality characteristics. With reduced supply levels, and isolated areas with lower vitreous kernel levels, lighter thousand kernel weights, and some DON detections, buyers should always remain diligent in their contract specifications.

SEASONAL CONDITIONS



Planting of the Northern durum crop began the third week of April, slightly ahead of average. Producers were able to make fairly steady planting progress due to warm conditions and few rain delays. Planting was mostly finished by the end of May, ahead of average, but slightly behind last year's faster than normal pace. Overly dry soil conditions were an increasing concern for much of the region at the end of May.

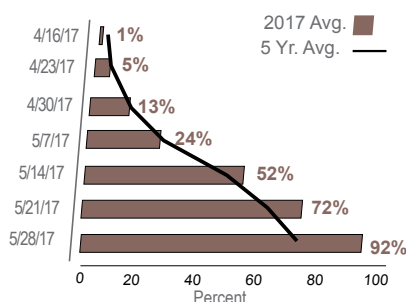


Precipitation was minimal throughout much of the growing season and crop condition ratings (which assess yield potential and other agronomic factors) declined during the crop development stages. Emergence was slow in areas as germination was delayed with the lack of moisture. The dry conditions pushed crop development ahead of normal and depressed yield potential, but also minimized disease pressure. Precipitation patterns were more beneficial across northern and eastern areas of the region, resulting in better crop potential in some pockets. However, the majority of the region produced yields that were well below average.

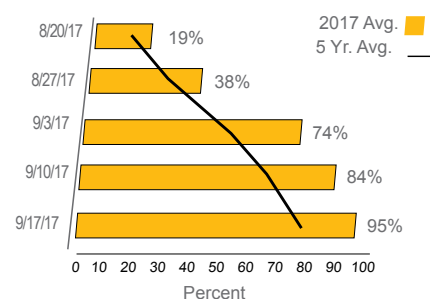


Harvest began in early August and moved quickly due to dry conditions and overall lower yields. Some acreage was abandoned and baled for hay due to extremely low yield potential and lack of feed supplies for cattle. Scattered rain delays were experienced towards the end of harvest which did affect the color on a portion of the crop. The majority of the harvest was done by the third week of September, well ahead of normal.

DURUM PLANTING PROGRESS



DURUM 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 a 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 or more hard, vitreous kernels;
- Amber Durum (AD)— between 60 and 74 percent hard, vitreous kernels;
- Durum (D)—less than 60 percent hard, vitreous kernels.



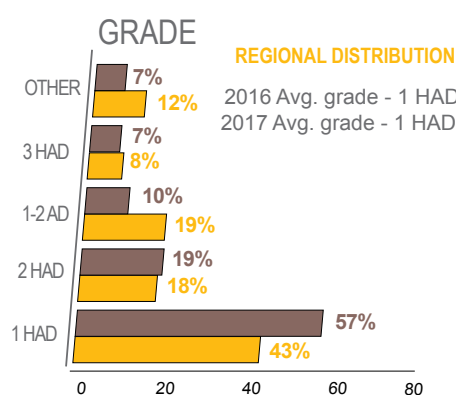
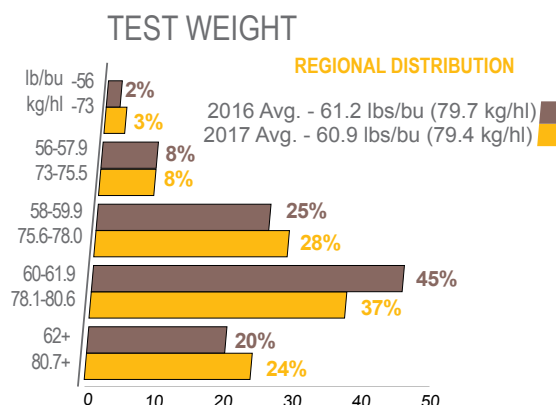
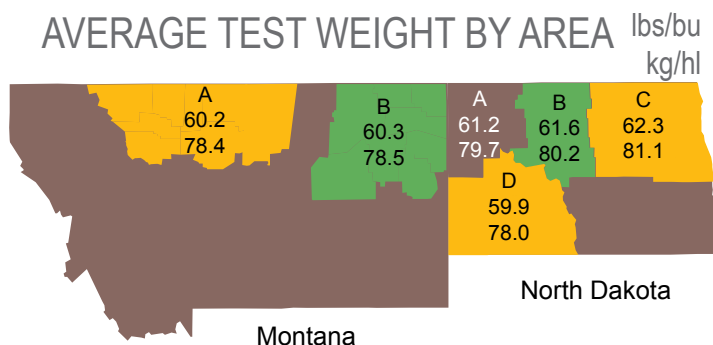
GRADING FACTORS	U.S. Grades				
	1	2	3	4	5
DURUM - MINIMUM TEST WEIGHTS					
Pounds per bushel	60.0	58.0	56.0	54.1	51.0
Kilograms per hectoliter	78.2	75.6	73.0	70.4	66.5
MAXIMUM PERCENT LIMITS OF:					
Damaged kernels					
Heat (part of total)	0.2	0.2	0.5	1.0	3.0
Total	2.0	4.0	7.0	10.0	15.0
Foreign material	0.4	0.7	1.3	3.0	5.0
Shrunken/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 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:

- Does not meet the requirements for U.S. Nos. 1, 2, 3, 4, or 5; or
- Has a musty, sour, or commercially objectionable foreign odor (except smut or garlic odor); or
- is heating or of distinctly low quality.
  - Includes damaged kernels (total), foreign material, and shrunken and broken kernels.
  - Unclassed wheat of any grade may contain not more than 10.0 percent of wheat of other classes.
  - Includes contrasting classes.
  - Includes any combination of animal filth, castor beans, crotalaria seeds, glass, stones, or unknown foreign substance.

WHEAT GRADING DATA

STATE AND CROP REPORTING AREA	TEST WEIGHT		DAMAGE	SHRUNKEN/ BROKEN KERNELS	TOTAL DEFECTS	CONTRASTING CLASSES	U.S. GRADE	VITREOUS KERNELS
	LBS/BU	KG/HL	%	%	%	%		%
MONTANA								
Area A	60.2	78.4	0.0	0.9	0.9	0.0	1 HAD	98
Area B	60.3	78.5	0.0	1.5	1.5	0.0	1 HAD	91
State Avg 2017	60.3	78.5	0.0	1.4	1.4	0.0	1 HAD	93
State Avg 2016	61.3	79.8	0.2	0.7	0.9	0.9	1 HAD	93
NORTH DAKOTA								
Area A	61.2	79.7	0.0	1.0	1.0	0.0	1 HAD	84
Area B	61.6	80.2	0.2	1.0	1.2	0.0	1 HAD	91
Area C	62.3	81.1	0.5	0.7	1.2	0.0	1 HAD	85
Area D	59.9	78.0	0.0	1.2	1.2	0.0	2 HAD	87
State Avg 2017	61.2	79.7	0.1	1.0	1.1	0.0	1 HAD	86
State Avg 2016	61.2	79.7	0.5	0.8	1.3	1.0	1 HAD	88
TWO-STATE AVG								
Avg 2017	60.9	79.4	0.1	1.1	1.2	0.0	1 HAD	88
Avg 2016	61.2	79.7	0.4	0.8	1.2	0.9	1 HAD	90
Five-Year Avg	60.4	78.7	0.4	1.0	1.4	0.2	1 HAD	86

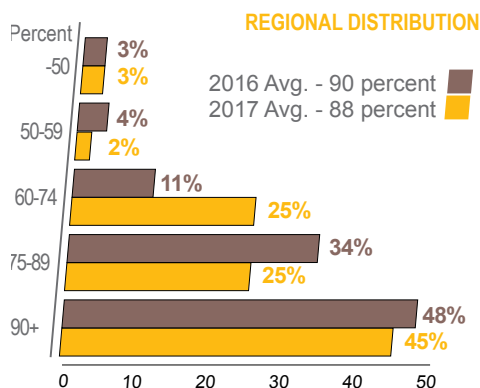


U.S. DURUM WHEAT

MONTANA • NORTH DAKOTA

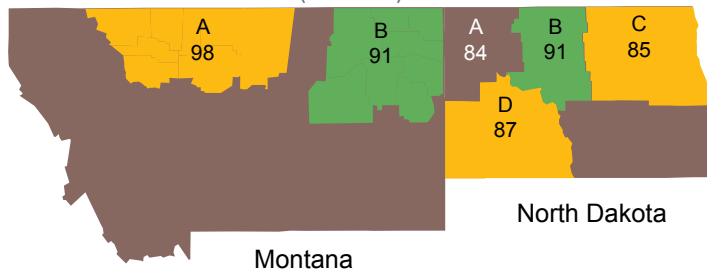
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VITREOUS KERNEL

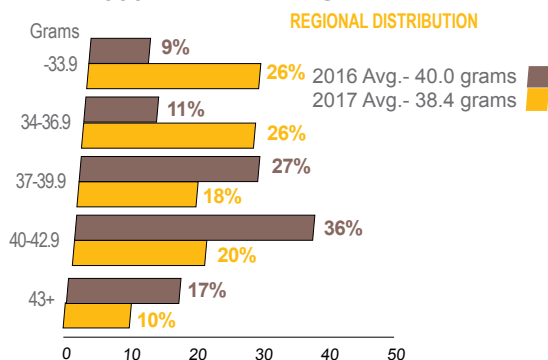


AVERAGE VITREOUS KERNEL BY AREA

(Percent)

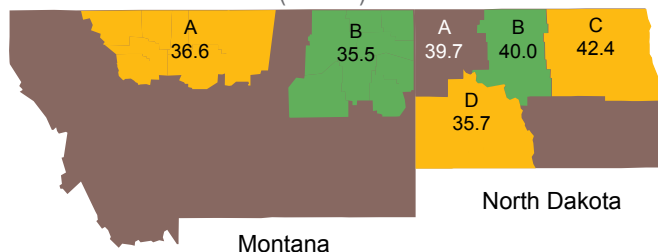


1000 KERNEL WEIGHT

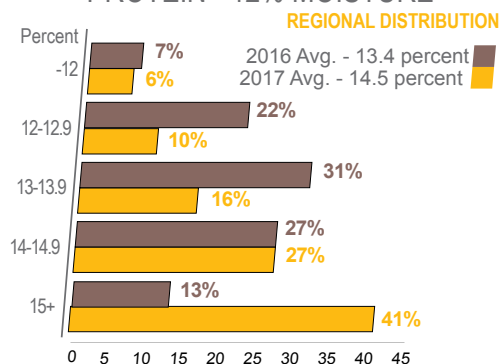


AVERAGE 1000 KERNEL WEIGHT BY AREA

(Grams)

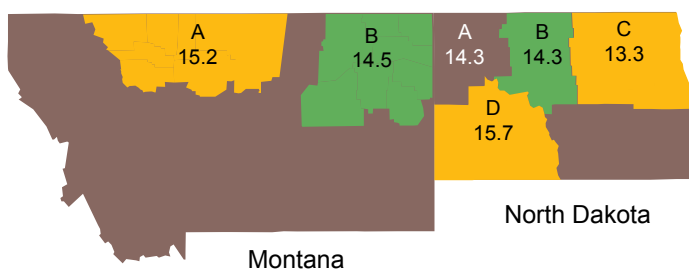


PROTEIN - 12% MOISTURE



AVERAGE PROTEIN BY AREA

12% Moisture Basis-Percent



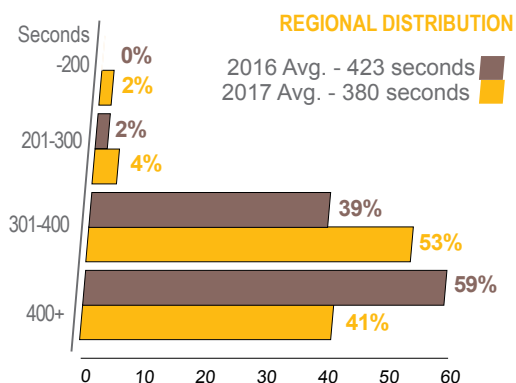
OTHER KERNEL QUALITY DATA

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	1.2	9.4	36.6	48/48	15.2/17.3	<0.5	1.60	458	97
Area B	1.7	11.3	35.5	65/29	14.5/16.5	<0.5	1.41	358	96
State Avg 2017	1.6	10.8	35.8	61/34	14.7/16.7	<0.5	1.45	383	96
State Avg 2016	0.3	11.1	39.2	48/49	13.4/15.2	<0.5	1.60	438	54

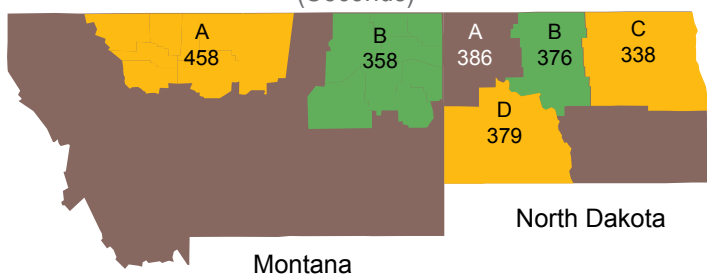
NORTH DAKOTA									
Area A	1.0	11.3	39.7	52/43	14.3/16.3	<0.5	1.45	386	84
Area B	0.9	12.1	40.0	52/44	14.3/16.2	<0.5	1.50	376	81
Area C	0.7	12.1	42.4	41/55	13.3/15.1	0.6	1.58	338	70
Area D	0.8	11.3	35.7	64/31	15.7/17.8	<0.5	1.41	379	90
State Avg 2017	0.9	11.5	39.5	53/43	14.4/16.4	<0.5	1.47	379	83
State Avg 2016	0.2	11.6	40.5	43/54	13.4/15.2	1.5	1.62	415	54

TWO STATE AVG									
Avg 2017	1.1	11.3	38.4	55/40	14.5/16.5	<0.5	1.46	380	87
Avg 2016	0.2	11.4	40.0	44/52	13.4/15.2	1.0	1.61	423	54
Five-Year Avg	0.7	11.5	39.6	41/55	13.6/15.4	1.1	1.59	380	54

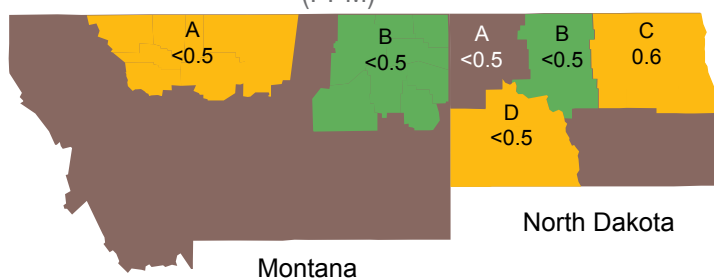
FALLING NUMBER



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.

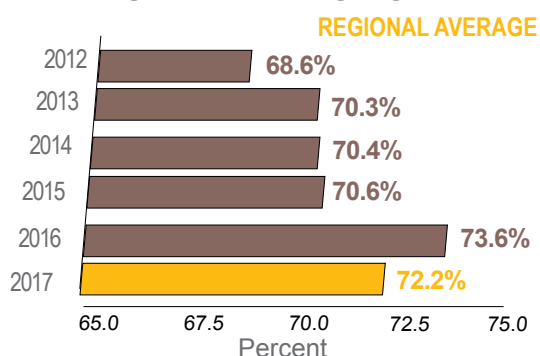
ASH CONTENT in the endosperm of durum is inherently higher than in the endosperm of other hard wheats, but can still be used as a relative measure of bran or mineral content in the flour and semolina.

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.

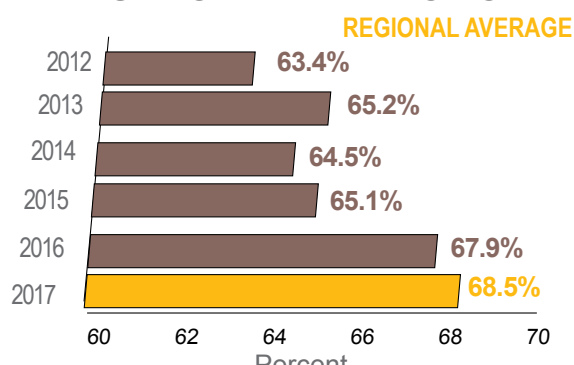
PROTEIN CONTENT in semolina has a high correlation with gluten content and, in turn, mechanical strength and cooking quality. Wet gluten is a quantitative measure of the gluten forming proteins in semolina that are primarily responsible for its mechanical strength and pasta quality.

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.

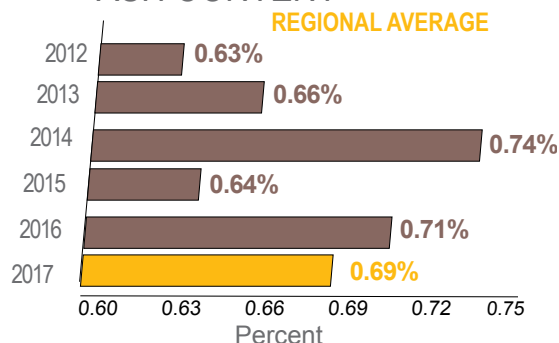
TOTAL EXTRACTION



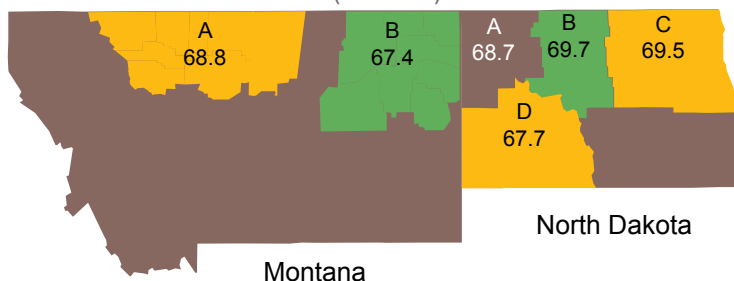
SEMOLINA EXTRACTION



ASH CONTENT



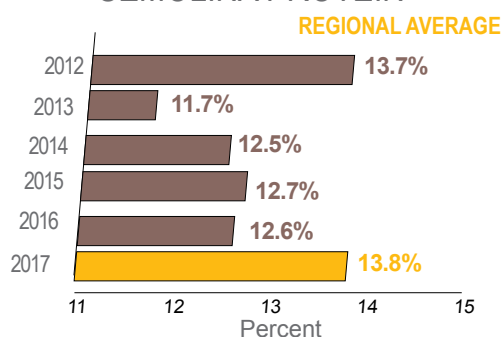
AVERAGE SEMOLINA EXTRACTION BY AREA (Percent)



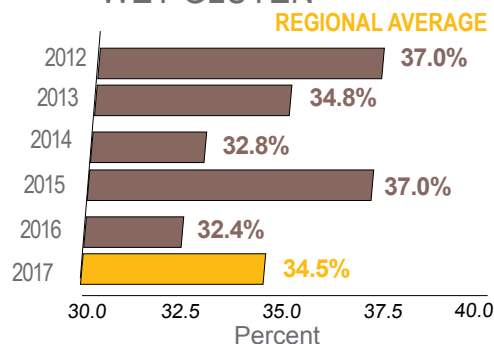
SEMOLINA QUALITY DATA

STATE AND CROP REPORTING AREA	TOTAL EXTRACTION %	SEMOLINA EXTRACTION %	ASH %	SPECKS NO/10 SQ IN	PROTEIN (14% MOISTURE) %	WET GLUTEN %	GLUTEN INDEX %	MIXOGRAM CLASSIFICATION SCALE 1-8
MONTANA								
Area A	72.4	68.8	0.77	27	14.5	36.2	91.6	6.3
Area B	70.8	67.4	0.68	23	14.0	34.9	86.7	5.7
State Avg 2017	71.2	67.7	0.71	24	14.1	35.3	87.9	5.9
State Avg 2016	73.5	68.4	0.70	29	12.8	33.3	62.4	5.3
NORTH DAKOTA								
Area A	72.6	68.7	0.68	27	13.6	34.6	85.8	5.5
Area B	73.3	69.7	0.68	27	13.5	33.0	85.9	6.0
Area C	73.3	69.5	0.73	33	12.1	31.7	77.1	5.2
Area D	71.2	67.7	0.68	23	14.6	35.6	90.0	6.2
State Avg 2017	72.6	68.9	0.68	27	13.6	34.1	85.6	5.7
State Avg 2016	73.6	67.7	0.71	30	12.5	31.9	59.9	5.0
TWO-STATE AVG								
Avg 2017	72.2	68.5	0.69	26	13.8	34.5	86.3	5.7
Avg 2016	73.6	67.9	0.71	30	12.6	32.4	60.8	5.1
Five-Year Avg	70.7	65.2	0.68	26	12.6	34.8	54.4	5.4

SEMOLINA PROTEIN

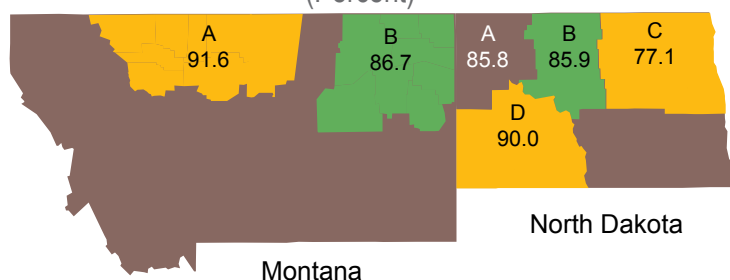


WET GLUTEN



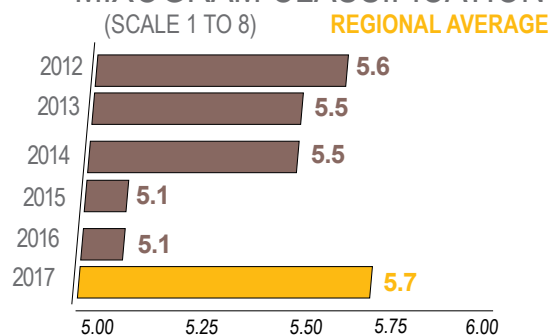
AVERAGE GLUTEN INDEX BY AREA

(Percent)



MIXOGRAM CLASSIFICATION

(SCALE 1 TO 8)



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.



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	81.3	-1.6	31.6	9.0	30.3	6.2	5.4
Area B	83.8	-2.4	29.1	9.5	30.2	5.7	5.6
State Avg 2017	83.2	-2.2	29.7	9.4	30.2	5.8	5.5
State Avg 2016	84.1	-2.8	30.4	8.6	30.7	6.0	4.3
NORTH DAKOTA							
Area A	83.1	-2.2	29.5	9.0	31.4	5.8	4.6
Area B	83.8	-2.5	28.8	9.0	31.3	5.7	5.0
Area C	84.0	-2.6	28.4	8.5	31.8	6.3	4.2
Area D	83.7	-2.5	29.6	8.5	31.0	6.0	4.4
State Avg 2017	83.4	-2.3	29.2	8.9	31.4	5.9	4.6
State Avg 2016	84.4	-2.8	30.2	8.5	31.2	6.5	4.1
TWO-STATE AVG							
Avg 2017	83.3	-2.3	29.4	9.0	31.0	5.9	4.9
Avg 2016	84.3	-2.8	30.3	8.5	31.0	6.3	4.2
Five-Year Avg	84.6	-3.2	29.2	8.9	31.3	6.2	4.4

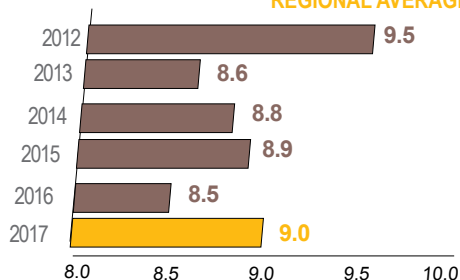
U.S. DURUM WHEAT

MONTANA • NORTH DAKOTA

12

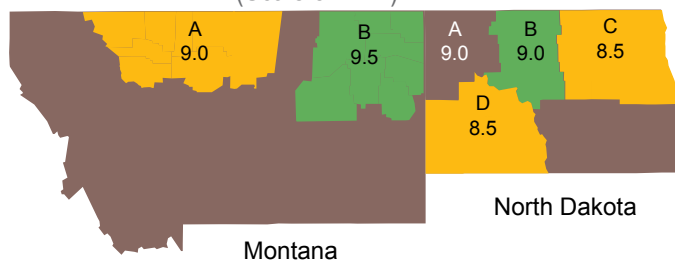
COLOR SCORE (SCALE 1 TO 12)

REGIONAL AVERAGE



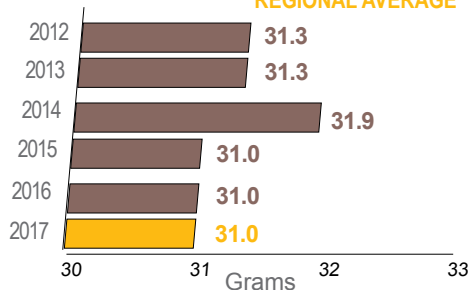
AVERAGE COLOR SCORE BY AREA

(Scale of 1-12)



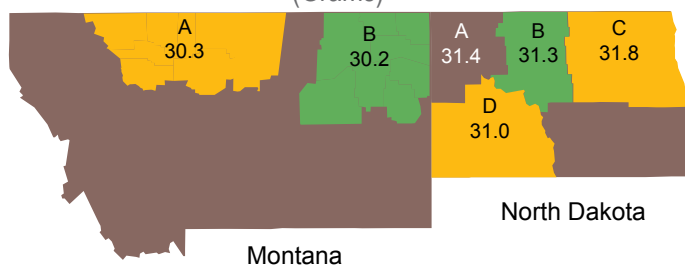
COOKED WEIGHT

REGIONAL AVERAGE



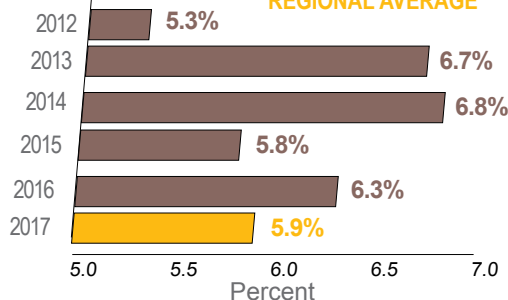
AVERAGE COOKED WEIGHT BY AREA

(Grams)



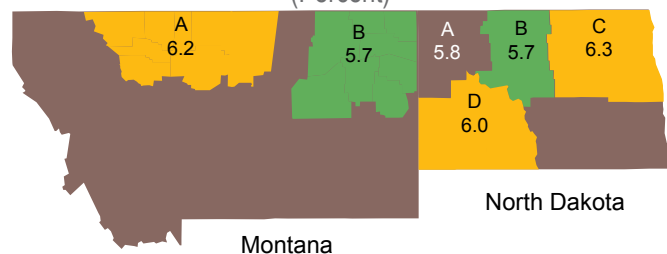
COOKING LOSS

REGIONAL AVERAGE



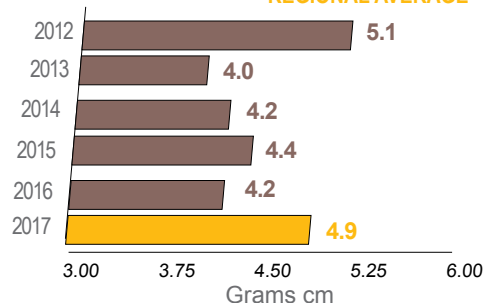
AVERAGE COOKING LOSS BY AREA

(Percent)



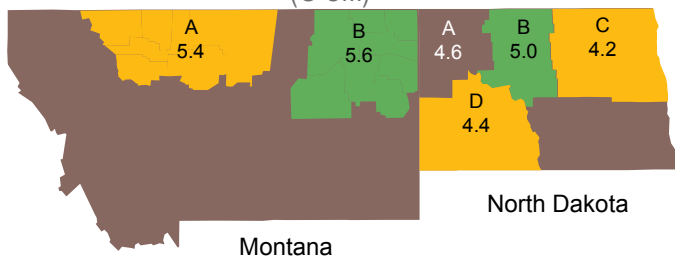
COOKED FIRMNESS

REGIONAL AVERAGE



AVERAGE COOKED FIRMNESS BY AREA

(G CM)



RECENT QUALITY TRENDS

	2017	2016	2015	2014	2013	2012	Five-Year Average
GRADING AND WHEAT DATA							
Test Weight (lbs/bu)	60.9	61.2	60.6	59.0	60.7	60.6	60.4
Test Weight (kg/hl)	79.4	79.7	78.9	76.8	79.0	78.9	78.7
Total Defects (%)	1.2	1.2	1.3	1.6	1.0	1.8	1.4
Vitreous Kernels (%)	88	90	91	74	85	89	86
Grade	1 HAD	1 HAD	1 HAD	2 AD	1 HAD	1 HAD	1 HAD
OTHER WHEAT DATA							
Dockage (%)	1.1	0.2	0.9	0.7	0.9	0.9	0.7
Protein: 12% moisture	14.5	13.4	13.9	13.2	12.8	14.6	13.6
1000 Kernel Weight (gm)	38.4	40.0	38.5	38.0	44.1	36.9	39.6
Moisture (%)	11.3	11.4	11.2	12.4	12.1	10.5	11.5
DON	<0.5	1.0	0.8	2.1	1.0	1.0	1.1
Ash (%)	1.46	1.61	1.57	1.64	1.57	1.57	1.59
Falling Number (sec)	380	423	414	276	375	412	380
Sedimentation (cc)	87	54	62	60	46	49	54
SEMOLINA DATA							
Total Extraction (%)	72.2	73.6	70.6	70.4	70.3	68.6	70.7
Semolina Extraction (%)	68.5	67.9	65.1	64.5	65.2	63.4	65.2
Ash (%)	0.69	0.71	0.64	0.74	0.66	0.63	0.68
Wet Gluten (%)	34.5	32.4	37.0	32.8	34.8	37.0	34.8
Specks (no/10 sq in)	26	30	24	26	26	23	26
Protein (%)	13.8	12.6	12.7	12.5	11.7	13.7	12.6
Gluten Index (%)	86.3	60.8	50.2	45.1	55.1	60.6	54.4
Mixograph Classification	5.7	5.1	5.1	5.5	5.5	5.6	5.4
*Color: L (black-white)	83.3	84.3	84.4	84.9	84.6	85.0	84.6
*a (green-red)	-2.3	-2.8	-3.1	-4.0	-3.2	-2.8	-3.2
*b (blue-yellow)	29.4	30.3	30.1	27.9	27.7	29.8	29.2
SPAGHETTI PROCESSING DATA							
Color Score (scale of 1-12)	9.0	8.5	8.9	8.8	8.6	9.5	8.9
*L (black-white)	54.4	53.5	54.5	53.5	56.4	55.5	54.7
*b (blue-yellow)	27.1	26.4	27.3	26.6	27.4	27.5	27.0
Cooked Weight (gm)	31.0	31.0	31.0	31.9	31.3	31.3	31.3
Cooking Loss (%)	5.9	6.3	5.8	6.8	6.7	5.3	6.2
Cooked Firmness (g cm)	4.9	4.2	4.4	4.2	4.0	5.1	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.

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

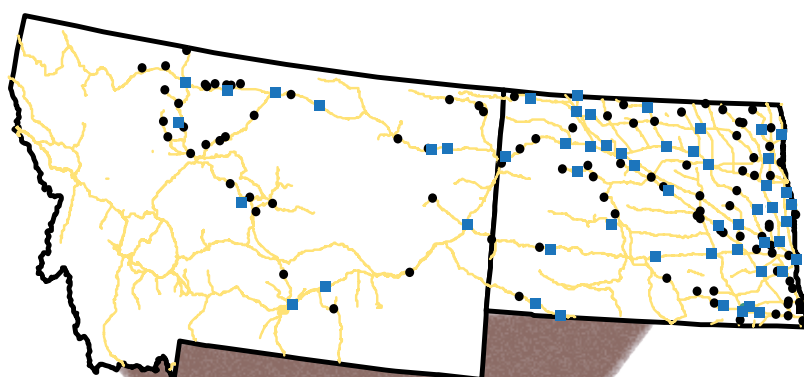
Burlington Northern Santa Fe, followed by the Canadian Pacific.

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.

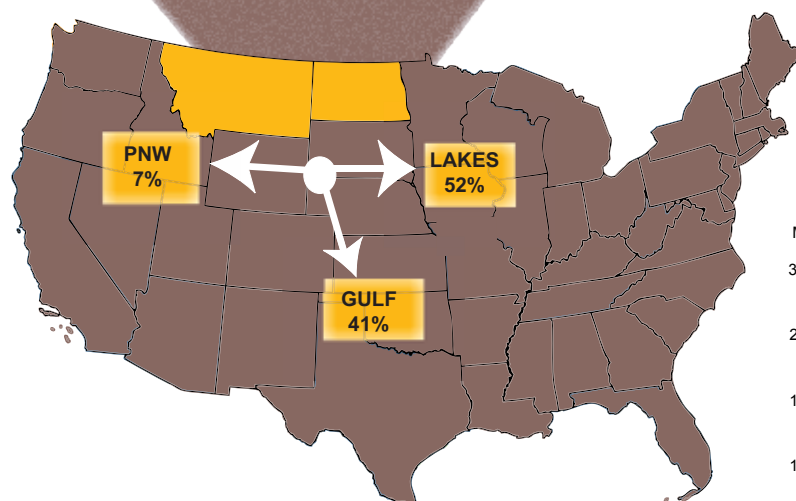
The rail and elevator network in the U.S. northern grown durum region is well suited for meeting the increasing quality demands of both domestic and international customers.



- Track for 50 to 99 rail cars
- Track for 100 or more cars

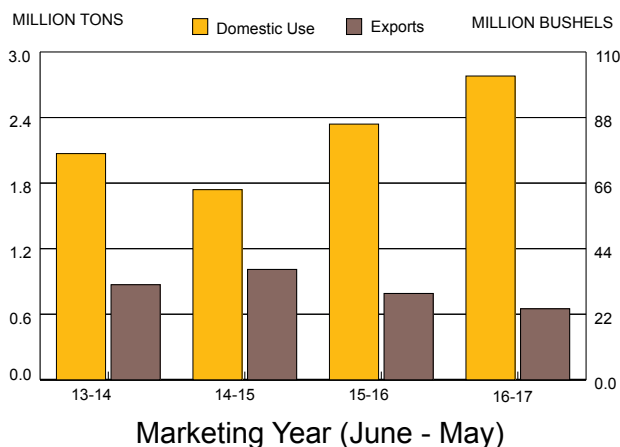
Source: Upper Great Plains Transportation Institute

Grain Handling and Transportation Facilities in the Two-State Region



AVERAGE SHARE OF U.S. DURUM EXPORTS BY PORT (2013-2016)

2013-16 U.S. DURUM DOMESTIC USE AND EXPORTS



VARIETAL INFORMATION

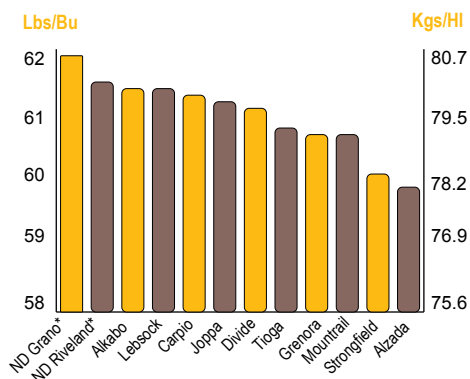
Quality products begin with quality ingredients. In the case of wheat, quality begins with the varieties planted. Within the durum class of wheat, there are different varieties available—all with relatively uniform characteristics. The public plant breeding program at North Dakota State University in Fargo develops and releases most of the durum varieties grown in the northern region, although some private firms also have durum breeding programs. Before any durum variety is released to the public, breeders are encouraged to show that it meets or exceed current standards for the class. Prospective releases are evaluated for milling and pasta characteristics as well as for yield, protein content, test weight, resistance to diseases and insects, and straw strength.

Environment influences the quality of varieties across growing areas and planting years. For this reason, wheat breeders use “check” or reference varieties to evaluate quality in experimental varieties. They test and analyze quality data from multiple years and growing locations before a variety is released.

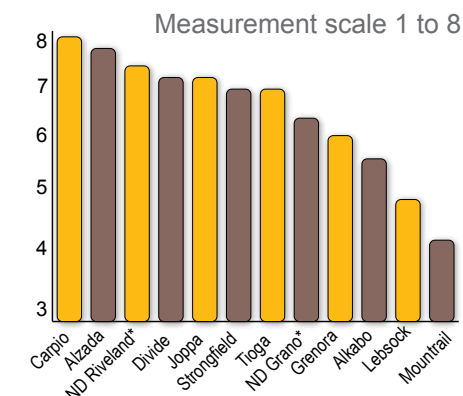
* Low Cadmium

Source: Yield trials 2014-16 crop years across four North Dakota locations.

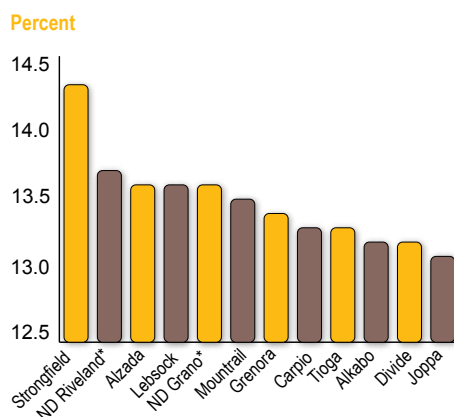
TEST WEIGHT



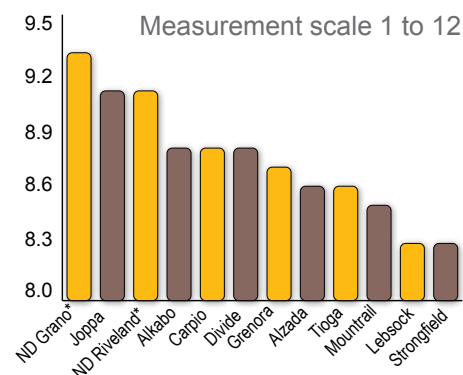
MIXOGRAPH



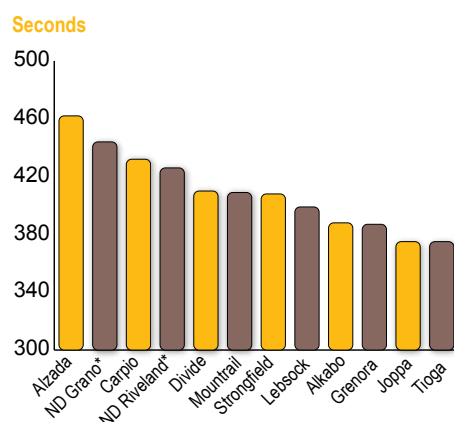
KERNEL PROTEIN



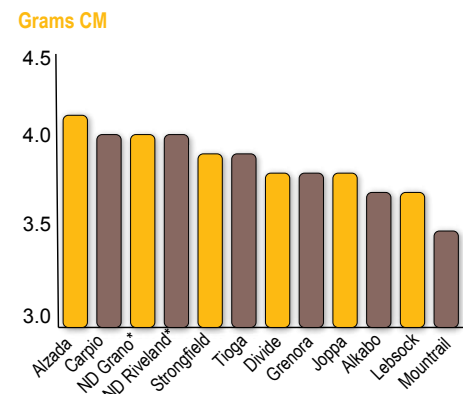
PASTA COLOR



FALLING NUMBER



COOKED FIRMNESS



VARIETAL INFORMATION

MAJOR VARIETIES PRODUCED IN REGION • AGRONOMIC FACTORS							
Agronomic Description			Reaction to Disease ²			Average Yield Western, North Dakota ³	
Variety	Agent or Origin ¹	Year Released	Straw Strength	Leaf Rust	Foliar Disease	BU/Acre	MT/Hect
Alkabo	ND	2005	strg.	R	M	62.0	4.17
Alzada	WB	2004	med. weak	R	S	47.4	3.19
Carpio	ND	2012	med.	R	M	59.8	4.02
Divide	ND	2005	med.	R	M	62.5	4.20
Grenora	ND	2005	med.	R	M	60.2	4.05
Joppa	ND	2013	med.	R	M	64.0	4.30
Lebsock	ND	1999	strg.	R	M	58.9	3.96
Mountrail	ND	1998	med.	R	M	62.0	4.17
ND Grano*	ND	2017	med.	R	M	64.3	4.32
ND Riveland*	ND	2017	med.	R	M	63.6	4.28
Strongfield	CAN	2004	med. weak	R	MS	56.0	3.76
Tioga	ND	2010	med. strg.	R	M	61.0	3.43

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	61.4	80.0	13.2	388	5.8	8.8	39	3.7	good
Alzada	59.9	78.0	13.6	462	7.7	8.6	85	4.1	good
Carpio	61.3	79.8	13.3	432	7.9	8.8	92	4.0	good
Divide	61.1	79.5	13.2	410	7.2	8.8	68	3.8	good
Grenora	60.7	79.0	13.4	387	6.2	8.7	57	3.8	good
Joppa	61.2	79.7	13.1	375	7.2	9.1	78	3.8	good
Lebsock	61.4	79.9	13.6	399	5.1	8.3	33	3.7	average
Mountrail	60.7	79.0	13.5	409	4.4	8.5	15	3.5	average
ND Grano*	61.9	80.6	13.6	444	6.5	9.3	64	4.0	excellent
ND Riveland*	61.5	80.1	13.7	426	7.4	9.1	79	4.0	excellent
Strongfield	60.1	78.3	14.3	408	7.0	8.3	62	3.9	good
Tioga	60.8	79.2	13.3	375	7.0	8.6	72	3.9	good

* **Low Cadmium**

Source: 2017 North Dakota Durum Wheat Variety Performance Descriptions

1. ND—North Dakota State University, WB—Westbred and CAN—Canada.
2. Reaction to Disease: resistant (R), moderately resistant (MR), intermediate (M), moderately susceptible (MS), susceptible (S).
3. Yield trials 2014-16 crop years across four North Dakota locations.
4. Based on NDSU Durum Quality Lab testing of 2014-16 samples grown at multiple North Dakota locations.
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 grown in North Dakota in 2017 are Joppa, Divide, Carpio, Alkabo, and Tioga. Combined, these five varieties account for more than two-thirds of the planted acreage. 2017 variety data is not available from Montana as an official survey was not done. Based on producer and industry input, it appears the top varieties did not change significantly from 2016. Top varieties in Montana are Divide, Mountrail, Alzada, and Joppa.

JOPPA took over as the top variety in North Dakota in 2017, accounting for 18 percent of the state's acreage – up from 10 percent last year. It is also gaining acreage in Montana. Joppa was released from NDSU in 2013 and exhibits strong yield potential and other positive agronomic characteristics. Joppa has high end-use quality traits with especially high pasta color scores.

DIVIDE is now the second most popular variety in North Dakota after being the top variety for the last eight years. It accounts for about 17 percent of the acreage in the state and is still one of the top varieties grown in Montana. A 2005 release from NDSU, Divide remains popular with producers for its high yield potential and disease tolerance. It is rated good for end-use quality.

CARPIO accounts for about 15 percent of the acreage in North Dakota, down slightly from the previous year, dropping to the third ranked variety in the state. It is the top planted variety in the west central part of the state. Carpio was released from NDSU

in 2012 and has high yield potential and improved quality over the older varieties. It is rated excellent for end-use quality with strong gluten properties, and high color and cooked firmness scores.

NORTH DAKOTA VARIETY SHARE OF PLANTED ACRES³

Variety	2017% ¹	2016% ¹
Joppa	18.0	10.3
Divide	16.8	21.5
Carpio	14.9	17.0
Alkabo	11.1	11.2
Tioga	7.9	8.0
Mountrail	4.6	5.5
Grenora	4.2	3.8
VT Peak	4.1	1.9
Lebsock	3.5	7.8
MS Dart	1.3	1.2
Other ²	13.6	11.8

1. Percentage may not add to 100 due to rounding.

2. Includes varieties with less than 1% of acreage in 2017 and unknown varieties.

3. 1,000 acres (1 acre = 0.405 hectares)
2017 - 1,260,000 acres
2016 - 1,460,000 acres

NORTH DAKOTA VARIETY SHARE OF 2017 PLANTED ACRES BY CROP DISTRICT

Variety	North West	West Central	South West	Combined Districts ¹	Total State
percentage (%) ²					
Joppa	13.5	9.7	24.9	36.6	18.0
Divide	20.7	17.2	9.9	10.5	16.8
Carpio	14.3	18.8	22.0	2.4	14.9
Alkabo	10.2	17.8	4.9	16.1	11.1
Tioga	8.7	4.3	12.8	1.0	7.9
Mountrail	6.7	0.0	0.0	7.9	4.6
Grenora	6.0	0.0	0.0	7.4	4.2
VT Peak	3.8	3.9	1.4	10.2	4.1
Lebsock	2.9	9.1	2.8	0.8	3.5
MS Dart	1.3	2.8	0.0	1.9	1.3
Other ³	12.0	16.5	21.3	5.2	13.6
1,000 acres (1 acre = 0.4 hectares)					
Total Acres ³	600	165	215	140	1,120 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 2017 and unknown varieties.

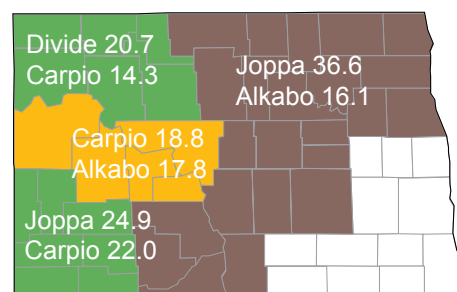
4. September 30, 2017 small grain estimates was 1,260,000 acres.

ALKABO's share of North Dakota acreage remained fairly stable, accounting for 11 percent of the state's durum acreage. Released by NDSU in 2005, it has good yield potential and stronger straw properties when compared to other popular varieties. Alkabo possesses good end-use quality traits, especially for color.

MOUNTRAIL remains a top variety in Montana and is the sixth most popular variety in North Dakota, although its acreage share continues to decline. It is a 1998 NDSU release and has good yield potential and other agronomic traits, making it a top choice for producers. Mountrail is rated as average for end-use quality.

ALZADA is one of the top five varieties planted in Montana and remains popular with end users for its strong gluten properties and excellent cooking properties. Alzada is a 2004 release from Westbred (Monsanto) and in recent years accounted for approximately 15 percent of the state's durum acreage.

NORTH DAKOTA 2017 TOP TWO VARIETIES BY DISTRICT (% OF ACRES)



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 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 early August

when approximately 20 percent of the regional durum crop had been harvested and continued until the third week of September. A total of 211 samples were collected during harvest from Montana (56) and North Dakota (155).

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 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 (Combustion Method), expressed on dry basis and 12 percent moisture basis.

ASH • American Association of Cereal Chemists Method 08-01, 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 56-81B, 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, 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, approved October 1999; determined with the glutomatic in-

strument as an indication of gluten strength.

SEMOLINA

EXTRACTION • AACC Method 26-41 (modified for the Buhler Mill). Expressed on a total product basis.

ASH • AACC Method 08-01, approved April 1961, revised October 1999; expressed on a 14 percent moisture basis.

PROTEIN • AACC Method 46-30 (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 54-40A 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, 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 • AACC Method 66-50 with some modifications: 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. 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 with a Plexiglas tooth attached to a Texture Analyzer (Model TA-XT2, Texture Technology Corp., Scarsdale, New York).

U.S. DURUM
WHEAT
REGIONAL QUALITY REPORT

17

FUNDING & SUPPORT PROVIDED BY

U.S. Wheat Associates

North Dakota Wheat Commission

Montana Wheat and Barley Committee

North Dakota State University Plant Sciences Department