U.S. DURUM WHEAT

REGIONAL QUALITY REPORT

15

U.S. DURUM WHEAT

MONTANA • NORTH DAKOTA

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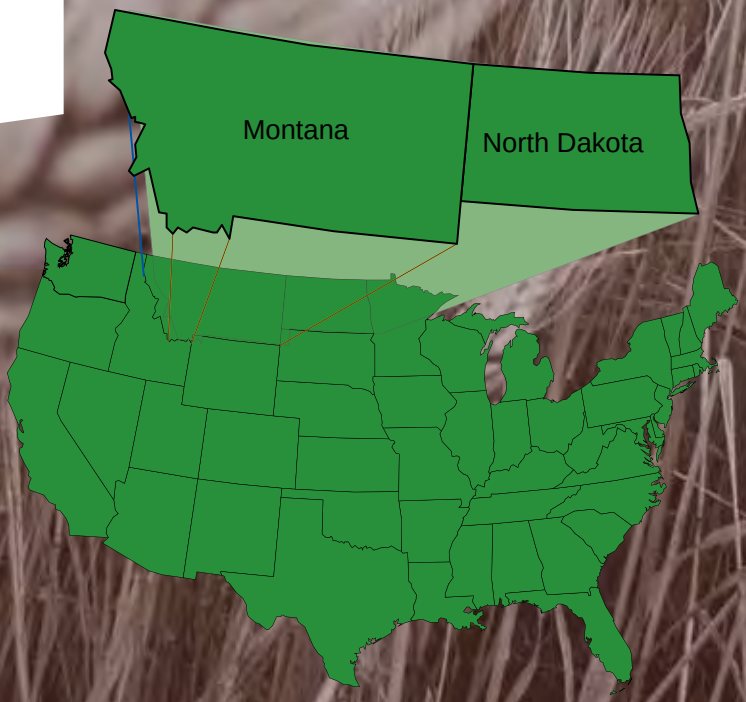


MAKING PREMIUM PASTA

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. The states of North Dakota and Montana in most years jointly produce 80 percent of the U.S. durum crop.

U.S. DURUM WHEAT

MONTANA • NORTH DAKOTA

PRODUCTION DATA	2015	2014	2010-14 AVERAGE
MILLION BUSHELS			
Montana	18.8	13.3	14.5
North Dakota	42.5	28.2	37.1
U.S. Total	82.5	54.1	69.4
MILLION METRIC TON			
Montana	0.51	0.36	0.40
North Dakota	1.16	0.77	1.01
U.S. Total	2.24	1.47	1.89

Source: USDA 2015 Small Grains Summary

2015 OVERVIEW

The 2015 durum crop produced in Montana and North Dakota is nearly 50 percent larger in production compared to 2014 and touts beneficial improvements in key grade and non-grade parameters. Production rebounded due to higher planted area and record yields across North Dakota. The crop averages a #1 Hard Amber Durum (HAD) compared to a #2 Amber Durum (AD) last year. More favorable planting conditions, lower disease pressures and a dry harvest season contributed to the improved crop quality profile. Functional performance on the crop is showing positive improvements in milling and pasta processing qualities compared to 2014, although gains are not as great as those made in grade and non-grade parameters.

Ninety percent of the crop is #2 grade or higher, and nearly sixty percent is a #1 HAD, compared to just 60 and 30 percent, respectively, in 2014. Specific kernel factors that helped boost the overall grade are an average test weight of 60.6 lbs/bu (78.9 kg/hl), damaged kernels of just 0.3 percent and vitreous kernels of 91 percent. Distributions of test weight on the crop show nearly two-thirds falling above 60 lbs/bu (78.1 kg/hl), compared to just 28 percent last year, indicative of a very balanced crop. Vitreous kernel distributions indicate two-thirds of the crop is above 90 percent, compared to just 24 percent in 2014. Some later portions of the harvest did see lower vitreous counts due to rains, but this impacted a minimal portion of the crop with only eleven percent of the crop below 75 percent vitreous.

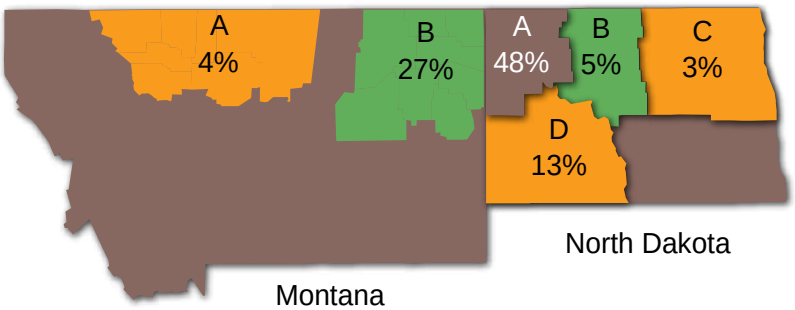
Drier weather in the last part of the growing season and through the bulk of the harvest contributed to lower moisture in the 2015 crop, averaging just 11.2 percent, a full point below 2014. Similarly, the crop averages 414 second for falling number, well above 276 seconds in 2014 and 354 seconds for a five-year average. Distributions for falling number have nearly three-fourths of the crop above 400 seconds, and only two percent below 300 seconds. In 2014, two-thirds of the crop fell below 300 seconds, and just eleven percent was above 400 seconds.

Protein levels on the 2015 crop are higher than both last year and the five-year level, averaging 13.9 percent (12% moisture basis). Protein levels are about 1 percentage units higher in Montana compared to North Dakota, due to drought conditions in parts of Montana and lower average yields. Still, more than three-fourths of the crop exceeds the industry standard specification level of 13 percent.

Disease pressures, in particular Fusarium Headblight, were lower in the 2015 crop compared to 2014 and other more recent years and were more isolated. As such, DON impacts are not as broad or pervasive in the crop compared to 2014 when much of the crop was impacted by an extended wet period during flowering and kernel fill. The crop average DON is 0.8 parts per million, well below the 2.1 ppm of last year and also lower than the five-year average of 1.3 ppm.

Milling performance, based on a Buhler laboratory mill, reflects similar overall extraction compared to 2014 and the five-year average at 70.6 percent, but higher semolina extraction. At 65.1 percent, semolina extraction is 0.6 points higher than 2014 and about 0.3 points higher than the five-year average. The milled product is also showing

Approximate Share of Regional Production by Crop Reporting Area



reduced ash levels, 0.64 percent compared to 0.74 percent in 2014, and a lower speck count. Wet gluten values for the crop are at 37 percent, well above 32.8 percent last year and 35.1 percent for the five-year. The average gluten index of 50.2 percent is up slightly from 2014, but below the five-year.

Semolina mixing, and pasta processing and cooking properties indicate a slightly weaker crop compared to both 2014 and the five-year average but improved color and slightly greater cooked firmness. Color scores are high across the region, while cooked firmness tends to increase from east to west.

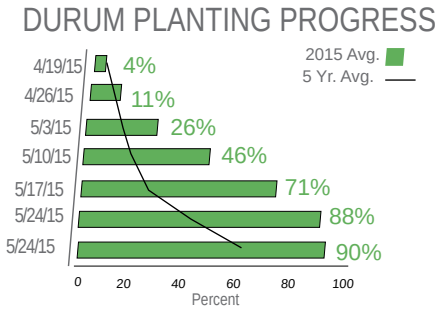
Buyers will be pleased with the improved average and depth of quality in the 2015 crop, especially on factors routinely valued in contract specifications. The crop boasts solid test weights, high protein, very high vitreous kernel levels and falling numbers, and a much lower persistence of DON compared to recent years. End-use performance factors of the crop indicate a high quality crop with good overall balance, although mixing properties are a bit weaker than some pre-milling factors might indicate. Although quality extremes or shortfalls are much more isolated in 2015, diligent contract specifications are still encouraged to ensure the best value from 2015 purchases.

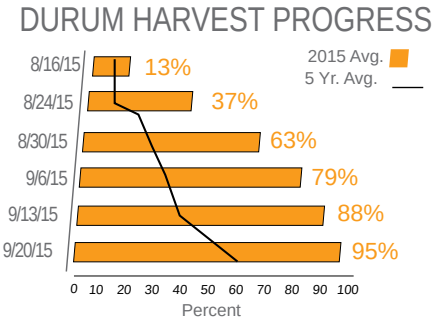
SEASONAL CONDITIONS

Durum planting in the Northern region began the third week of April, about two weeks ahead of average, and nearly one month earlier than the previous year. An early spring combined with dry soils allowed producers to make rapid planting progress. Planting continued with very few interruptions and most was finished by the end of May. Producers welcomed the improved spring planting weather and were able to plant fields that had remained idle in previous years due to overly wet conditions.

The nearly ideal growing conditions in the early part of the season allowed for quick crop emergence and development that was ahead of average. Moisture conditions were good the first part of the season which allowed for promising yield potential, however, some western areas did endure overly dry conditions in July which reduced the yields there. Disease pressure was minimal during the growing season and was more isolated throughout the region.

Harvest of the durum crop began in early August, about two weeks ahead of average. The harvest moved swiftly with very few rain delays. With no significant precipitation during harvest, falling numbers were high and color was maintained. The majority of harvest was finished by mid-September, with the last portion harvested in early October.





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:

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

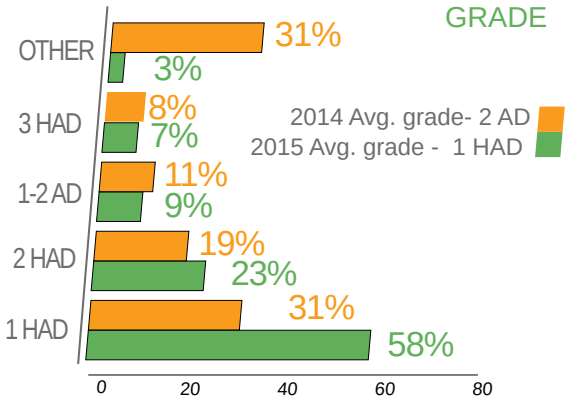
c. is heating or of distinctly low quality.

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.

WHEAT GRADING DATA

STATE AND CROP REPORTING AREA	TEST WEIGHT LBS/BU	TEST WEIGHT KG/HL	DAMAGE %	FOREIGN MATERIAL %	SHRUNKEN/ BROKEN KERNELS %	TOTAL DEFECTS %	CONTRASTING CLASSES %	U.S. GRADE	VITREOUS KERNELS %
MONTANA									
Area A	60.3	78.5	0.1	0.0	0.9	1.0	0.4	1 HAD	97
Area B	60.5	78.8	0.1	0.0	1.2	1.3	0.0	1 HAD	95
State Avg. 2015	60.5	78.8	0.1	0.0	1.2	1.3	0.1	1 HAD	95
State Avg. 2014	59.6	77.6	0.0	0.0	0.8	0.8	0.0	2 AD	67
NORTH DAKOTA									
Area A	60.5	78.8	0.4	0.0	0.9	2.3	0.0	1 HAD	87
Area B	61.2	79.7	0.5	0.0	1.2	1.7	0.0	1 HAD	89
Area C	61.5	80.1	0.3	0.0	1.1	1.4	0.5	1 HAD	96
Area D	60.8	79.2	0.3	0.0	0.9	1.2	0.1	1 HAD	89
State Avg. 2015	60.7	79.0	0.4	0.0	0.9	1.3	0.0	1 HAD	88
State Avg. 2014	58.7	76.5	1.1	0.0	0.9	2.0	0.0	2 HAD	77
TWO-STATE REGION AVG									
Avg. 2015	60.6	78.9	0.3	0.0	1.0	1.3	0.0	1 HAD	91
Avg. 2014	59.0	76.8	0.8	0.0	0.9	1.6	0.0	2 AD	74
Five-Year Avg	60.0	78.2	0.6	0.0	1.0	1.7	0.2	1 HAD	84

REGIONAL DISTRIBUTION



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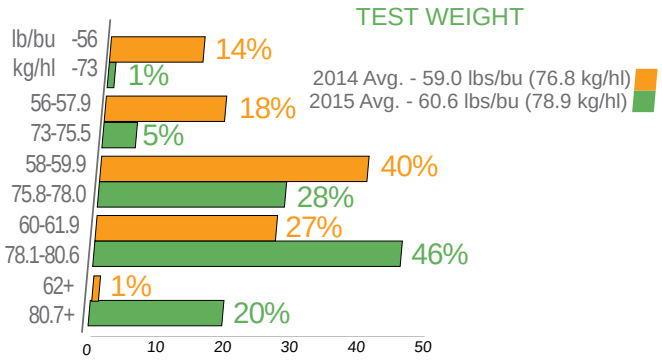
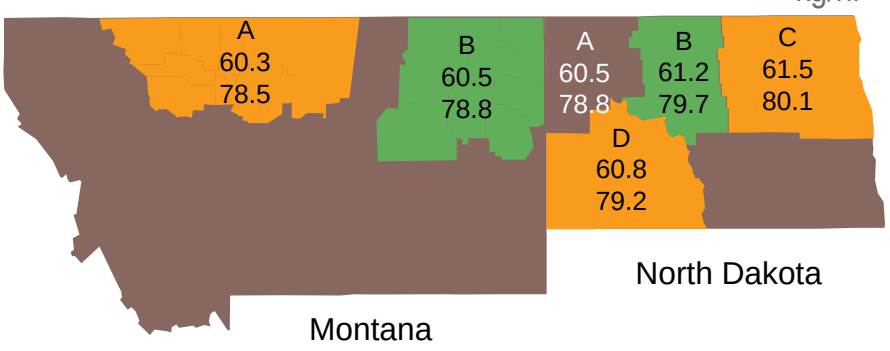


AVERAGE TEST WEIGHT BY AREA



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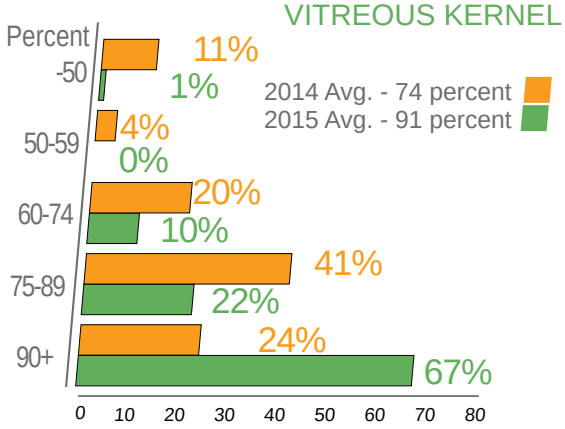
MONTANA • NORTH DAKOTA

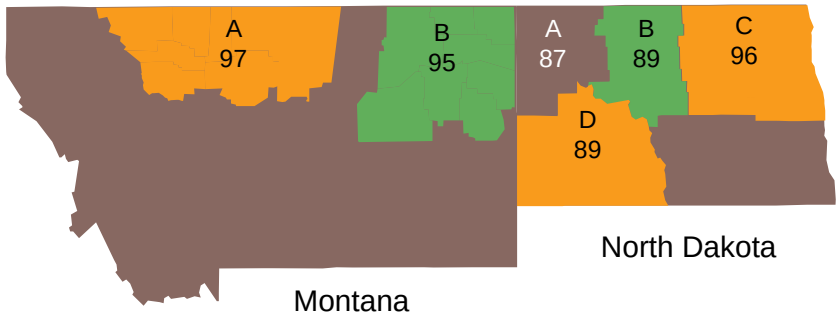
REGIONAL DISTRIBUTION

VITREOUS KERNEL



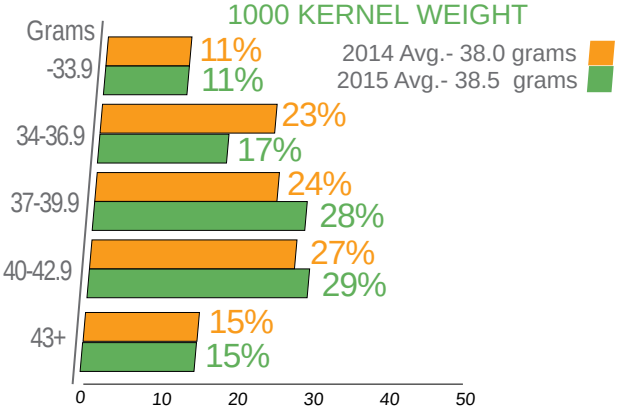
AVERAGE VITREOUS KERNEL BY AREA

(Percent)



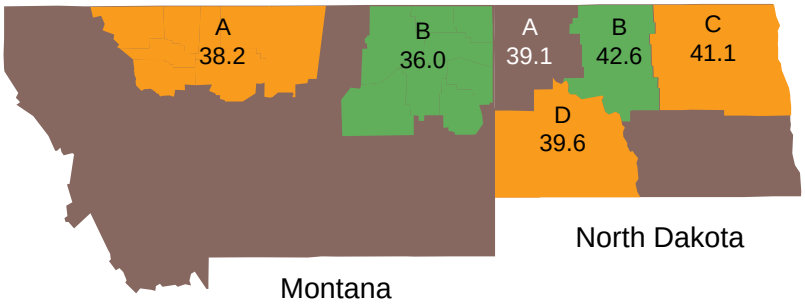
REGIONAL DISTRIBUTION

1000 KERNEL WEIGHT



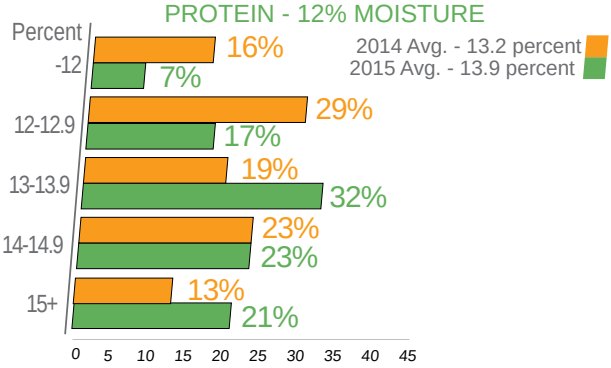
AVERAGE 1000 KERNEL WEIGHT BY AREA

(Grams)



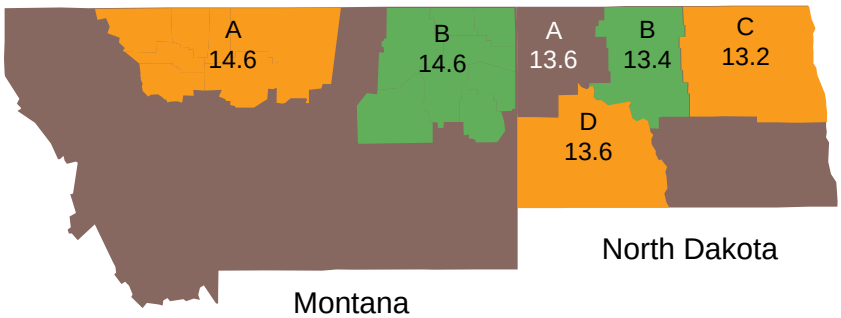
REGIONAL DISTRIBUTION

PROTEIN - 12% MOISTURE



AVERAGE PROTEIN BY AREA

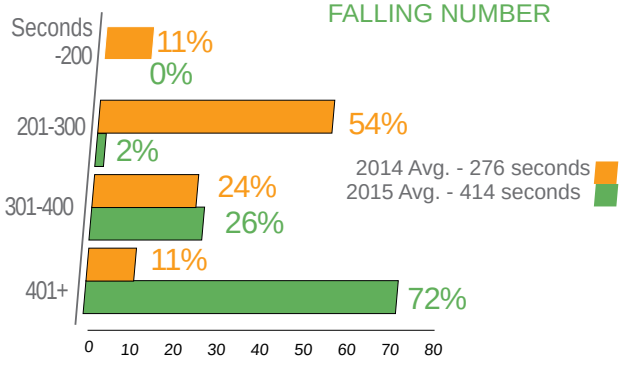
12% Moisture Basis-Percent



OTHER KERNEL QUALITY DATA

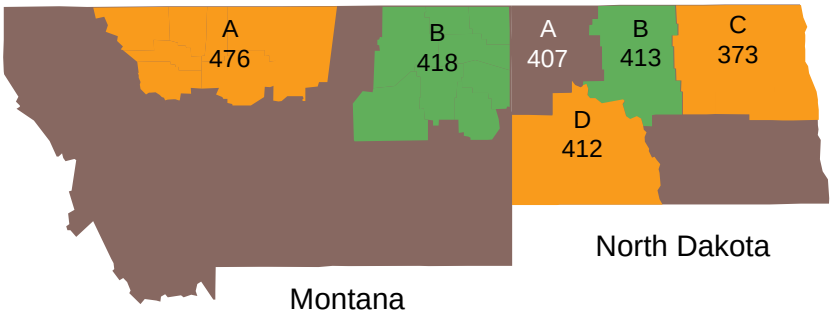
STATE AND CROP REPORTING AREA	Dockage %	Moisture %	1000 Kernel Weight G	Kernel Dist. Medium %	Kernel Dist. Large %	Protein (12% moisture) %	Protein (0% moisture) %	DON (ppm)	Wheat Ash %	Falling Number (sec)	Micro Sed (cc)
MONTANA											
Area A	0.6	10.1	38.2	47	50	14.6	16.6	<0.25	1.37	476	82
Area B	1.1	10.5	36.0	61	35	14.6	16.6	<0.25	1.49	418	68
State Avg. 2015	1.0	10.4	36.3	59	37	14.6	16.6	<0.25	1.47	426	70
State Avg. 2014	0.6	12.1	37.6	54	43	13.4	15.2	<0.25	1.53	304	65
NORTH DAKOTA											
Area A	0.9	11.5	39.1	47	50	13.6	15.5	1.2	1.61	407	59
Area B	0.7	12.1	42.6	40	57	13.4	15.2	2.9	1.67	413	52
Area C	0.8	12.1	41.1	38	59	13.2	15.0	1.1	1.65	373	52
Area D	0.9	11.7	39.6	46	50	13.6	15.5	0.3	1.63	412	62
State Avg. 2015	0.9	11.6	39.7	46	51	13.6	15.4	1.2	1.62	407	58
State Avg. 2014	0.8	12.5	38.2	42	56	13.1	14.9	3.1	1.69	264	58
TWO STATE REGION											
Avg. 2015	0.9	11.2	38.5	51	46	13.9	15.8	0.8	1.57	414	62
Avg. 2014	0.7	12.4	38.0	46	52	13.2	15.0	2.1	1.64	276	60
Five-Year Avg	1.0	11.6	39.2	45	51	13.5	15.4	1.3	1.62	354	48

REGIONAL DISTRIBUTION



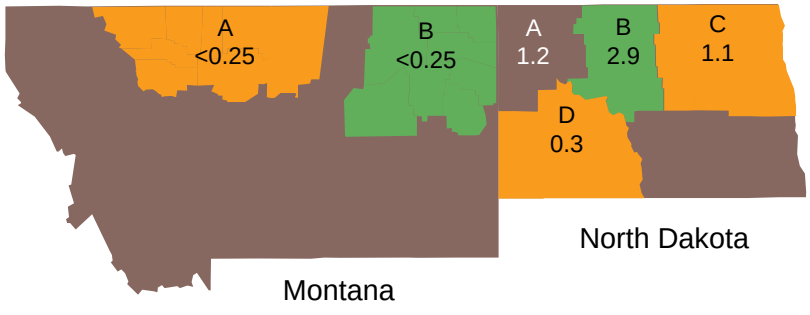
AVERAGE FALLING NUMBER BY AREA

(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.

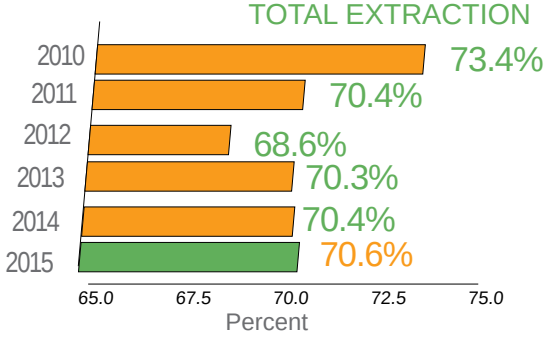
ASH CONTENT in the endosperm of durum is inherently higher than in the endosperm of other hard wheats, but can still be used as a relative measure of bran or mineral content in the flour and semolina.

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.

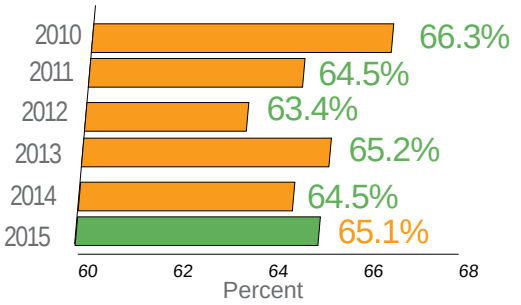
PROTEIN CONTENT in semolina has a high correlation with gluten content and, in turn, mechanical strength and cooking quality. Wet gluten is a quantitative measure of the gluten forming proteins in semolina that are primarily responsible for its mechanical strength and pasta quality.

MIXOGRAM curves reveal important information about the gluten 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.

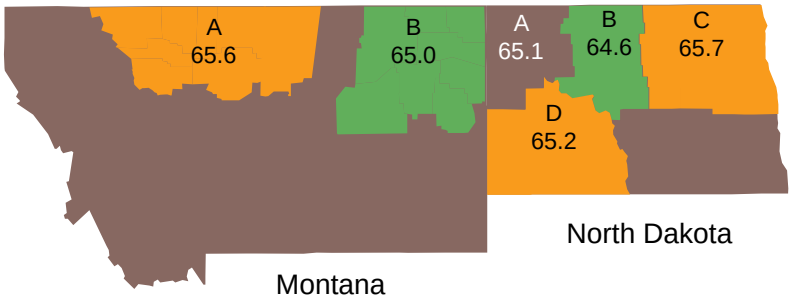
REGIONAL AVERAGE
TOTAL EXTRACTION



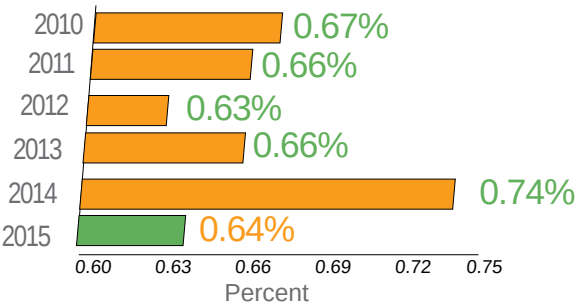
REGIONAL AVERAGE
SEMOLINA EXTRACTION



AVERAGE SEMOLINA EXTRACTION BY AREA
(Percent)



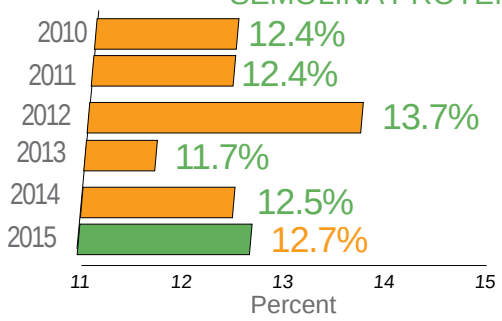
REGIONAL AVERAGE
ASH CONTENT



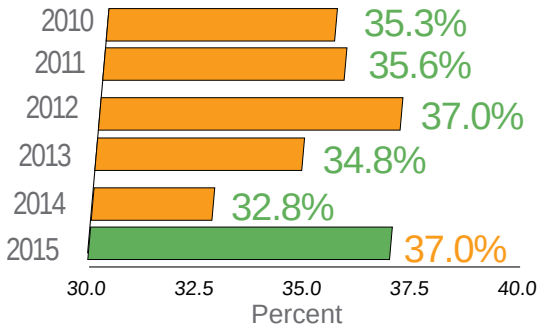
SEMOLINA QUALITY DATA

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	70.4	65.6	0.69	17	13.4	36.7	86.9	7.0
Area B	70.2	65.0	0.63	20	13.3	39.1	53.3	5.0
State Avg. 2015	70.2	65.1	0.64	20	13.3	38.8	57.7	5.3
State Avg. 2014	70.3	65.0	0.71	23	12.8	33.5	52.7	6.3
NORTH DAKOTA								
Area A	70.8	65.1	0.61	27	12.4	36.7	44.7	5.0
Area B	70.9	64.6	0.66	27	12.3	35.3	40.2	5.0
Area C	71.9	65.7	0.70	27	11.9	33.7	43.9	5.0
Area D	70.9	65.2	0.71	27	12.3	33.5	58.1	5.0
State Avg. 2015	70.9	65.1	0.63	27	12.3	35.9	46.0	5.0
State Avg. 2014	70.4	64.3	0.75	28	12.4	32.5	41.7	5.2
TWO-STATE REGION								
Avg. 2015	70.6	65.1	0.64	24	12.7	37.0	50.2	5.1
Avg. 2014	70.4	64.5	0.74	26	12.5	32.8	45.1	5.5
Five-Year Avg	70.6	64.8	0.68	29	12.5	35.1	54.3	5.5

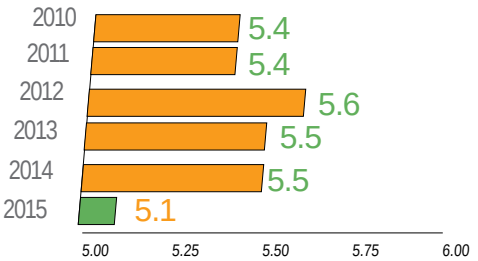
REGIONAL AVERAGE
SEMOLINA PROTEIN



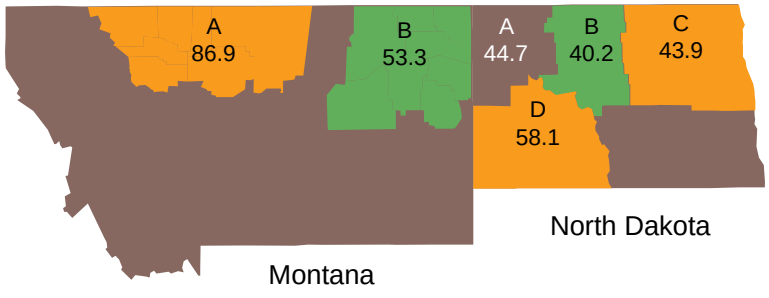
REGIONAL AVERAGE
WET GLUTEN



REGIONAL AVERAGE
MIXOGRAM CLASSIFICATION (Scale 1 to 8)



AVERAGE GLUTEN INDEX BY AREA
(Percent)



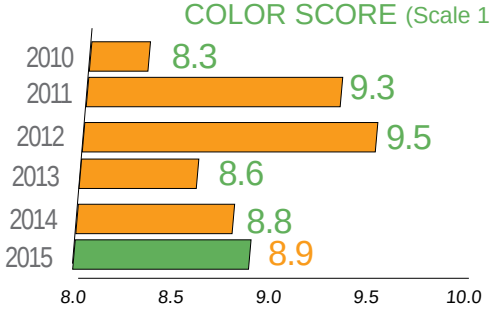
PASTA CHARACTERISTICS

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.

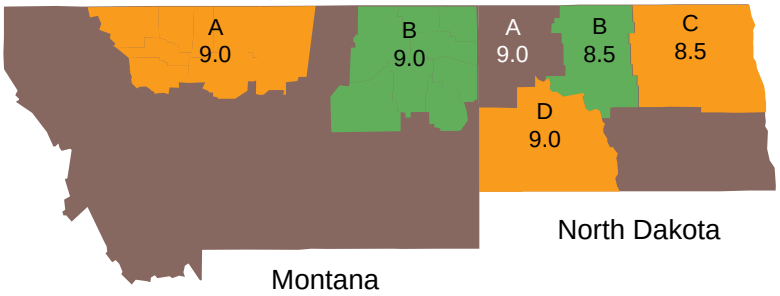
Yellow color in semolina and pasta is a traditional, rather than functional, mark of quality. In the early days of the pasta industry, before sophisticated testing evolved, consumers assumed that a yellow pasta was made from durum wheat, which is known to make pasta with superior cooking quality compared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

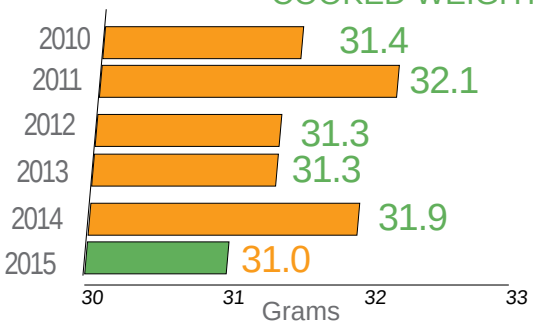
REGIONAL AVERAGE
COLOR SCORE (Scale 1 to 12)



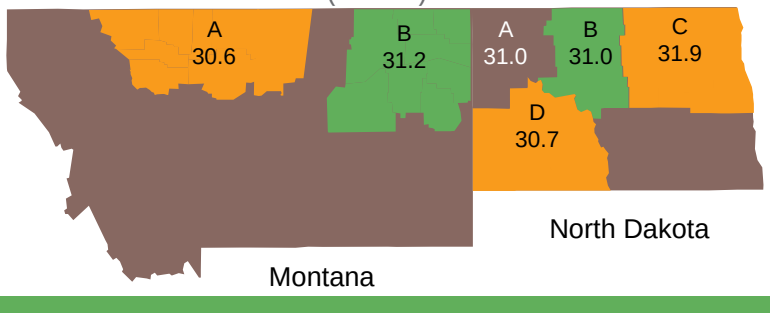
AVERAGE COLOR SCORE BY AREA
(Scale of 1-12)



REGIONAL AVERAGE
COOKED WEIGHT



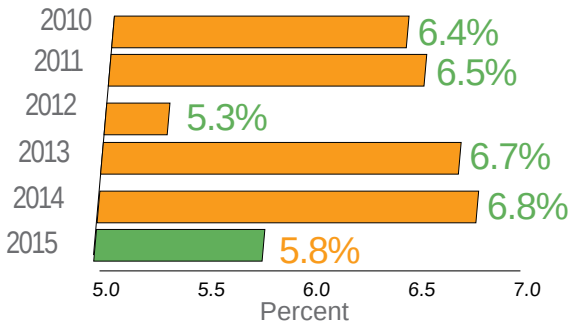
AVERAGE COOKED WEIGHT BY AREA
(Grams)



SEMOLINA & SPAGHETTI DATA

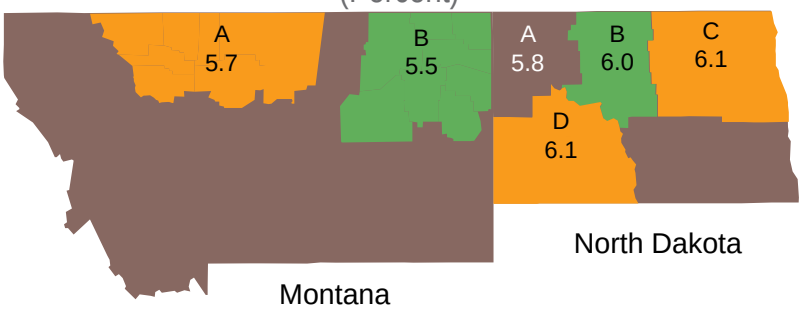
STATE AND CROP REPORTING AREA	SEMOLINA COLOR L (black-white)	SEMOLINA COLOR a (red-green)	SEMOLINA COLOR b (yellow-blue)	SPAGHETTI COLOR SCORE (1-12)	SPAGHETTI COOKED WEIGHT G	SPAGHETTI COOKING LOSS %	SPAGHETTI COOKED FIRMNESS G CM
MONTANA							
Area A	84.5	-3.0	31.5	9.0	30.6	5.7	4.9
Area B	84.5	-3.1	30.1	9.0	31.2	5.5	4.5
State Avg. 2015	84.5	-3.1	30.3	9.0	31.1	5.5	4.6
State Avg. 2014	85.0	-4.0	28.7	9.5	31.6	6.3	4.2
NORTH DAKOTA							
Area A	85.2	-4.0	27.7	9.0	31.0	5.8	4.3
Area B	84.3	-3.8	28.1	8.5	31.0	6.0	4.3
Area C	84.2	-3.5	25.7	8.5	31.9	6.1	3.9
Area D	84.3	-3.8	27.9	9.0	30.7	6.1	4.3
State Avg. 2015	84.3	-3.0	30.0	8.9	31.0	5.9	4.3
State Avg. 2014	84.9	-3.9	27.7	8.5	32.0	7.0	4.2
TWO-STATE REGION							
Avg. 2015	84.4	-3.1	30.1	8.9	31.0	5.8	4.4
Avg. 2014	84.9	-4.0	27.9	8.8	31.9	6.8	4.2
Five-Year Avg	84.7	-3.0	28.5	8.9	31.6	6.3	4.6

REGIONAL AVERAGE COOKING LOSS



AVERAGE COOKING LOSS BY AREA

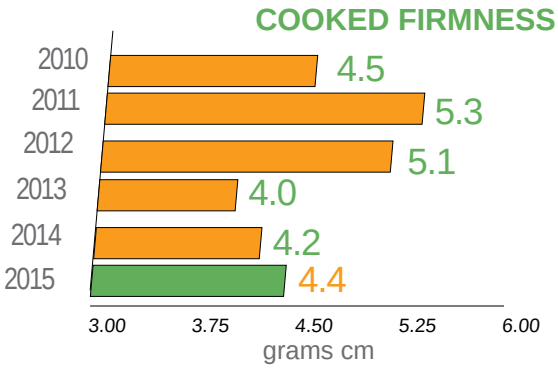
(Percent)



U.S. DURUM WHEAT

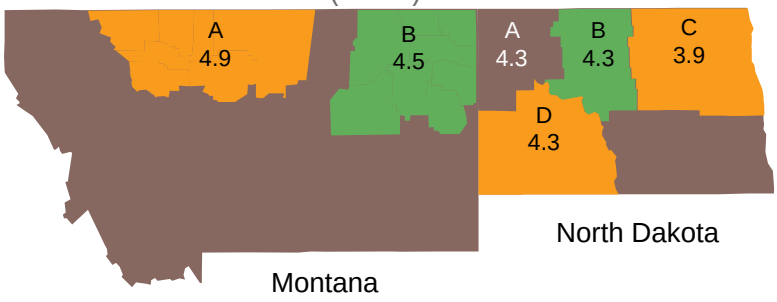
MONTANA • NORTH DAKOTA

REGIONAL AVERAGE



AVERAGE COOKED FIRMNESS BY AREA

(G CM)



AVERAGE QUALITY FACTORS

	2015	2014	2013	2012	2011	2010	Five-Year Average
GRADING AND WHEAT DATA							
Test Weight (lbs/bu)	60.6	59.0	60.7	60.6	59.9	60.0	60.0
Test Weight (kg/hl)	78.9	76.8	79.0	78.9	78.0	78.1	78.2
Total Defects (%)	1.3	1.6	1.0	1.8	1.8	2.0	1.7
Vitreous Kernels (%)	91	74	85	89	88	82	84
Grade	1 HAD	2 AD	1 HAD	1 HAD	2 HAD	1 HAD	1 HAD
OTHER WHEAT DATA							
Dockage (%)	0.9	0.7	0.9	0.9	1.4	0.9	1.0
Protein: 12% moisture	13.9	13.2	12.8	14.6	13.6	13.4	13.5
1000 Kernel Weight (gm)	38.5	38.0	44.1	36.9	36.6	40.3	39.2
Moisture (%)	11.2	12.4	12.1	10.5	11.6	11.5	11.6
DON	0.8	2.1	1.0	1.0	1.0	0.3	1.3
Ash (%)	1.57	1.64	1.57	1.57	1.71	1.56	1.62
Falling Number (sec)	414	276	375	412	372	335	354
Sedimentation (cc)	62	60	46	49	43	43	48
SEMOLINA DATA							
Total Extraction (%)	70.6	70.4	70.3	68.6	70.4	73.4	70.6
Semolina Extraction (%)	65.1	64.5	65.2	63.4	64.5	66.3	64.8
Ash (%)	0.64	0.74	0.66	0.63	0.66	0.67	0.68
Wet Gluten (%)	37.0	32.8	34.8	37.0	35.6	35.3	35.1
Specks (no/10 sq in)	24	26	26	23	31	41	29
Protein (%)	12.7	12.5	11.7	13.7	12.4	12.4	12.5
Gluten Index (%)	50.2	45.1	55.1	60.6	55.5	55.2	54.3
Mixograph Classification	5.1	5.5	5.5	5.6	5.4	5.4	5.5
Color: L (black-white)	84.4	84.9	84.6	85.0	84.6	84.2	84.7
a (red-green)	-3.1	-4.0	-3.2	-2.8	-2.7	-2.7	-3.0
b (yellow-blue)	30.1	27.9	27.7	29.8	29.7	25.9	28.5
SPAGHETTI PROCESSING DATA							
Color Score (scale of 1-12)	8.9	8.8	8.6	9.5	9.3	8.3	8.9
L (black-white)	54.5	53.5	56.4	55.5	55.2	55.2	55.2
b (yellow-blue)	27.3	26.6	27.4	27.5	27.3	26.9	27.1
Cooked Weight (gm)	31.0	31.9	31.3	31.3	32.1	31.4	31.6
Cooking Loss (%)	5.8	6.8	6.7	5.3	6.4	6.4	6.3
Cooked Firmness (g cm)	4.4	4.2	4.0	5.1	5.3	4.5	4.6

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.

EXPORT CARGO SAMPLING

SAMPLE COUNT	2014 (36)	2013 (7)
GRADING AND WHEAT DATA		
Test Weight (lbs/bu)	60.0	60.6
Test Weight (kg/hl)	78.1	79.0
Damaged Kernels (%)	4.3	2.2
Foreign Material (%)	0.1	0.2
Shrunken & Broken (%)	1.4	1.3
Total Defects (%)	5.7	3.6
Vitreous Kernels (%)	62	71
Grade	3 AD	2 AD
OTHER WHEAT DATA		
Dockage (%)	0.6	0.6
Moisture (%)	12.3	12.7
Protein: 12% moisture (%)	13.2	13.3
Protein: Dry (%)	15.0	15.1
Ash: 14% moisture (%)	1.63	1.70
Ash: Dry (%)	1.90	1.97
1000 Kernel Weight (gm)	40.0	40.5
Kernel Size (%) lg/md/sm	47/51/2	47/48/5
Falling Number (sec)	275	391
DON (ppm)	n/a	0.0
SEMOLINA DATA		
Total Extraction (%)	70.6	70.8
Semolina Extraction (%)	63.7	64.4
Ash: 14% moisture (%)	0.69	0.68
Ash: Dry (%)	0.81	0.79
Gluten Index	48	40
Specks (no/10 sq in)	28	27
Protein: 14% moisture (%)	12.0	11.9
Protein: Dry (%)	14.0	13.8
Mixograph Classification (scale of 1-8)	5.4	5.3
Color: L (black-white)	84.4	85.2
a (red-green)	-2.81	-3.43
b (yellow-blue)	26.8	26.1
SPAGHETTI PROCESSING DATA		
Color Score (scale of 1-12)	8.0	8.5
Cooked Weight (gm)	31.5	32.0
Cooking Loss (%)	6.3	6.7
Cooked Firmness (g cm)	3.9	4.2

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.

Data contained in previous sections of this report are derived from the testing of samples gathered during harvest from origination points throughout the northern U.S. durum growing region. The results provide and assessment of the overall quality of the crop produced in a given year.

U.S. Wheat Associates, the export market development arm for American wheat growers, furthers this information by commissioning an export cargo sampling program. That data is shown in the table to the left. The program provides an accurate representation of the supplies moving through the grain marketing and transportation system and actually reaching export points. Results show the quality levels at which U.S. wheat is realistically traded and are useful to customers in developing reasonable purchase specifications.

The Federal Grain Inspection service oversees the program whereby all export inspection agencies at all ports collect every tenth sub lot sample from every vessel of U.S. wheat shipped during three two-month time periods annually.

The durum wheat samples are sent for analysis to the Durum Wheat Quality and Pasta Processing Laboratory in the North Dakota State University Plant Science Department. The samples represented here are based on samples collected from the fall of 2013 through the summer of 2014 for crop year 2013. For crop year 2014, samples tested were collected from the fall of 2014 through the spring of 2015. Grade data in the table is the actual official grade on individual sublots.

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, Hiroshi Ando and Yu Liu, food technologists 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 when approximately 13 percent of the regional durum crop had been harvested and continued until mid September. A total of 204 samples were collected during harvest from Montana (56) and North Dakota (148).

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 instrument 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.

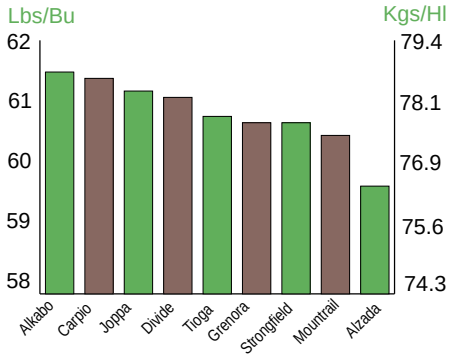
COOKED WEIGHT • AACC Method 66-50 with some modifications: 10 g of dry spaghetti were placed in 300 ml boiling distilled water and cooked for 12 min. The cooked and drained spaghetti sample was weighed and the results were reported in grams.

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.

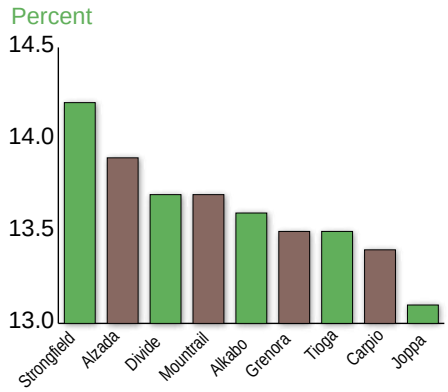
FIRMNESS • AACC Method 66-50 with a Plexiglas tooth attached to a Texture Analyzer (Model TA-XT2, Texture Technology Corp., Scarsdale, New York).

VARIETAL INFORMATION

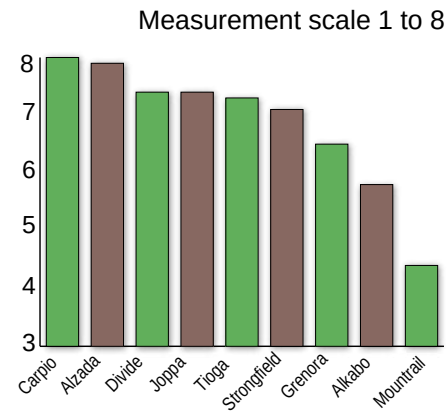
TEST WEIGHT



KERNEL PROTEIN



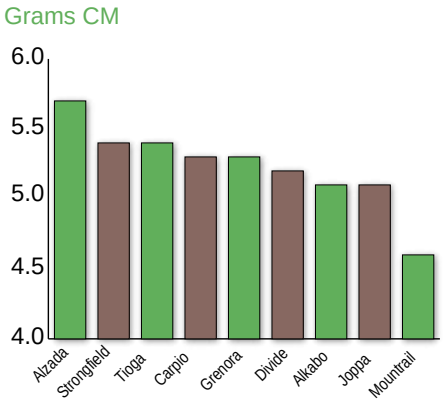
MIXOGRAPH



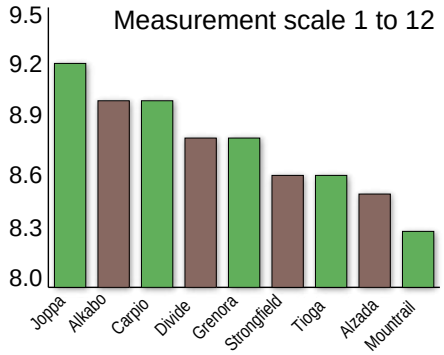
Quality products begin with quality ingredients. In the case of wheat, quality begins with the varieties planted. Within the durum class of wheat, there are different varieties available—all with relatively uniform characteristics. The public plant breeding program at North Dakota State University in 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.

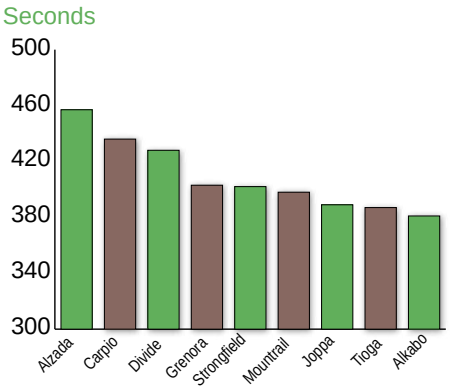
COOKED FIRMNESS



PASTA COLOR



FALLING NUMBER



Source: Yield trials 2012-14 crop years across multiple North Dakota locations.

VARIETAL INFORMATION

MAJOR VARIETIES PRODUCED IN REGION • AGRONOMIC FACTORS								
			Agronomic Description		Reaction to Disease[2]		Average Yield	
Variety	Agent or Origin[1]	Year Released	Straw Strength	Leaf Rust	Foliar Disease	Head (Scab)	Western, North Dakota[3] BU/Acre	MT/Hect
Alkabo	ND	2005	strong	R	M	MS	60.6	4.07
Alzada	WB	2004	med weak	R	S	VS	51.3	3.45
Carpio	ND	2012	medium	R	M	M	60.7	4.09
Divide	ND	2005	medium	R	M	M	59.5	4.00
Grenora	ND	2005	medium	R	M	MS	59.7	4.01
Joppa	ND	2013	medium	R	M	MS	62.7	4.20
Mountrail	ND	1998	medium	R	M	S	61.1	4.11
Strongfield	CAN	2004	med weak	R	MS	S	58.2	3.91
Tioga	ND	2010	med strong	R	M	MS	61.6	4.14

GROWN AND TESTED ACROSS NORTH DAKOTA • QUALITY & END-USE FACTORS									
	Quality Factors[4]								
Variety	Test Weight LB/BU	Test Wheat KG/HL	Wheat Protein %	Wheat Falling # Seconds	Mixogram Score (scale 1-12)	Pasta Color (Scale 1-12)	Gluten Index %	Cooked Firmness G CM	Overall Pasta Quality Rating [5]
Alkabo	61.5	80.1	13.6	381	5.8	9.0	49	5.1	good
Alzada	59.7	77.8	13.9	457	7.9	8.5	89	5.7	good
Carpio	61.4	80.0	13.4	436	8.0	9.0	91	5.3	excellent
Divide	61.1	79.6	13.7	428	7.4	8.8	76	5.2	good
Grenora	60.7	79.1	13.5	403	6.5	8.8	67	5.3	good
Joppa	61.2	79.7	13.1	389	7.4	9.2	82	5.1	excellent
Mountrail	60.5	78.8	13.7	398	4.4	8.3	21	4.6	average
Strongfield	60.7	79.1	14.2	402	7.1	8.6	65	5.4	good
Tioga	60.8	79.2	13.5	387	7.3	8.6	77	5.4	good

Source: 2015 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), very susceptible (VS).
3. Three year average data 2012-14 from six locations across North Dakota.
4. Based on NDSU Durum Quality Lab testing of samples grown at multiple North Dakota locations during 2012-14.
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

The top five durum varieties planted in North Dakota in 2015 are Divide, Alkabo, Tioga, Mountrail and Lebsock. On a combined basis they account for nearly three-fourths of the planted acres. These varieties have been the top five for three consecutive years, although there have been some shifts among the varieties with Alkabo and Tioga making gains, and Divide, Mountrail and Lebsock all losing share of acres.

DIVIDE is the top variety planted in North Dakota, accounting for 30 percent of the acreage, down from its peak of 37 percent in 2014. It has been the leading variety in North Dakota for seven consecutive years. Divide also ranks second for popularity across Montana with a 21 percent share in 2015. A 2005 release from North Dakota State University, Divide remains popular with producers for its high yield potential and tolerance to disease. It is rated as good for end-use quality, especially for gluten strength.

ALKABO remained the second most popular variety in North Dakota with 21 percent of durum plantings, up 5 percent from 2014. It is most popular in the northwest and southwest districts in North Dakota. Alkabo is the seventh most popular variety in Montana with 2 percent of the acres. It is a 2005 NDSU release with improved yield potential and relatively stronger straw properties when compared to other popular varieties. Alkabo possesses good end-use quality traits, especially for pasta color.

TIOGA made gains in its share of durum acres in both North Dakota and Montana in 2015. It ranks third in North Dakota with 10 percent of the acres and fifth in Montana with 5.5 percent. Tioga was released in 2010 and is popular for its balance of yield potential, strong straw and very balanced end-use quality traits.

CARPIO a 2012 NDSU release, accounts for 2 percent of the North Dakota planted acres in 2015, but promises to make notable gains in the next few years as more seed becomes available to growers. It has improved yield potential, as well as improved end-use quality traits compared to current varieties. Carpio is rated as excellent for quality with strong gluten properties, and high color and cooking scores.

NORTH DAKOTA VARIETIES SHARE OF PLANTED ACRES[3]

Variety	2015%[1]	2014%[1]
Divide	29.5	37.0
Alkabo	20.9	16.2
Tioga	10.1	9.7
Mountrail	7.6	12.9
Lebsock	4.9	7.5
Grenora	4.3	3.4
Carpio	2.2	0.1
Maier	1.4	0.0
Ben	1.3	1.6
Dilse	1.0	1.0
Other[2]	16.8	10.6

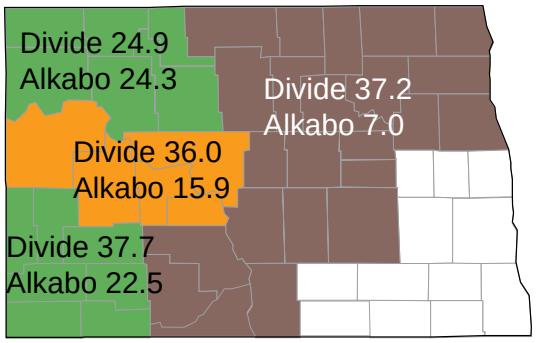
1. Percentage may not add to 100 due to rounding.
2. Includes varieties with less than 1% of acreage in 2015 and unknown varieties.
3. 1,000 acres (1 acre = 0.405 hectares)
   2015 - 1,100,000 acres
   2014 - 840,000 acres

NORTH DAKOTA VARIETIES SHARE OF 2015 PLANTED ACRES BY CROP DISTRICT

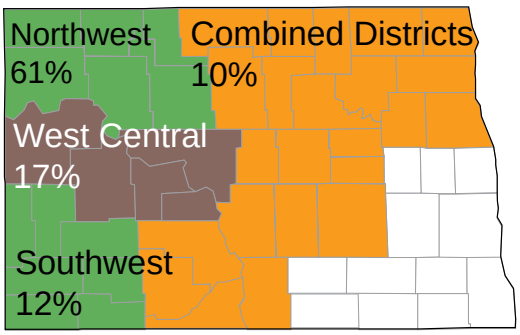
Variety	North West	West Central	South West	Combined Districts[1]	Total State
			percentage (%)[2]		
Divide	24.9	36.0	37.7	37.2	29.5
Alkabo	24.3	15.9	22.5	7.0	20.9
Tioga	8.3	13.7	17.8	5.5	10.1
Mountrail	11.3	1.9	0.0	2.9	7.6
Lebsock	5.8	4.8	1.5	3.9	4.9
Grenora	4.9	4.5	2.8	1.7	4.3
Carpio	2.4	0.3	1.6	4.6	2.2
Maier	1.9	0.0	0.0	2.3	1.4
Ben	1.2	0.0	5.1	0.0	1.3
Dilse	0.0	0.0	8.1	0.0	1.0
Other[3]	14.8	22.9	2.8	34.8	16.8
			1,000 acres (1 acre = 0.4 hectares)		
Total Acres[3]	675	185	130	110	1,100[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 2015 and unknown varieties.
4. September 30, 2015 small grain estimates was 1,100,000 acres.

NORTH DAKOTA 2015 TOP TWO VARIETIES BY DISTRICT (% OF ACRES)



NORTH DAKOTA 2015 SHARE OF PLANTED ACRES BY NASS DISTRICTS



MONTANA

The top five durum varieties planted across Montana in 2015 are Mountrail, Divide, Alzada, Kyle and Tioga, combining for nearly eighty percent of the total durum acres. Compared to 2014, Mountrail held a stable share of the acres, while Divide dropped sharply, and Alzada, Kyle and Tioga all made slight gains.

MOUNTRAIL is the leading variety in Montana with a 27 percent share of the acres. In North Dakota, it ranks fourth with a 7.6 percent share but continues to lose acres to newer releases. Released by NDSU in 1998 it remains one of the elite yielding varieties with positive agronomic traits, but ranks lower than other varieties for disease resistance. Mountrail is rated as average for end-use quality.

ALZADA is the third most popular variety in Montana with a 14 percent share of acres, making notable gains from 2014 when it held a 6 percent share. All of its acres are outside of the north east district in the state due to its susceptibility to disease. Alzada is a 2004 release from Westbred. It is largely contract produced for its uniquely strong gluten qualities and excellent cooking properties.

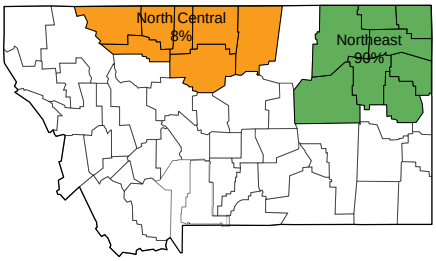
KYLE is the fourth ranked variety in Montana in 2015 with a 9 percent share, up from only 3 percent in 2014. Its share of acres had declined in acres in recent years due to weaker straw and lower yield potential compared to newer releases, but the resurgence in 2015 was due in part to the prolonged, wet 2014 harvest, conditions that Kyle tends to tolerate better than other varieties. Kyle is a 1984 release from Agriculture Canada.

MONTANA VARIETIES SHARE OF PLANTED ACRES[3]

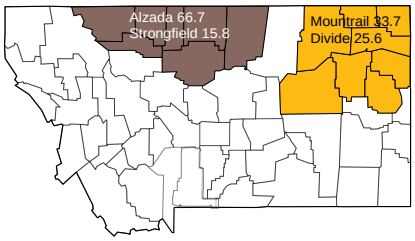
Variety	2015%[1]	2014%[1]
Mountrail	27.0	28.0
Divide	21.3	34.4
Alzada	14.2	6.2
Kyle	9.0	3.4
Tioga	5.5	4.0
Strongfield	4.6	5.8
Alkabo	2.2	4.4
Grenora	1.5	1.1
Other[2]	14.7	12.7

1. Percentage may not total 100 due to rounding.
2. Includes varieties with less than 1% of acreage in 2015 and unknown varieties.
3. 1,000 acres (1 acre = 0.405 hectares)
   2015 - 630,000 planted acres
   2014 - 440,000 planted acres

MONTANA SHARE OF PLANTED ACRES BY NASS DISTRICT



MONTANA 2015 TOP TWO VARIETIES BY CROP DISTRICT (% OF ACRES)



MONTANA VARIETIES SHARE OF 2015 PLANTED ACRES BY CROP DISTRICT

Variety	North Central	North East	Other Districts[1]	Total State
	percentage (%)[2]			
Montrail	0.0	33.7	0.0	27.0
Divide	0.0	25.6	0.0	21.3
Alzada	66.7	0.0	42.9	14.2
Kyle	0.0	10.8	0.0	9.0
Tioga	0.0	6.3	0.0	5.5
Strongfield	15.8	1.9	0.0	4.6
Alkabo	0.0	2.8	0.0	2.2
Grenora	0.0	2.0	0.0	1.5
Other[3]	17.5	16.8	57.1	14.7

1,000 acres (1 acre = 0.4 hectares)

Total Acres[3]	630[4]

1. Other district varieties were combined to avoid disclosure of individual information.
2. Percentages may not add to 100 due to rounding.
3. Includes varieties with less than 1% acreage in 2015 and unknown varieties.
4. September 30, 2015 small grain estimates was 630,000 acres.

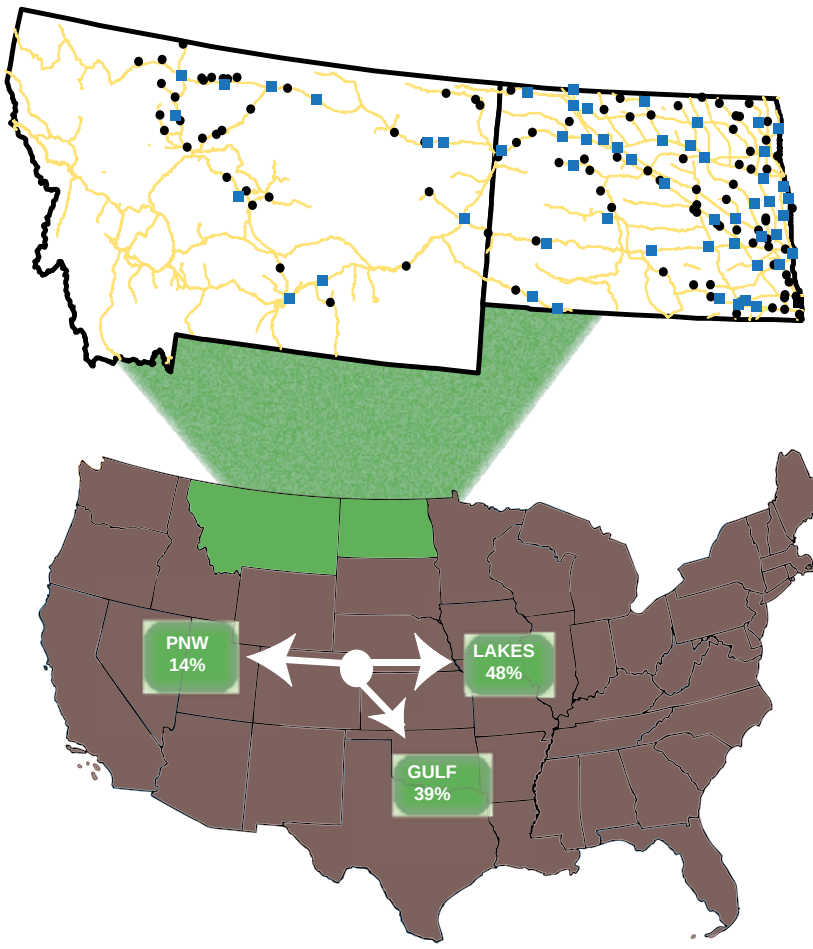
HANDLING & TRANSPORTATION

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.

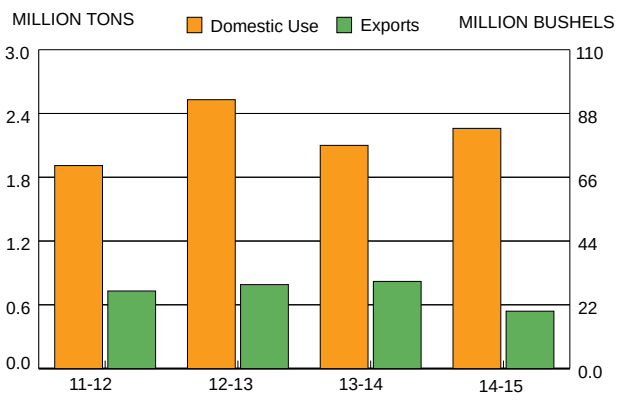
The rail and elevator network in the U.S. northern grown durum region is well suited for meeting the increasing quality demands of both domestic and international customers.



Grain Handling and Transportation Facilities in the Two-State Region

AVERAGE SHARE OF U.S. DURUM EXPORTS BY PORT (2011-2014)

2011-14 U.S. DURUM DOMESTIC USE AND EXPORTS



Marketing Years (June - May)

U.S. DURUM WHEAT 15

REGIONAL QUALITY REPORT

FUNDING & SUPPORT PROVIDED BY

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North Dakota Wheat Commission

Montana Wheat and Barley Committee

North Dakota State University Plant Sciences Department