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Hard Red Winter

Soft White

Hard Red Spring

Soft Red Winter

Durum

Hard White

# Hard Red Winter Wheat

## Midwestern Harvest Survey

Most of the U.S. hard red winter (HRW) wheat is grown in the Great Plains area of the U.S. (Colorado, Kansas, Montana, Nebraska, Oklahoma, South Dakota and Texas). For 2001, weather patterns were generally favorable with the exception of dry conditions during the fall 2000 planting season which delayed germination and slowed growth before winter. Winter conditions were much colder than the previous year, with adequate snow cover which was beneficial for reducing plant diseases but caused some winter-kill. The northern part of the production area had some low levels of wheat disease, and buyers should maintain a vomitoxin or DON specification. Weather during spring was mostly good for wheat growth with an absence of hot, dry winds during the crucial flowering stage and mild temperatures during the grain filling period. Predominantly dry conditions during harvest produced a very sound crop.

Processing quality is better than last year by most measures. Test weight is significantly higher and protein content average is 0.1% greater than last year. All wheat physical size factors are improved over last year, and milling yield on experimental milling is increased. Much of the HRW is also more vitreous compared with previous years, which positively affects milling. Much higher farinograph absorption and larger bread loaf volume indicate protein quality is improved.

**Survey Methods:** Information on the 2001 HRW crop is based on testing by CII Laboratory Services of Kansas City, Missouri. Approximately 650 samples were collected in 20 crop production zones during harvest. Data on protein content, test weight, moisture, thousand-kernel weight, wheat ash, and falling number were recorded for individual samples. Samples were composited into three protein ranges (below 11.5%, 11.5% - 12.5%, and above 12.5%) within each crop production zone for the remaining tests. After FGIS established the grade on the composites, single kernel characteristics were determined and laboratory milling was carried out using a Buhler experimental mill (Model MLU-202). Milled composites were tested for flour and dough quality factors and baking performance. Data are weighted by production based on the USDA "Small Grains Summary" of 28 September 2001. These data are presented as composite (overall) averages and the projected averages that can be expected at Pacific Northwest and Gulf of Mexico ports. Testing conforms to the American Association of Cereal Chemists Approved Methods (2000).

**Milling and Flour Use:** Commercial flour millers indicate the transition to new crop wheat this year was not difficult after the wheat had gone through the traditional "sweat" period. They report similar to slightly higher milling yield, with good flour quality which meets their customers' requirements. Mill labs confirm the higher farinograph absorption and higher loaf volume. The baking industries in

the U.S. indicate the crop has processing characteristics similar to 2000, although some bakeries may not see the absorption increase indicated by the farinograph. Bakeries with manual production practices, as opposed to high speed commercial production, may experience better absorption characteristics. Pan bread loaf volumes remain at levels acceptable to the baking companies.

**Summary:** The 2001 HRW crop has good milling quality and acceptable to good baking performance. Millers are experiencing improved yields due to larger, more vitreous kernels. Protein quality is better than in 2000, and the supply of high protein wheat is comparable to 2000. A range of protein contents is available to supply bakers of both traditional and non-traditional products. Buyers should always specify important quality requirements.

The harvest data were compiled by the International Grains Program (IGP) at Kansas State University (KSU), Manhattan, Kansas with support from the KSU Agricultural Experiment Station, the Kansas, Colorado, Nebraska, Oklahoma, Texas, and South Dakota Wheat Commissions or Boards and U.S. Wheat Associates, Inc.

## California Harvest Survey

The varieties of Brooks, Bonus, Express, and Yecora Rojo accounted for over 70% of the state's HRW acreage. Brooks and Yecora will produce protein above 12.5%. Express will usually range in protein between 11.0-12.4%. Stander, a new variety with medium range protein, has a very extensible gluten and is recommended for whole-wheat products. It is not unusual for buyers of California HRW to request a specific variety or quality type in their buying specifications.

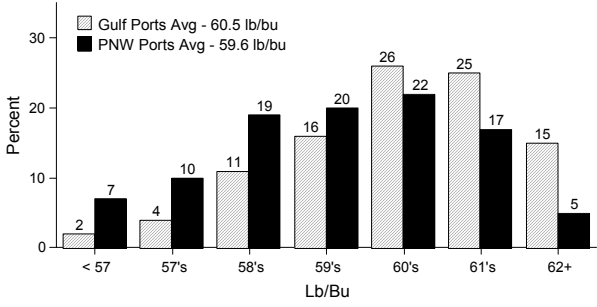
California red wheats are harvested in the months of June and July. With the strong demand for new crop wheat in the domestic market, export buyers are encouraged to express interest in purchasing California wheat in early spring months.

The California Wheat Commission laboratory replaced the old rollers on the experimental mill (Quadromat Sr.) which has led to higher ash and higher milling yields than in previous years.

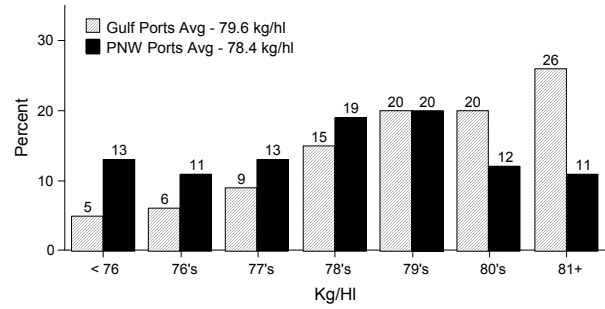
## Export Cargo Survey

The export cargo data show the results of analysis of 490 individual subplot samples for marketing years 2001 and 2000. Of the 370 2000 samples, 289 are from Gulf ports and 81 from PNW ports. Of the 121 2001 samples (collected in July and August), 101 were drawn at Gulf ports and 20 at PNW ports. Samples were randomly selected from official Federal Grain Inspection Service samples. Grade data are the actual official grades on the individual subplots. Milling and baking analyses were conducted by CII Laboratory Services.

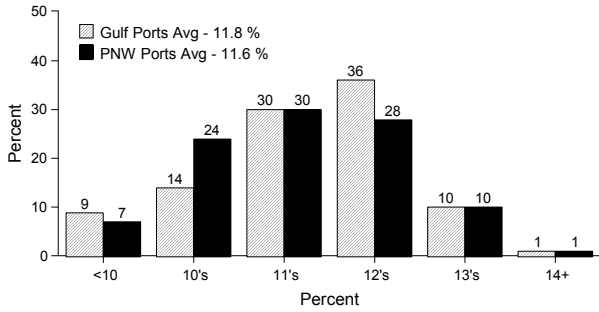
**Test Weight**



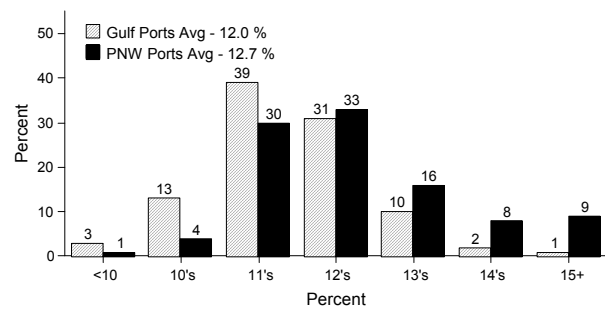
**Hectoliter Weight**



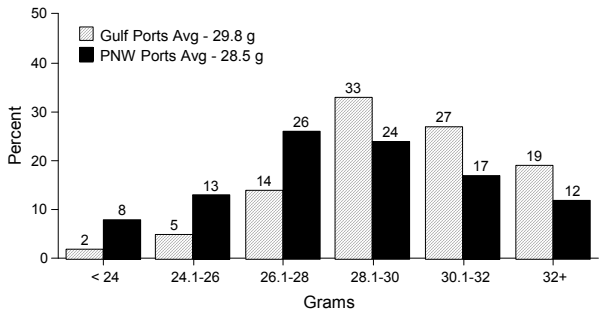
**Wheat Moisture**



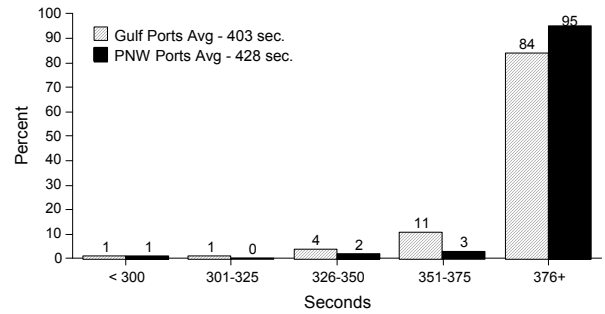
**Protein (12% mb)**



**1000 Kernel Weight**



**Falling Number**

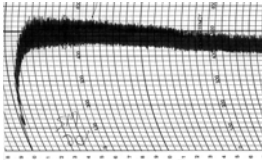


Hard red winter survey results are from eight states.

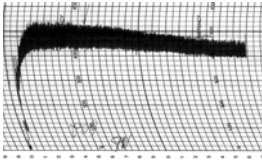
## Composite Average Farinograms and Alveograms

### Farinograms:

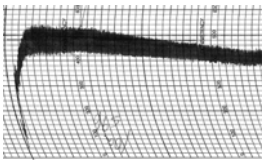
High Protein:



Medium Protein:

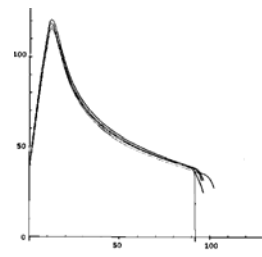


Low Protein:

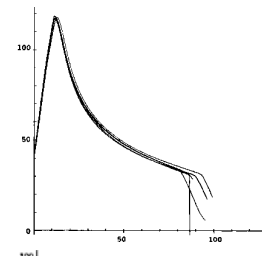


### Alveograms:

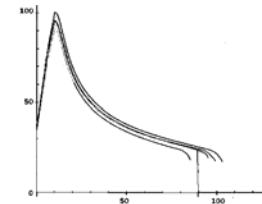
High Protein:



Medium Protein:



Low Protein:



## Hard Red Winter

### Composite Average

	2001 By Protein*				2000 Overall	5-Year Avg
	Low	Med	High	Overall		
<b>Wheat Grade Data:</b>						
Test Weight (lb/bu)	60.8	60.3	59.9	60.4	59.2	59.7
(kg/hl)	80.0	79.3	78.8	79.4	77.9	78.6
Damaged Kernels (%)	0.2	0.1	0.1	0.1	0.3	0.3
Foreign Material (%)	0.1	0.1	0.1	0.1	0.1	0.2
Shrunken & Broken (%)	1.3	1.3	1.4	1.3	1.4	1.3
Total Defects (%)	1.6	1.5	1.6	1.6	1.8	1.7
Grade	1 HRW	1 HRW	2 HRW	1 HRW	2 HRW	2 HRW
<b>Wheat Non-Grade Data:</b>						
Dockage (%)	0.6	0.7	0.8	0.7	0.8	0.7
Moisture (%)	12.0	11.8	11.4	11.7	11.5	11.7
Protein: 12% Moisture Basis (%)	10.9	12.0	13.4	12.1	12.0	11.8
0% Moisture Basis (%)	12.4	13.7	15.3	13.7	13.6	13.4
Ash: 14% Moisture Basis (%)	1.48	1.51	1.53	1.51	1.60	1.54
0% Moisture Basis (%)	1.72	1.75	1.78	1.75	1.86	1.79
1000 Kernel Weight (g)	30.8	29.5	28.4	29.6	26.7	28.9
Kernel Size (%) lg/md/sm	68/32/1	59/40/1	51/48/2	59/40/1	49/48/2	
Single Kernel: Hardness	77.1	80.0	80.2	79.2	75.7	72.7
Weight (mg)	29.6	28.9	28.8	29.1	27.6	29.6
Diameter (mm)	2.28	2.20	2.22	2.23	2.2	2.25
Sedimentation (cc)	32.9	38.9	47.7	39.6	40.3	38.5
Falling Number (sec)	402	407	412	407	393	374
<b>Flour Data:</b>						
Extraction Rate (%)	68.8	69.1	69.8	69.2	68.3	70.5
Color: L*	92.4	92.5	92.2	92.4	91.5	
a*	-3.2	-3.3	-3.3	-3.3	-3.3	
b*	9.9	10.1	10.4	10.1	9.8	
Protein: 14% Moisture Basis (%)	9.8	10.6	11.9	10.7	10.4	10.4
0% Moisture Basis (%)	11.4	12.3	13.7	12.4	12.1	12.1
Ash: 14% Moisture Basis (%)	0.46	0.47	0.49	0.47	0.50	0.48
0% Moisture Basis (%)	0.53	0.55	0.57	0.55	0.58	0.55
Wet Gluten (%)	25.8	28.4	31.8	28.6	26.8	27.0
Falling Number (sec)	395	423	443	420	410	392
Amylograph Viscosity 65 g (BU)	661	679	666	670	653	656
Starch Damage (%)	8.6	8.9	9.2	8.9	7.7	
<b>Dough Properties:</b>						
Farinograph:						
Peak Time (min)	5.3	5.8	6.4	5.8	5.5	5.6
Stability (min)	10.9	11.3	11.2	11.1	11.2	11.8
Absorption (%)	57.9	58.8	61.1	59.2	57.0	59.2
Alveograph: P (mm)						
L (mm)	97	92	103	96	86	89
W (erg/gm)	76	90	94	87	90	89
258	280	313	283	271	268	
Extensigraph: Resistance (cm)						
(45/135 min) Extension (cm)						
Area (sq cm)						
<b>Baking Evaluation:</b>						
Crumb Grain	6.9	7.1	7.6	7.2	7	6.9
Crumb Texture	6.9	7.3	7.7	7.3	7	6.9
Loaf Volume (cc)	808	867	894	857	818	820
<b>% of Area Production:</b>	30	41	29	100	100	100

\* Low: Less than 11.5%; Med: 11.5 - 12.5%; High: 12.5% or greater

# Harvest Data

Gulf Exportable Average						PNW Exportable Average					
2001 By Protein*				2000 Overall	5-Year Avg	2001 By Protein*				2000 Overall	5-Year Avg
Low	Med	High	Overall			Low	Med	High	Overall		
60.8	60.5	60.1	60.5	58.8	59.6	60.7	59.5	59.3	59.6	59.9	59.8
80.0	79.6	79.1	79.6	77.4	78.4	79.8	78.3	78.0	78.4	78.8	78.7
0.2	0.1	0.1	0.1	0.3	0.3	0.9	0.2	0.1	0.3	0.4	0.3
0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.2	0.1	0.1	0.1
1.3	1.3	1.3	1.3	1.5	1.3	1.3	1.4	1.5	1.5	1.2	1.3
1.6	1.5	1.6	1.5	1.9	1.7	2.2	1.8	1.9	1.9	1.6	1.7
1 HRW	1 HRW	1 HRW	1 HRW	2 HRW	2 HRW	1 HRW	2 HRW	2 HRW	2 HRW	2 HRW	2 HRW
0.5	0.7	0.8	0.7	0.7	0.6	0.8	0.8	0.8	0.8	0.9	0.8
12.0	11.8	11.3	11.8	11.6	11.8	11.8	11.7	11.5	11.6	11.1	11.4
10.9	12.0	13.3	12.0	11.9	11.7	11.0	12.0	13.9	12.7	12.1	12.1
12.4	13.7	15.1	13.6	13.5	13.4	12.5	13.7	15.8	14.4	13.8	13.7
1.48	1.50	1.55	1.51	1.62	1.54	1.48	1.54	1.47	1.50	1.53	1.53
1.72	1.75	1.80	1.75	1.88	1.79	1.72	1.79	1.71	1.74	1.78	1.78
30.9	29.6	28.7	29.8	26.2	28.7	30.1	28.9	27.5	28.5	28.0	29.1
68/31/1	60/39/1	53/45/2	61/38/1	47/50/2		60/39/1	54/45/1	43/56/1	50/49/1	54/44/2	
76.9	80.8	81.3	79.7	76.5	73.1	79.6	75.9	76.5	76.7	72.7	70.9
29.6	29.1	28.9	29.2	27.0	29.5	29.2	27.8	28.4	28.3	29.2	29.8
2.28	2.23	2.23	2.25	2.1	2.24	2.24	2.05	2.21	2.15	2.2	2.24
32.8	39.2	46.4	38.9	39.7	38.2	34.1	37.3	51.8	43.1	41.9	39.6
400	403	406	403	391	371	428	428	429	428	396	385
68.8	69.0	69.5	69.0	67.8	70.4	68.7	69.1	71.1	69.9	69.2	70.9
92.3	92.4	92.1	92.3	90.9		92.6	92.5	92.5	92.5	92.3	
-3.2	-3.3	-3.3	-3.3	-3.1		-3.4	-3.4	-3.1	-3.3	-3.6	
9.9	10.1	10.5	10.1	9.8		10.2	10.1	10.0	10.1	9.7	
9.8	10.6	11.7	10.6	10.3	10.3	10.0	10.7	12.4	11.3	10.6	10.7
11.4	12.3	13.6	12.3	11.9	12.0	10.9	12.4	14.4	13.0	12.3	12.4
0.46	0.47	0.49	0.47	0.51	0.48	0.47	0.48	0.49	0.48	0.47	0.47
0.53	0.54	0.56	0.55	0.60	0.56	0.51	0.56	0.57	0.56	0.54	0.54
25.8	28.5	31.9	28.5	26.3	26.7	26.5	27.7	31.4	29.1	27.9	28.0
393	417	432	413	406	386	428	454	479	461	418	413
655	663	651	657	681	663	743	752	712	733	559	629
8.6	9.0	9.5	9.0	7.7		9.0	8.1	8.5	8.4	7.7	
5.3	5.7	6.3	5.7	5.4	5.5	5.7	6.0	6.7	6.2	5.6	5.9
10.8	11.0	10.9	10.9	11.2	11.7	12.5	12.3	12.1	12.3	11.0	11.8
57.8	58.8	61.2	59.1	56.5	59.0	58.5	58.6	60.7	59.5	57.7	59.9
96	91	101	95	86	89	102	96	108	102	86	90
77	93	95	88	90	86	73	80	90	83	91	89
258	282	307	280	271	267	261	268	330	294	268	269
11.4/10.0	9.5/11.5	10.1/12.5	10.4/11.4	10.3/10.1		11.7/13.5	8.7/10.7	10.1/10.6	9.7/11.0	8.9/9.3	
17.3/14.2	16.6/15.7	17.6/15.4	17.3/15.3	18.6/15.8		17.2/13.3	14.5/14.3	15.9/14.8	15.5/14.4	18.4/15.3	
142/132	118/132	124/133	129/136	128/107		141/130	95/112	116/111	110/114	105/100	
6.8	7.1	7.7	7.2	7	7	7.0	7.4	7.1	7.2	7	7
6.9	7.3	7.8	7.3	7	7	7.0	7.3	7.6	7.4	7	7
807	870	903	857	809	818	819	850	866	853	839	822
34	41	25	100	100	100	14	43	43	100	100	100

# California and Export Data

Hard Red Winter	California Harvest Data				Export Cargo Data			
	Medium Protein Average		High Protein Average		Gulf		PNW	
	2001	2000	2001	2000	2001	2000	2001	2000
<b>Wheat Grade Data:</b>								
Test Weight (lb/bu)	62.9	62.5	62.5	62.8	61.2	60.5	61.3	62.1
(kg/hl)	82.7	82.2	82.2	82.6	80.6	79.6	80.6	81.7
Damaged Kernels (%)	0.0	0.0	0.0	0.1	1.1	1.2	0.1	0.2
Foreign Material (%)	0.1	0.1	0.1	0.2	0.3	0.2	0.1	0.2
Shrunken & Broken (%)	0.5	0.6	0.9	0.5	1.8	1.9	1.7	1.5
Total Defects (%)	0.6	0.7	1.0	0.8	3.2	3.3	1.9	1.8
Grade	1 HRW	1 HRW	1 HRW	1 HRW	2 HRW	2 HRW	1 HRW	1 HRW
<b>Wheat Non-Grade Data:</b>								
Dockage (%)	0.6	0.6	0.7	0.6	0.7	0.6	0.3	0.4
Moisture (%)	8.4	10.2	8.2	9.2	11.5	11.7	10.8	10.2
Protein: 12% Moisture Basis (%)	11.8	11.7	13.8	13.2	12.0	11.6	12.4	12.0
0% Moisture Basis (%)	13.4	13.3	15.7	15.0	13.6	13.1	14.1	13.6
Ash: 14% Moisture Basis (%)	1.60	1.49	1.60	1.46	1.57	1.57	1.51	1.46
0% Moisture Basis (%)	1.90	1.73	1.86	1.70	1.83	1.83	1.76	1.70
1000 Kernel Weight (g)	40.5	38.4	41.0	38.5	28.2	25.9	27.9	28.3
Kernel Size (%) lg/md/sm					57/40/2	55/43/2	52/46/2	60/39/1
Single Kernel: Hardness					*	71.0	*	72.0
Weight (mg)					*	28.8	*	31.0
Diameter (mm)					*	2.25	*	2.33
Sedimentation (cc)					27.8	27.5	33.0	33.3
Falling Number (sec)	362	334	381	354	471	441	453	423
<b>Flour Data:</b>								
Extraction Rate (%)	69.4	69.3	69.7	70.3	72.6	70.0	72.6	70.5
Color: L*					92.8	92.5	92.7	92.2
a*					-2.5	-2.6	-2.6	-2.7
b*					9.1	9.1	9.3	9.6
Protein: 14% Moisture Basis (%)	10.5	10.5	12.2	11.5	10.7	10.1	11.2	10.7
0% Moisture Basis (%)	12.2	12.2	14.2	13.4	12.4	11.8	13.1	12.4
Ash: 14% Moisture Basis (%)	1.00	0.46	0.80	0.46	0.53	0.50	0.51	0.46
0% Moisture Basis (%)	1.20	0.53	0.93	0.53	0.61	0.58	0.59	0.54
Wet Gluten (%)	26.0	26.9	31.3	30.4	27.3	25.6	29.3	28.7
Falling Number (sec)	362	334	381	354	491	474	463	477
Amylograph Viscosity 65 g (BU)					622	584	464	522
Starch Damage (%)								
<b>Dough Properties:</b>								
Farinograph:								
Peak Time (min)	10.8	8.3	11.5	10.7	6.1	6.7	5.9	5.6
Stability (min)	17.7	13.2	13.9	13.5	10.7	13.6	8.9	10.1
Absorption (%)	62.0	65.8	63.6	66.8	59.3	57.6	60.0	60.6
Alveograph: P (mm)								
L (mm)					98	103	98	109
W (erg/gm)					86	77	96	80
Extensigraph: Resistance (cm)								
(45/135 min) Extension (cm)								
Area (sq cm)								
<b>Baking Evaluation:</b>								
Crumb Grain					7.1	7.1	6.8	7.3
Crumb Texture					7.6	7.2	7.0	7.5
Loaf Volume (cc)	841	849	927	907	871	855	863	886
<b>Number of Samples</b>								
					101	289	20	81

\* Data not yet available.

## Hard Red Winter Production by Crop Year

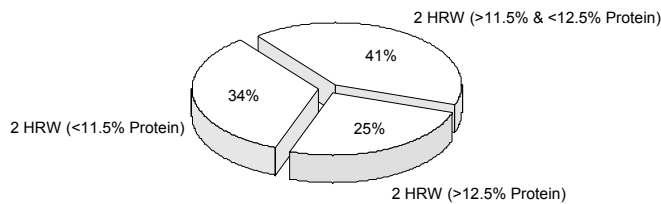
for the major HRW growing region  
(million metric tons)

	2001	2000	1999	1998	1997
Kansas	8.93	9.47	11.77	13.47	13.65
Oklahoma	3.32	3.89	4.10	5.41	4.62
Texas	2.96	1.80	3.33	3.71	3.24
Colorado	1.80	1.85	2.81	2.71	2.35
Nebraska	1.61	1.62	2.22	2.25	1.91
Montana	0.52	1.21	1.00	1.33	1.50
South Dakota	0.32	1.46	1.61	1.66	0.94
California	0.72	0.74	0.79	0.62	0.76
<b>Eight-State Total</b>	<b>20.19</b>	<b>22.04</b>	<b>27.62</b>	<b>31.17</b>	<b>28.96</b>
<b>Total HRW Production</b>	<b>20.87</b>	<b>23.03</b>	<b>28.60</b>	<b>32.10</b>	<b>29.89</b>

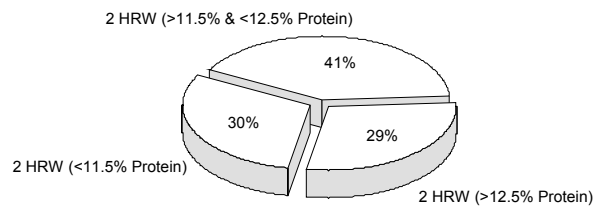
Based on USDA crop estimates of September 28, 2001.

## Protein Distribution

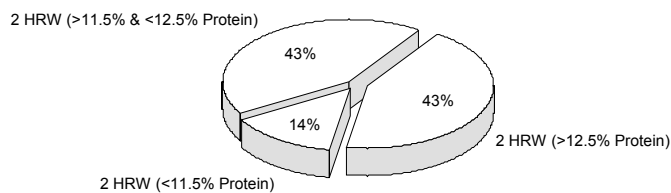
### Gulf Exportable



### Overall



### PNW Exportable



# Pacific Northwest Soft White Wheat

## Harvest Survey

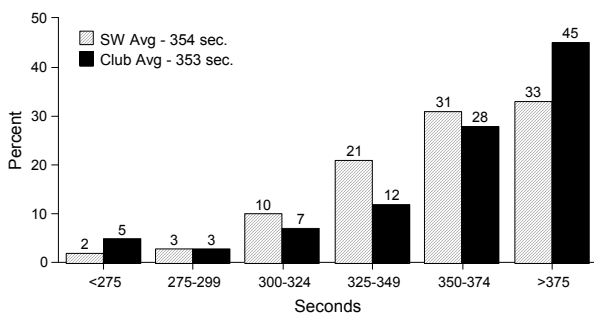
**Weather and Harvest:** Growing conditions in Oregon and Washington were very dry during grain filling in spring and early summer which increased protein content in most dryland farming areas. Much of the Idaho wheat was irrigated, so the drought did not have a major effect on the wheat crop there. Timely summer rainfall resulted in fairly plump kernels with high test weights. Mostly dry harvest conditions prevailed.

**Wheat and Grade Data:** The average test weight of 61.4 lb/bu for the 2001 soft white (SW) crop was slightly below

**Chinese Southern-Type Steamed Bread:** Each flour was made into southern-type steamed bread and compared with a Chinese commercial southern-type steamed bread flour. Specific volume was higher for club than for SW. However, the total steamed bread score was higher for SW than for club. Medium protein SW was rated similar in quality score to the control flour, and high protein SW had steamed bread quality close to the control flour. Compared to last year, this year's crop performed better in steamed bread quality.

**Summary:** Test weight, 1000-kernel weight and experimental milling indicated a good milling quality for both

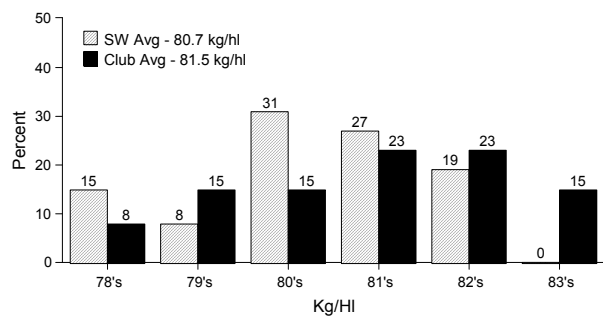
**Falling Number**



last year, but higher than the five-year average. Club wheat test weight was 0.8 and 0.6 lb/bu higher than last year and the five-year average, respectively. Other grade data were similar to last year and the five-year average. All final composite samples graded No. 1. The most striking difference for the 2001 SW and club crop was the higher protein contents compared to last year and the five-year average. Thousand-kernel weight and kernel diameter were slightly lower this year than last. Sedimentation volumes were higher due to the increase in protein contents. High falling numbers indicate very little sprout damage.

**Flour, Dough and Bake Data:** Flour extractions for both SW and club wheat increased by about 2 percentage points in spite of having lower 1000-kernel weights and smaller kernel sizes. Although flour protein contents were higher, wet gluten values were lower. High flour falling numbers and amylograph peak viscosities indicated sound flour samples. Starch damage values were higher than last year. SW and club farinograph data showed higher absorption and stronger mixing properties than last year. Alveograph data indicated that compared with last year and the five-year average maximum overpressure ("P") for SW was similar but extensibility ("L") and overall strength ("W") were slightly higher. All alveograph properties for club were similar to last year and five-year average. Extensigraph data showed lower resistance to extension and longer extensibility for both SW and club than last year and the five-year average. Cookie spreads and sponge cake volume, appearance, and crumb grain scores for SW and club were less than last year and the five-year averages.

**Hectoliter Weight**



SW and club. High falling number values indicated a sound crop. Wheat protein content was the highest in the last five years. The high flour protein content negatively affected both sponge cake and cookie baking qualities. Medium and high protein SW showed potential of making good quality Chinese southern-type steamed bread.

Wheat quality testing and data analyses were conducted by the Wheat Marketing Center, Portland, Oregon. Laboratory testing was conducted according to American Association of Cereal Chemists Approved Methods (10th Edition). Survey samples were collected from producers under the management of the National Agricultural Statistics Service, USDA, and represent a statistical sampling of the crop.

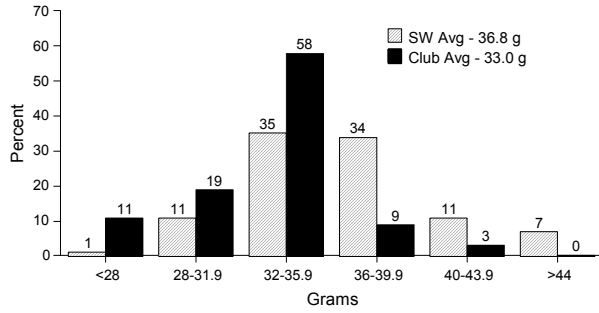
The wheat commissions of Idaho, Oregon and Washington, U.S. Wheat Associates, Inc., and the U.S. Department of Agriculture supported this program.

## Export Cargo Survey

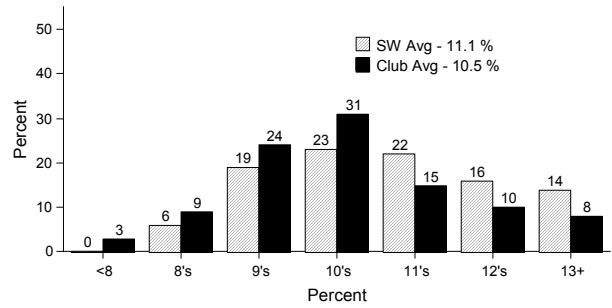
The Pacific Northwest white wheat export cargo data show the results of analyses of individual subplot samples including 90 drawn from the 1999 crop (October 1999-September 2000) and 60 from the 2000 crop. The samples were randomly selected from official Federal Grain Inspection Service samples. Grade data are the actual grades on the individual sublots. Milling and processing analyses were conducted by the Wheat Marketing Center, Portland, Oregon.



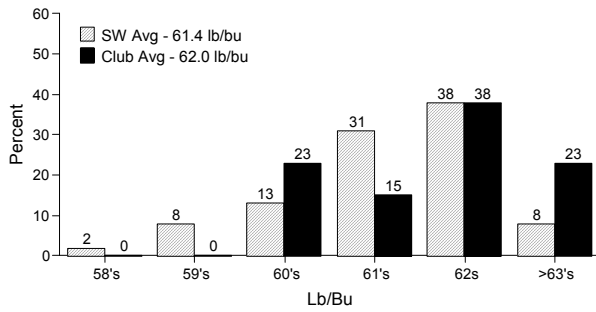
### 1000 Kernel Weight



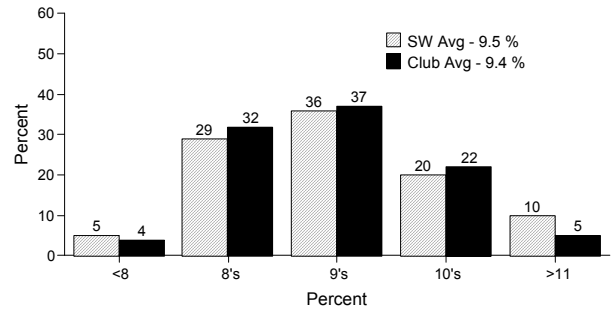
### Protein (12% mb)



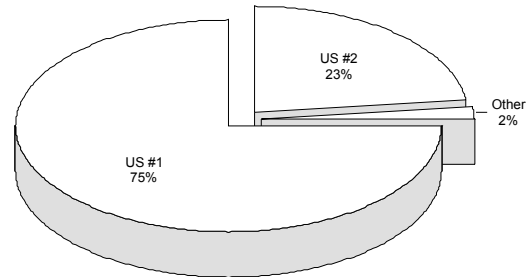
### Test Weight



### Wheat Moisture



### 2001 SW Grade Distribution



## Pacific Northwest Soft White Wheat Production

by crop year in major white wheat producing states  
(million metric tons)

	2001		2000		1999		1998		1997	
	SW	CLUB	SW	CLUB	SW	CLUB	SW	CLUB	SW	CLUB
Washington	2.91	0.30	3.52	0.41	2.78	0.19	3.60	0.33	3.72	0.32
Oregon	0.81	0.05	1.27	0.11	0.87	0.03	1.43	0.09	1.59	0.08
Idaho	1.49	0.05	2.03	0.08	1.86	0.02	2.01	0.02	2.47	0.02
<b>Three-state Total</b>	<b>5.21</b>	<b>0.40</b>	<b>6.82</b>	<b>0.60</b>	<b>5.51</b>	<b>0.24</b>	<b>7.04</b>	<b>0.44</b>	<b>7.78</b>	<b>0.42</b>
<b>Three-state Total Soft White Wheat</b>	5.61		7.42		5.75		7.48		8.20	
<b>Total Soft White Wheat Production</b>	6.31		8.25		6.72		8.11		9.04	

Based on USDA crop estimates of September 28, 2001.

# Pacific Northwest Harvest Data

Soft White

Soft White	2001					2000		5-Year Avg	
	Soft White By Protein*				Club Avg	SW	Club	SW	Club
	Low	Med	High	All					
<b>Wheat Grade Data:</b>									
Test Weight (lb/bu)	62.2	62.0	61.0	61.4	62.0	61.5	61.2	60.8	61.4
(kg/hl)	81.7	81.5	80.2	80.7	81.5	80.9	80.4	80.0	80.7
Heat Damage (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Damaged Kernels (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Foreign Material (%)	0.2	0.1	0.1	0.1	0.2	0.3	0.1	0.1	0.2
Shrunken & Broken (%)	0.8	1.0	0.8	0.8	1.4	0.8	1.1	0.8	1.2
Total Defects (%)	1.0	1.0	0.9	0.9	1.6	1.1	1.2	1.0	1.3
Grade	1 SW	1 SW	1 SW	1 SW	1 WC	1 SW	1 WC	1 SW	1 WC
<b>Wheat Non-Grade Data:</b>									
Dockage (%)	0.4	0.4	0.4	0.4	0.5	0.4	0.7	0.4	0.6
Moisture (%)	9.7	9.8	9.6	9.7	9.6	9.2	8.3	9.7	9.3
Protein: 12% Moisture Basis (%)	8.7	9.8	12.0	11.1	10.5	9.2	8.3	10.0	9.3
0% Moisture Basis (%)	9.9	11.1	13.7	12.6	12.0	10.5	9.4	11.3	10.6
Ash: 14% Moisture Basis (%)	1.37	1.35	1.39	1.38	1.21	1.37	1.24	1.39	1.28
0% Moisture Basis (%)	1.59	1.57	1.62	1.61	1.41	1.60	1.45	1.62	1.48
1000 Kernel Weight (g)	39.1	39.5	36.1	37.4	32.8	38.4	34.4	37.8	34.3
Kernel Size (%) lg/md/sm									
Single Kernel: Hardness	34.0	31.0	34.0	33.0	41.0	38.0	39.2	34.0	38.0
Weight (mg)	39.1	39.5	36.1	37.4	32.8	38.4	34.4	37.7	34.4
Diameter (mm)	2.62	2.60	2.45	2.51	2.28	2.7	2.46	2.58	2.41
Sedimentation (cc)	13.4	17.5	24.5	21.4	13.9	14.0	11.4	16.0	12.3
Falling Number (sec)	329	346	360	353	360	327	319	333	336
<b>Flour Data:</b>									
Extraction Rate (%)	70.9	70.1	68.0	68.8	70.8	66.7	68.8	67.9	69.0
Color: L*	92.5	92.7	92.5	92.6	92.3	92.3	92.4		
a*	-2.7	-2.7	-2.5	-2.6	-2.5	-2.8	-2.6		
b*	7.7	7.5	7.0	7.2	7.2	7.9	7.3		
Protein: 14% Moisture Basis (%)	7.0	7.9	9.9	9.0	8.8	7.6	6.9	8.2	7.7
0% Moisture Basis (%)	8.2	9.2	11.5	10.5	10.3	8.8	8.0	9.6	8.9
Ash: 14% Moisture Basis (%)	0.38	0.36	0.38	0.37	0.38	0.36	0.37	0.38	0.39
0% Moisture Basis (%)	0.44	0.41	0.44	0.43	0.44	0.42	0.43	0.44	0.45
Wet Gluten 14% mb (%)	9.0	10.9	14.2	12.8	9.2	19.2	11.5	19.5	13.7
Falling Number (sec)	321	319	373	352	368	338	340		
Amylograph Viscosity 65 g (BU)	530	535	625	590	550	514	533	548	594
Starch Damage (%)	3.6	3.3	3.4	3.4	3.1	2.6	2.4		
<b>Dough Properties:</b>									
Farinograph:									
Peak Time (min)	1.5	1.7	2.2	2.0	1.6	1.3	0.9	1.6	1.2
Stability (min)	2.2	3.3	3.6	3.3	1.4	2.3	0.9	3.0	1.4
Absorption (%)	50.7	51.2	52.3	51.8	50.9	49.9	47.4	50.3	49.1
Alveograph: P (mm)	39	40	39	39	26	38	23	40	29
L (mm)	76	92	126	111	55	101	56	101	61
WV (erg/gm)	90	105	125	116	40	91	30	104	45
Extensigraph: Resistance (cm)	4.5	3.9	3.3	3.6	1.3	4.1	2.0	4.1	1.7
(45 min) Extension (cm)	14.8	17.0	21.2	19.4	15.3	14.7	11.5	16.3	14.4
Area (sq cm)	53	51	63	59	18	51	20	54	21
<b>Baking Evaluation:</b>									
Sponge Cake: Volume (cc)	1183	1100	1050	1077	1075	1124	1169	1116	1139
Score	56	51	48	50	48	50	53	50	52
Cookie Diameter (cm)	8.6	8.4	8.0	8.2	8.6	8.7	8.9	8.4	8.7
<b>Chinese Southern-Type Steamed Bread Evaluation:</b>									
Specific Volume (ml/g)	2.75	3.05	2.95	2.96	3.43	3.18	3.27		
Total Score	64.6	70.4	68.8	68.9	63.1	64.5	60.4		
<b>% of Area Production:</b>	9	30	61	100	100	100	100	100	100

\* Low: Less than 9.0%; Med: 9.0 - 10.5%; High: greater than 10.5%

# Export Cargo Data

Soft White		
	2000	1999
<b>Wheat Grade Data:</b>		
Test Weight (lb/bu)	62.0	61.4
(kg/hl)	81.5	80.7
Heat Damage (%)	0.0	0.0
Damaged Kernels (%)	0.1	0.2
Foreign Material (%)	0.2	0.1
Shrunken & Broken (%)	1.0	0.9
Total Defects (%)	1.3	1.2
Grade	1 SW	1 SW
<b>Wheat Non-Grade Data:</b>		
Dockage (%)	0.4	0.4
Moisture (%)	9.7	10.0
Protein: 12% Moisture Basis (%)	8.9	10.0
0% Moisture Basis (%)	10.2	11.3
Ash: 14% Moisture Basis (%)	1.32	1.31
0% Moisture Basis (%)	1.54	1.53
1000 Kernel Weight (g)	37.2	37.6
Kernel Size (%) lg/md/sm	86/14/1	84/15/1
Single Kernel: Hardness	37.5	33.5
Weight (mg)	37.6	37.8
Diameter (mm)	2.53	2.52
Sedimentation (cc)	14.8	17.0
Falling Number (sec)	349	358
<b>Flour Data:</b>		
Extraction Rate (%)	69.7	69.5
Color: L*	92.7	92.3
a*	-2.6	-2.6
b*	7.3	7.5
Protein: 14% Moisture Basis (%)	7.3	8.2
0% Moisture Basis (%)	8.5	9.5
Ash: 14% Moisture Basis (%)	0.37	0.39
0% Moisture Basis (%)	0.43	0.45
Wet Gluten 14% mb (%)	18.5	21.1
Falling Number (sec)	368	372
Amylograph Viscosity 65 g (BU)	478	503
Starch Damage (%)		
<b>Dough Properties:</b>		
Farinograph:		
Peak Time (min)	1.3	1.4
Stability (min)	1.9	2.3
Absorption (%)	50.2	50.1
Alveograph: P (mm)		
L (mm)	46	39
W (erg/gm)	74	104
Extensigraph: Resistance (cm)		
(45 min) Extension (cm)		
Area (sq cm)		
<b>Baking Evaluation:</b>		
Sponge Cake: Volume (cc)	1053	1118
Score	44	42
Cookie Diameter (cm)	8.4	8.4
<b>Chinese Southern-Type Steamed Bread Evaluation:</b>		
Specific Volume (ml/g)		
Total Score		
<b>Sample Count:</b>	60	90

## Composite Average Farinograms and Alveograms

### Farinograms:

High Protein:



Medium Protein:



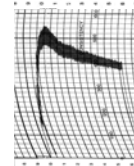
Low Protein:



Average Protein:

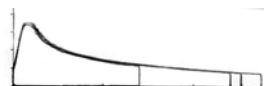


Club:

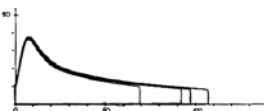


### Alveograms:

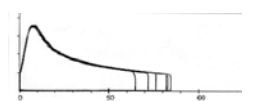
High Protein:



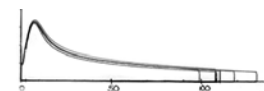
Medium Protein:



Low Protein:



Average Protein:



Club:



Soft White

# Hard Red Spring Wheat

## Harvest Survey

**Weather and Harvest:** The 2001 hard red spring (HRS) wheat production season was favorable for above-average yields and quality over a majority of the region, although some areas suffered from drought while others endured disease and insect pressures. The planting season began in early April under favorable soil conditions. Excessively wet soils in northeastern portions of the region and very dry soil conditions throughout much of Montana delayed completion of plantings into the first week of June. Good moisture and near ideal temperatures aided early crop development in the southern and eastern parts of the region while persistent drought conditions prevailed in Montana and reduced yield potential.

During the second half of the growing season high humidity and very warm temperatures increased disease pressures in central and northern parts of the region. However, the 2001 crop faced less fusarium head blight (scab) than in previous years. Near ideal conditions allowed harvest to progress quickly, and harvest was completed by mid-September, ahead of average. Yields and quality were excellent in the southern portions of the region but were more variable in the northern areas due to the impacts of disease and insects.

**Samples and Methods:** Sample collection and analysis were conducted by the Department of Cereal and Food Sciences, North Dakota State University, Fargo, North Dakota. A total of 775 HRS samples were collected from growers and grain elevators in Minnesota (133), Montana (170), North Dakota (379) and South Dakota (93). Samples were then segregated and composited into three protein ranges for each export region as follows: less than 13.5%, 13.5-14.5%, and greater than 14.5%. The methods are described in the Analysis Methods section of this booklet.

**Wheat and Grade Data:** Test weights on average for the 2001 crop are slightly lower than last year and the five-year average. The average wheat protein content is slightly higher than last year and is the highest it has been in the past five years. The percentage of vitreous kernels is higher than last year with the average grade of 1DNS for the region. The average amount of damaged kernels is slightly higher than last year but slightly lower than the five-year average. There are isolated areas with some fusarium head blight (scab) but there is considerably less than there was a few years ago. The average falling number is higher than last year and the five-year average.

**Flour and Baking Data:** Flour extraction using the Buhler experimental flour mill is slightly lower than last year and a little lower than the five-year average. The wet gluten values for the 2001 crop are on average lower than last year but higher than the five-year average. Dough properties on

average, as measured with the farinograph, are stronger than last year and the five-year average. However, the farinogram absorption is lower than the 2000 crop average and slightly lower than the five-year average. The lower hardness and starch damage values in this year's crop compared to last year may in part be responsible for the reduction in absorption values. The baking data show that the average bake absorption is lower than last year and slightly lower than the long-term average. Average loaf volume for the region is higher than last year and higher than the five-year average. Crumb grain and texture is rated the same as last year's crop.

### Mixing properties of low protein PNW sample:

Results obtained on these samples warrant some discussion. In the low protein range (PNW <13.5%) the farinogram data exhibits very strong dough mixing characteristics which is unexpected for a low protein HRS wheat. The extensigraph resistance values both for the 45-minute and 135-minute stretch and the alveogram "P" value reflect similar strong properties. The predominance of a particular variety with very strong mixing properties grown in Montana and in some parts of western North Dakota is likely responsible for these effects.

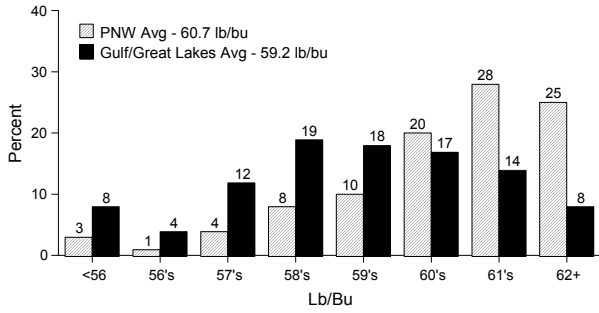
**Summary:** Compared to the five-year averages, the 2001 HRS crop has slightly higher wheat protein content, higher falling number values, slightly lower test weight and a slightly lower percentage of damaged kernels. Fusarium head blight was present to a minor extent in isolated areas in the northern part of the region.

The average dough mixing stability of the 2001 crop, as measured with the farinograph, is stronger than the five-year average. There are areas in the region that are stronger in terms of mixing characteristics than other areas. Overall bread-baking performance shows higher loaf volume with good crumb grain and texture when compared to the five-year average. However, bake absorption is slightly lower than the five-year average. The 2001 HRS wheat crop is rated as having average to very good quality, but care must be exercised in wheat purchasing due to the occurrence of 'scab' damage in isolated areas in the north central part of the HRS wheat region. Quality differences do exist between the west and east export regions.

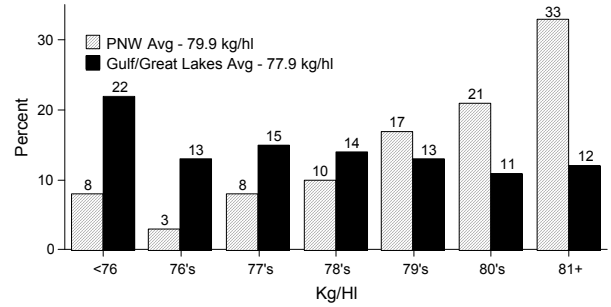
## Export Cargo Survey

The export cargo survey shows the results of analysis of 170 individual subplot samples for crop year 2000 (collected from October through August) and 255 for crop year 1999. Of the 170 2000 samples, 97 were collected from PNW ports, 36 from the Lakes and 37 from Gulf ports. The samples were randomly selected from official Federal Grain Inspection Service samples. Grade data are the official grades on the individual subplots. Milling and baking analyses were conducted by North Dakota State University.

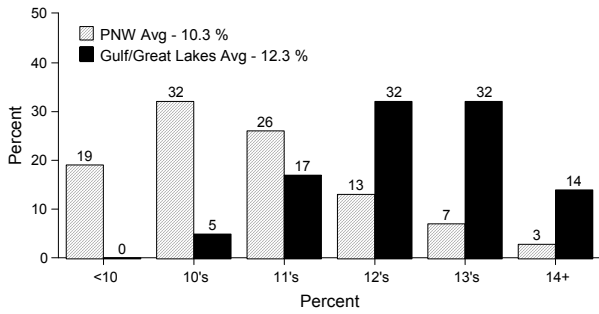
### Test Weight



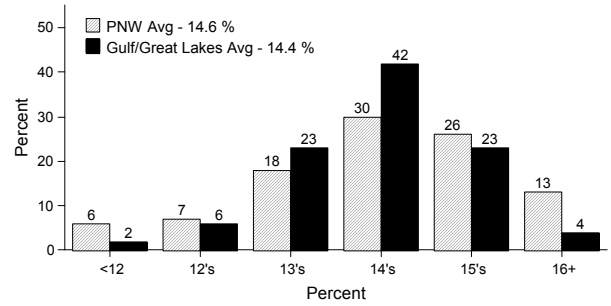
### Hectoliter Weight



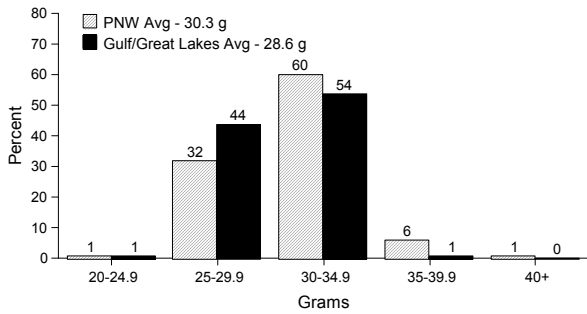
### Wheat Moisture



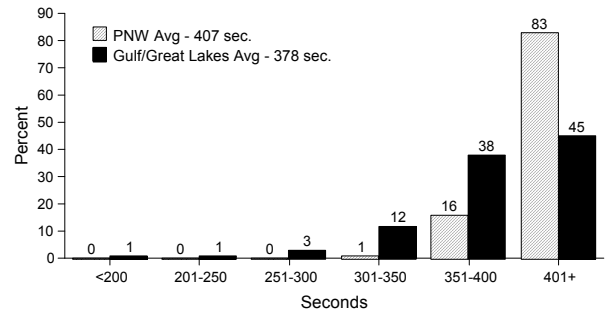
### Protein (12% mb)



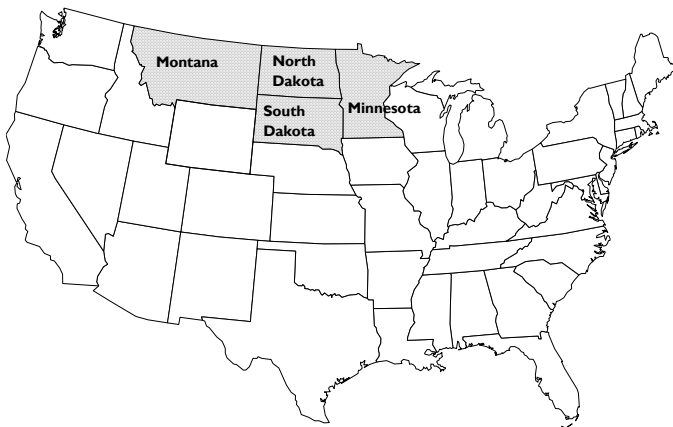
### 1000 Kernel Weight



### Falling Number



Hard Red Spring

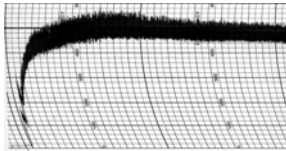


Hard red spring survey results are from four states.

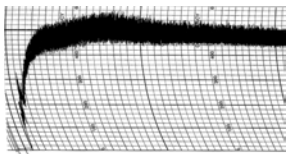
## Composite Average Farinograms and Alveograms

### Farinograms:

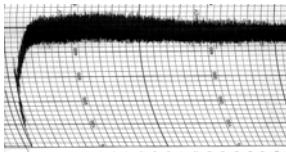
High Protein:



Medium Protein:

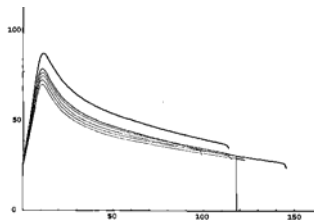


Low Protein:

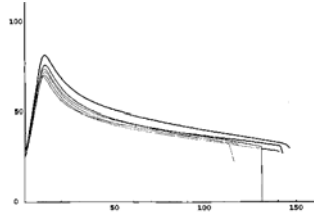


### Alveograms:

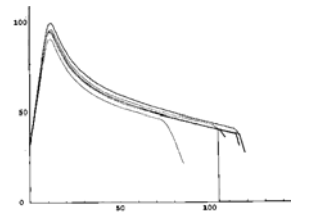
High Protein:



Medium Protein:



Low Protein:



Hard Red Spring	Composite Average					
	2001 By Protein*				2000 Overall	5-year Avg
	Low	Med	High	Overall		
<b>Wheat Grade Data:</b>						
Test Weight (lb/bu)	60.8	60.0	59.3	59.9	60.4	60.1
(kg/hl)	79.9	79.0	78.1	78.8	79.4	79.1
Damaged Kernels (%)	0.5	0.6	0.7	0.6	0.5	0.7
Foreign Material (%)	0.1	0.0	0.0	0.0	0.0	0.0
Shrunken & Broken (%)	1.7	1.7	1.7	1.7	1.4	1.5
Total Defects (%)	2.2	2.2	2.4	2.3	1.9	2.2
Vitreous Kernels (%)	68	73	80	75	69	70
Grade	1 NS	1 NS	1 DNS	1 DNS	1 NS	1 NS
<b>Wheat Non-Grade Data:</b>						
Dockage (%)	1.0	1.4	1.2	1.2	1.1	1.8
Moisture (%)	11.4	11.6	11.3	11.4	11.6	12.0
Protein: 12% Moisture Basis (%)	12.7	14.2	15.7	14.5	14.4	14.2
0% Moisture Basis (%)	14.4	16.1	17.9	16.5	16.4	16.1
Ash: 14% Moisture Basis (%)	1.64	1.69	1.72	1.69	1.67	1.66
0% Moisture Basis (%)	1.90	1.96	2.00	1.97	1.94	1.93
1000 Kernel Weight (g)	30.8	30.0	28.1	29.3	30.6	30.9
Kernel Size (%) lg/md/sm	54/38/8	53/39/8	44/46/10	49/42/9	65/31/4	
Single Kernel: Hardness	75.1	76.0	75.5	75.6	79.5	
Weight (mg)	30.8	29.2	29.8	29.8	30.3	
Diameter (mm)	2.35	2.27	2.29	2.30	2.30	
Sedimentation (cc)	38.0	47.7	58.0	50.2	54.0	
Falling Number (sec)	391	384	395	391	379	373
<b>Flour Data:</b>						
Extraction Rate (%)	69.7	69.3	68.4	69.0	69.1	69.4
Color: L*	90.3	90.0	90.0	90.1	90.3	
a*	-1.6	-1.6	-1.4	-1.5	-1.4	
b*	9.4	9.6	9.4	9.5	9.5	
Protein: 14% Moisture Basis (%)	11.4	12.9	14.5	13.3	13.2	13.0
0% Moisture Basis (%)	13.3	15.0	16.8	15.5	15.3	15.1
Ash: 14% Moisture Basis (%)	0.41	0.42	0.45	0.43	0.48	0.45
0% Moisture Basis (%)	0.47	0.49	0.52	0.50	0.56	0.53
Wet Gluten (%)	29.5	35.1	39.8	36.0	36.5	35.0
Falling Number (sec)	402	400	428	413	400	393
Amylograph Viscosity: 65g (BU)	613	646	714	670	584	561
100g (BU)	2491	2428	2737	2581	2009	2532
Starch Damage (%)	6.3	6.8	6.2	6.5	6.7	
<b>Dough Properties:</b>						
Farinograph:						
Peak Time (min)	16.1	8.5	8.5	10.2	7.5	9.9
Stability (min)	24.1	16.5	16.6	18.2	13.5	16.6
Absorption (%)	61.9	62.8	64.8	63.5	65.3	63.9
Classification	6.9	6.3	6.5	6.5	5.6	6.1
Alveograph: P (mm)						
L (mm)	101	89	97	95	100	93
W (erg/gm)	332	385	378	370	400	359
Extensigraph: Resistance (cm)						
(45/135 min) Extension (cm)	12.4/15.6	11.3/12.9	9.8/10.8	10.9/12.5	8.0/8.9	
Area (sq cm)	21.1/18.1	22.5/21.9	23.7/25.1	22.7/22.5	23.5/23.1	
	178/189	174/203	156/190	167/194	134/146	
<b>Baking Evaluation:</b>						
Absorption (%)	60.4	61.3	63.3	62.0	63.8	62.4
Crumb Grain and Texture	8.0	8.2	8.2	8.2	8.2	8.2
Loaf Volume (cc)	1005	1070	1093	1066	1027	1030
<b>% Area Production:</b>	22	33	45	100	100	100

\* Low: Less than 13.5%; Med: 13.5 - 14.5%; High: 14.5% or greater

# Data

PNW Average						Gulf/Great Lakes Average					
2001 By Protein*				2000	5-year Avg	2001 By Protein*				2000	5-year Avg
Low	Med	High	Overall			Low	Med	High	Overall		
61.7	61.2	60.1	60.7	60.3	60.5	60.0	59.4	58.5	59.2	60.4	59.9
81.1	80.5	79.1	79.9	79.3	79.6	78.9	78.2	77.0	77.9	79.4	78.9
0.5	0.5	1.0	0.8	0.2	0.2	0.5	0.6	0.4	0.5	0.7	1.0
0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0
1.9	1.8	1.9	1.9	1.9	2.0	1.5	1.6	1.5	1.5	0.9	1.2
2.4	2.3	2.9	2.6	2.1	2.2	2.1	2.2	1.9	2.1	1.6	2.2
85	88	92	89	85	81	54	66	67	64	56	62
I DNS	I DNS	I DNS	I DNS	I DNS	I DNS	I NS	I NS	I NS	I NS	I NS	I NS
1.3	1.4	1.5	1.4	1.2	1.6	0.8	1.4	0.9	1.1	1.1	1.8
10.2	10.5	10.2	10.3	10.8	11.1	12.4	12.2	12.4	12.3	12.4	12.6
12.5	14.2	15.8	14.6	14.8	14.4	12.8	14.2	15.6	14.4	14.2	14.1
14.2	16.1	18.0	16.7	16.8	16.3	14.5	16.1	17.7	16.4	16.1	16.0
1.62	1.62	1.66	1.64	1.65	1.60	1.65	1.72	1.79	1.73	1.68	1.70
1.88	1.88	1.93	1.91	1.92	1.86	1.92	2.00	2.08	2.01	1.95	1.98
32.1	31.1	29.1	30.3	30.5	30.4	29.8	29.4	27.0	28.6	30.5	31.1
51/41/8	52/40/8	47/44/9	49/42/9	58/36/6		56/36/8	53/39/8	41/48/11	49/42/9	68/28/4	
80.0	78.0	75.0	76.9	79.0		71.0	75.0	76.0	74.5	79.8	
31.1	29.6	29.9	30.1	30.5		30.6	29.0	29.6	29.6	30.2	
2.37	2.33	2.30	2.32	2.30		2.34	2.24	2.28	2.28	2.30	
38.0	47.0	58.0	50.7	54.0	52.0	38.0	48.0	58.0	49.7	54.0	46.6
404	387	418	407	371	372	381	383	372	378	383	372
69.3	69.5	68.7	69.0	68.4	69.0	70.1	69.2	68.0	68.9	69.7	69.6
90.6	90.4	90.2	90.3	90.4		90.1	89.7	89.8	89.8	90.2	
-1.5	-1.5	-1.3	-1.4	-1.4		-1.6	-1.6	-1.5	-1.5	-1.5	
9.0	9.2	9.0	9.1	9.2		9.8	9.8	9.9	9.8	9.8	
11.5	13.0	14.7	13.5	13.7	13.2	11.4	12.9	14.2	13.1	12.8	12.8
13.4	15.1	17.1	15.7	15.9	15.4	13.3	15.0	16.5	15.2	14.9	14.9
0.39	0.39	0.42	0.41	0.49	0.44	0.42	0.44	0.48	0.45	0.48	0.46
0.45	0.45	0.49	0.47	0.57	0.51	0.49	0.51	0.56	0.53	0.56	0.53
30.2	36.3	40.6	37.1	37.5	35.4	29.0	34.5	38.9	35.0	35.8	34.9
410	422	446	432	405	395	395	389	410	399	395	390
605	780	805	753	570	576	620	580	620	604	569	540
2480	2860	3100	2897	2165	2728	2500	2215	2360	2334	1829	2367
7.3	7.3	5.6	6.4	6.8		5.6	6.6	6.9	6.5	6.6	
26.5	9.5	9.0	13.2	8.4	13.7	7.5	8.0	8.0	7.9	6.8	7.4
37.0	21.5	19.5	24.0	16.8	22.9	13.5	14.0	13.5	13.7	10.9	12.9
63.4	64.5	66.7	65.4	66.5	65.0	60.7	61.9	62.9	62.0	64.3	63.3
8.0	7.0	7.0	7.2	6.3	7.2	6.0	6.0	6.0	6.0	5.0	5.5
128	105	110	113	106	103	78	81	83	81	96	87
74	104	81	85	115	109	105	131	145	131	121	114
371	396	353	368	420	406	300	379	405	372	384	330
13.3/17.6	10.7/11.4	9.4/9.4	10.6/11.8	8.5/9.6	8.1	11.6/13.9	11.6/13.6	10.2/12.2	11.1/13.1	7.5/8.3	6.8
20.4/16.9	21.2/22.1	26.7/27.5	23.9/23.7	23.9/24.5	22.8	21.6/19.0	23.1/21.8	20.6/22.5	21.8/21.5	22.9/22.0	22.4
187/203	155/182	173/186	172/189	145/168	132	170/177	184/214	139/195	163/198	122/128	112
61.9	63.0	65.2	63.9	65.0	63.5	59.2	60.4	61.4	60.5	62.8	61.8
8.0	8.5	8.0	8.1	8.4	8.4	8.0	8.0	8.5	8.2	8.0	8.2
1010	1080	1100	1074	1058	1036	1000	1065	1085	1059	1000	1027
23	25	52	100	100	100	22	39	39	100	100	100

Hard Red Spring

# Export Cargo Data

<b>Hard Red Spring</b>	<b>PNW Average</b>		<b>Great Lakes Average</b>		<b>Gulf Average</b>	
	2000	1999	2000	1999	2000	1999
<b>Wheat Grade Data:</b>						
Test Weight (lb/bu)	61.3	60.9	61.1	60.5	60.5	60.1
(kg/hl)	80.6	80.1	80.4	79.6	79.6	79.1
Damaged Kernels (%)	0.4	0.4	1.4	1.3	1.7	1.5
Foreign Material (%)	0.2	0.2	0.2	0.2	0.2	0.2
Shrunken & Broken (%)	1.7	1.7	1.4	1.6	1.4	1.7
Total Defects (%)	2.3	2.3	2.9	3.0	3.4	3.4
Vitreous Kernels (%)	83.3	82.9	47.1	54.3	55.0	53.0
Grade	1 DNS	1 DNS	1 NS	2 NS	2 NS	2 NS
<b>Wheat Non-Grade Data:</b>						
Dockage (%)	0.5	0.5	0.5	0.6	0.7	0.7
Moisture (%)	10.4	11.2	12.4	12.5	12.5	12.7
Protein: 12% Moisture Basis (%)	14.2	14.2	14.0	14.1	13.8	13.8
0% Moisture Basis (%)	16.1	16.1	16.0	16.0	15.6	15.7
Ash: 14% Moisture Basis (%)	1.58	1.55	1.65	1.68	1.65	1.66
0% Moisture Basis (%)	1.83	1.80	1.92	1.95	1.91	1.93
1000 Kernel Weight (g)	32.5	32.7	31.7	30.6	31.5	30.9
Kernel Size (%) lg/md/sm	57/35/8	59/35/6	61/31/7	59/34/7	61/31/8	59/34/7
Single Kernel: Hardness	77.3	79.1	76.6	77.7	76.1	75.8
Weight (mg)	32.7	32.4	31.3	30.4	31.1	30.4
Diameter (mm)	2.46	2.44	2.42	2.37	2.40	2.36
Sedimentation (cc)						
Falling Number (sec)	393	378	356	335	333	341
<b>Flour Data:</b>						
Extraction Rate (%)	69.7	69.7	71.1	70.5	70.8	70.5
Color: L*	90.4	90.3	90.3	90.0	90.3	90.1
a*	-1.1	-1.3	-1.3	-1.4	-1.3	-1.4
b*	8.7	8.5	9.3	9.2	9.4	9.2
Protein: 14% Moisture Basis (%)	13.1	13.1	12.7	12.9	12.5	12.7
0% Moisture Basis (%)	15.2	15.3	14.8	15.0	14.6	14.8
Ash: 14% Moisture Basis (%)	0.47	0.48	0.47	0.50	0.48	0.49
0% Moisture Basis (%)	0.55	0.55	0.55	0.58	0.56	0.57
Wet Gluten (%)	36.1	35.5	35.2	34.8	34.8	34.4
Falling Number (sec)	451	430	396	369	376	377
Amylograph Viscosity: 65g (BU)	576	569	424	398	401	404
100g (BU)						
Starch Damage (%)						
<b>Dough Properties:</b>						
Farinograph:						
Peak Time (min)	10.9	10.2	8.3	7.8	7.0	7.2
Stability (min)	21.7	19.9	12.7	12.2	11.6	11.6
Absorption (%)	65.6	66.7	64.3	65.1	63.8	64.1
Classification	6.8	6.6	5.5	5.4	5.3	5.2
Alveograph: P (mm)	115	125	98	100	96	101
L (mm)	96	86	103	95	101	92
W (erg/gm)	400	386	350	325	331	319
Extensigraph: Resistance (cm)						
(45/135 min) Extension (cm)						
Area (sq cm)						
<b>Baking Evaluation:</b>						
Absorption (%)	64.1	65.2	62.8	63.6	62.3	62.6
Crumb Grain and Texture	8.2	8.2	8.2	8.2	8.3	8.2
Loaf Volume (cc)	1021	989	1033	973	1016	979
<b>Sample Count:</b>	97	136	36	69	37	50

Hard Red Spring



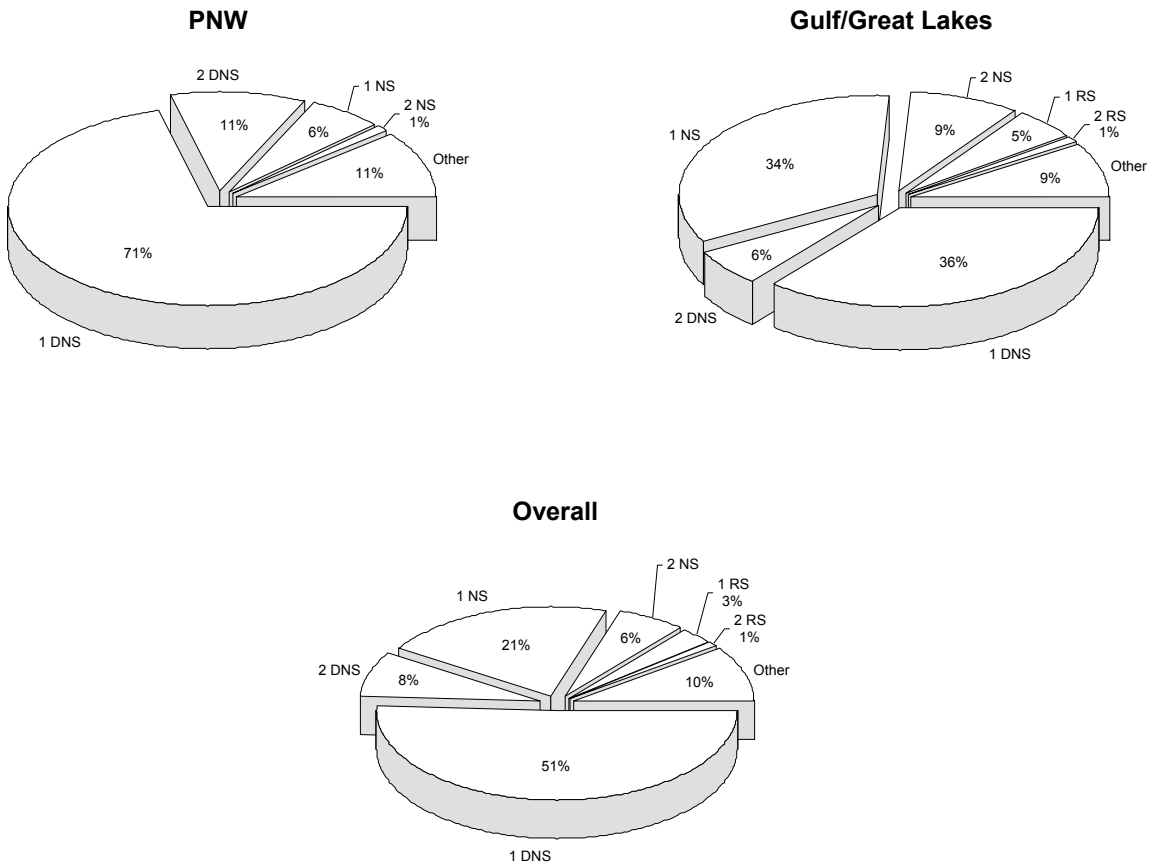
# Hard Red Spring Production by Crop Year

for the major producing states  
(million metric tons)

	2001	2000	1999	1998	1997
Minnesota	2.16	2.60	2.12	2.14	2.05
Montana	1.78	2.11	2.94	2.94	3.24
North Dakota	6.38	6.36	4.57	5.75	5.72
South Dakota	1.75	1.63	1.63	1.61	1.71
<b>Four-State Total</b>	<b>12.08</b>	<b>12.70</b>	<b>11.26</b>	<b>12.44</b>	<b>12.71</b>
<b>Total HRS Production</b>	<b>12.95</b>	<b>13.67</b>	<b>12.19</b>	<b>13.24</b>	<b>13.37</b>

Based on USDA crop estimates of September 28, 2001.

## Grade Distribution



# Soft Red Winter Wheat

## Harvest Survey

Soft red winter wheat (SRW) is grown over a wide geographic region of the eastern United States which has diverse weather patterns and results in variations in SRW quality. During the 2000/2001 growing season, weather patterns were mostly favorable for wheat growth. Conditions at harvest were primarily dry, except in the southeastern U.S. where there was some rain in June. A mostly sound crop was gathered. However, some samples with sub-optimal falling number values were noted. The northern part of the production area was dry, and wheat diseases generally were not a problem. The quality of the 2001 crop is similar to or better than the 2000 crop, as indicated by the higher test weight, falling number values and milling performance. Flour protein content is higher than last year, which some processors may consider to be a disadvantage for certain types of soft wheat products.

**SRW Survey:** For the 2001 SRW survey, 389 samples were collected in eight key production states: Arkansas, Illinois, Indiana, Maryland, Missouri, Ohio, North Carolina and Virginia. Samples were collected in each state at two different times reflecting early and late harvest conditions. Quality analysis was conducted by CII Laboratory Services,

Kansas City, Missouri. Data from these samples are reported as "Composite Average" and "projected" averages that might be expected at "East Coast" and "Gulf Ports". All data are weighted by production based on the USDA "Small Grains Summary" of September 28, 2001, for the SRW states surveyed.

**Mennel Data:** Information about the SRW crop is also provided through a voluntary survey of U.S. mills conducted by Mennel Milling Company. SRW samples this year were received from Ohio, Missouri, Illinois, Indiana, North Carolina, and Virginia.

**Summary:** The 2001 SRW crop has similar moisture, higher average falling number and protein content, and much higher average test weight than the 2000 crop. Grade factors show the crop to be well within the limits for U.S. No. 2 SRW. Kernels are larger this year, and millers report improved flour yield and an easy transition period into the new crop. Baking performance is slightly better than last year for samples from the northern portion of the SRW area. Cookie spread ratios are slightly smaller than last year, possibly due to higher flour protein content. The flour from this crop has very good functionality.

(continued on p. 21)

## Winter Wheat Production

in major soft red winter wheat producing states  
(million metric tons)

	2001	2000	1999	1998	1997
Alabama	0.09	0.13	0.12	0.10	0.10
Arkansas	1.37	1.62	1.40	1.25	1.07
Georgia	0.29	0.29	0.26	0.28	0.42
Illinois	1.20	1.43	1.65	1.57	1.81
Indiana	0.68	0.96	0.92	0.97	0.99
Kentucky	0.65	0.65	0.67	0.67	0.62
Louisiana	0.22	0.27	0.13	0.11	0.12
Maryland	0.30	0.34	0.33	0.29	0.39
Michigan	0.98	0.98	1.13	0.84	0.88
Mississippi	0.32	0.35	0.22	0.18	0.20
Missouri	1.12	1.34	1.20	1.56	1.59
North Carolina	0.50	0.75	0.77	0.76	0.93
Ohio	1.64	2.18	1.96	2.02	1.87
South Carolina	0.25	0.26	0.26	0.21	0.41
Tennessee	0.50	0.57	0.52	0.41	0.44
Virginia	0.28	0.35	0.37	0.30	0.47
<b>16-State Total</b>	<b>10.37</b>	<b>12.47</b>	<b>11.92</b>	<b>11.53</b>	<b>12.31</b>
<b>Total SRW Production*</b>	<b>10.88</b>	<b>12.83</b>	<b>12.36</b>	<b>12.05</b>	<b>12.85</b>

\* Total SRW production includes only the class Soft Red Winter. The production estimates for individual states, while predominately SRW, may include other classes of winter wheat. Data are based on USDA crop estimates of September 28, 2001.

# Harvest Data

Soft Red Winter	Mennel Data		Composite Average		East Coast Maryland, Virginia and North Carolina*		Gulf Ports Arkansas, Illinois, Indiana, Missouri and Ohio	
	2001	2000	2001	2000	2001	2000	2001	2000
	<b>Wheat Grade Data:</b>							
Test Weight (lb/bu)	59.8	57.9	59.1	58.0	59.6	58.9	59.1	57.9
(kg/hl)	78.7	76.3	77.8	76.4	78.4	77.5	77.7	76.2
Damaged Kernels (%)			0.6	1.4	0.7	0.7	0.6	1.5
Foreign Material (%)			0.1	0.1	0.1	0.1	0.1	0.1
Shrunken & Broken (%)			0.5	0.5	0.5	0.7	0.5	0.5
Total Defects (%)			1.2	1.9	1.2	1.5	1.2	2.0
Grade			2 SRW	2 SRW	2 SRW	2 SRW	2 SRW	3 SRW
<b>Wheat Non-Grade Data:</b>								
Dockage (%)			0.6	0.5	0.7	0.5	0.6	0.5
Moisture (%)	12.9	13.0	13.3	13.2	13.8	12.9	13.2	13.2
Protein: 12% Moisture Basis (%)	10.0	10.2	10.5	10.2	11.3	10.8	10.3	10.1
0% Moisture Basis (%)	11.3	11.5	11.9	11.6	12.9	12.3	11.8	11.5
Ash: 14% Moisture Basis (%)			1.50	1.56	1.46	1.49	1.50	1.57
0% Moisture Basis (%)			1.74	1.81	1.70	1.73	1.75	1.82
1000 Kernel Weight (g)			33.6	31.2	34.4	31.4	33.5	31.2
Kernel Size (%) lg/md/sm			83/17/1	82/17/1	82/17/1	81/19/1	83/17/1	82/17/1
Single Kernel: Hardness			24.9	17.0	25.3	18.4	24.9	16.8
Weight (mg)			32.5	31.5	33.4	31.2	32.3	31.4
Diameter (mm)			2.35	2.3	2.35	2.2	2.35	2.3
Sedimentation (cc)			16.1	13.8	19.9	18.3	15.4	12.9
Falling Number (sec)	338	296	356	317	354	331	357	315
<b>Flour Data:</b>								
Extraction Rate (%)			72.3	69.8	71.8	69.3	72.4	70.0
Color: L*			93.4	93.5	93.4	94.0	93.4	93.5
a*			-3.3	-3.3	-3.4	-3.4	-3.3	-3.3
b*			8.2	8.2	8.4	8.2	8.2	8.2
Protein: 14% Moisture Basis (%)	8.7	8.7	9.0	8.5	9.8	9.1	8.8	8.5
0% Moisture Basis (%)	10.1	10.1	10.4	9.9	11.4	10.5	10.3	9.8
Flour Ash: 14% Moisture Basis (%)	0.45	0.47	0.45	0.43	0.46	0.39	0.45	0.43
0% Moisture Basis (%)	0.52	0.54	0.52	0.50	0.53	0.45	0.52	0.50
Wet Gluten (%)			24.1	23.0	26.7	24.4	23.7	22.6
Falling Number (sec)			352	294	359	324	351	291
Amylograph Viscosity 65 g (BU)	444	465	517	377	530	458	514	363
MacMichael Viscosity			63	63	79	90	61	59
Starch Damage (%)			4.4	4.0	4.3	3.8	4.4	4.0
<b>Dough Properties:</b>								
Farinograph:								
Peak Time (min)			2.1	1.7	2.6	1.8	2.0	1.7
Stability (min)			3.4	3.3	3.8	4.0	3.4	3.3
Absorption (%)			52.8	52.1	54.0	53.7	52.6	51.8
Alveograph: P (mm)								
			37	30	42	39	36	28
L (mm)								
			113	128	127	124	110	128
W (erg/gm)								
			99	91	128	137	94	84
<b>Baking Evaluation:</b>								
Crumb Grain			5.7	6	6.0	6	5.7	6
Crumb Texture			5.9	6	6.6	6	5.8	6
Loaf Volume (cc)			750	768	770	754	747	770
Cookie Spread Ratio	8.3	8.7	8.1	8.5	8.0	8.1	8.1	8.6
<b>% of Area Sampled:</b>								
			100	100	15	13	85	87

\*2000 data does not include Maryland

# Export Cargo Data

## Soft Red Winter

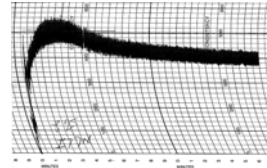
2001      2000

<b>Wheat Grade Data:</b>		
Test Weight (lb/bu)	59.9	58.8
(kg/hl)	78.9	77.4
Damaged Kernels (%)	1.8	2.1
Foreign Material (%)	0.1	0.1
Shrunken & Broken (%)	0.8	0.8
Total Defects (%)	2.7	3.1
Grade	2 SRW	2 SRW
<b>Wheat Non-Grade Data:</b>		
Dockage (%)	0.7	0.7
Moisture (%)	12.6	12.5
Protein: 12% Moisture Basis (%)	10.3	10.3
0% Moisture Basis (%)	11.7	11.7
Ash: 14% Moisture Basis (%)	1.57	1.62
0% Moisture Basis (%)	1.82	1.88
1000 Kernel Weight (g)	31.9	29.5
Kernel Size (%) lg/md/sm	82/17/1	80/19/1
Single Kernel: Hardness	*	19.8
Weight (mg)	*	32.2
Diameter (mm)	*	2.28
Sedimentation (cc)	13.1	13.6
Falling Number (sec)	368	324
<b>Flour Data:</b>		
Extraction Rate (%)	72.2	70.7
Color: L*	93.8	93.1
a*	-2.6	-2.7
b*	8.0	8.0
Protein: 14% Moisture Basis (%)	8.9	8.8
0% Moisture Basis (%)	10.4	10.2
Flour Ash: 14% Moisture Basis (%)	0.45	0.44
0% Moisture Basis (%)	0.53	0.51
Wet Gluten (%)	23.0	22.5
Falling Number (sec)	363	335
Amylograph Viscosity 65 g (BU)	540	406
MacMichael Viscosity	68	65
Starch Damage (%)		
<b>Dough Properties:</b>		
Farinograph:		
Peak Time (min)	1.6	1.6
Stability (min)	4.0	3.7
Absorption (%)	51.9	52.0
Alveograph: P (mm)		
L (mm)	41	42
W (erg/gm)	107	108
W (erg/gm)	120	125
<b>Baking Evaluation:</b>		
Crumb Grain	5.8	6.1
Crumb Texture	6.1	6.4
Loaf Volume (cc)	745	753
Cookie Spread Ratio	7.5	7.8
<b>Sample Count:</b>		
	41	125

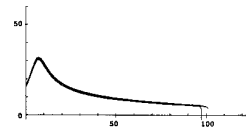
\* Data not yet available.

## 2001 Farinogram and Alveogram

### Farinogram:

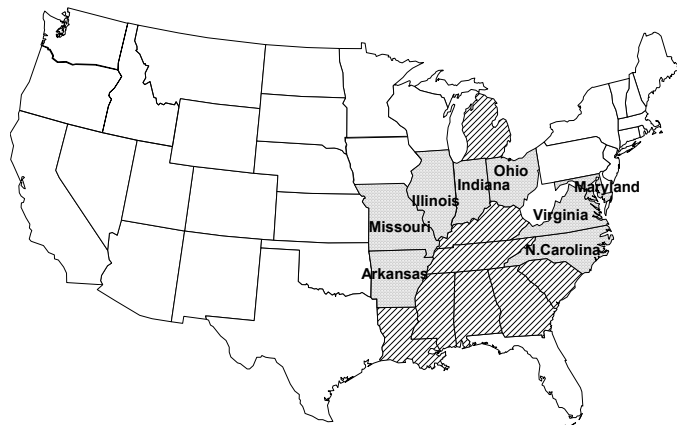


### Alveogram:

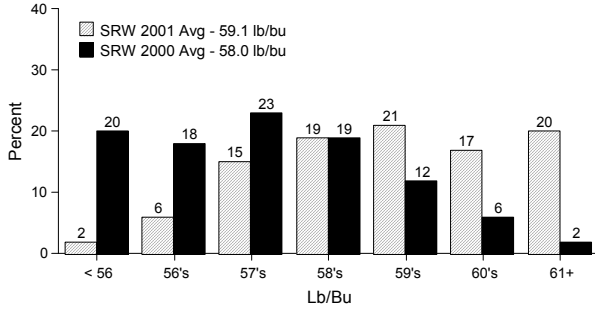


Soft Red Winter

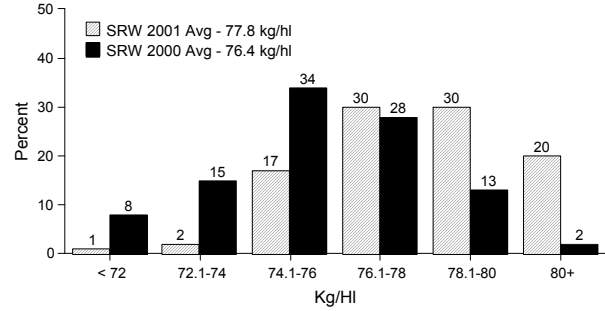
Of the sixteen-state soft red winter wheat growing area, survey samples were collected in eight states.



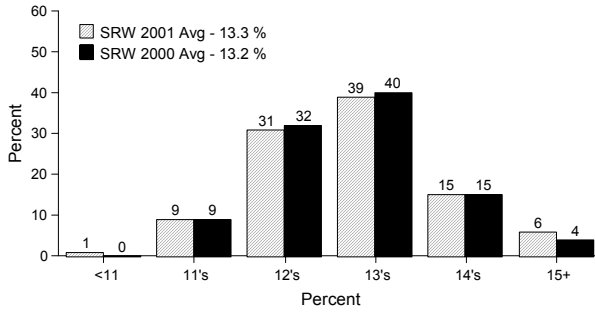
### Test Weight



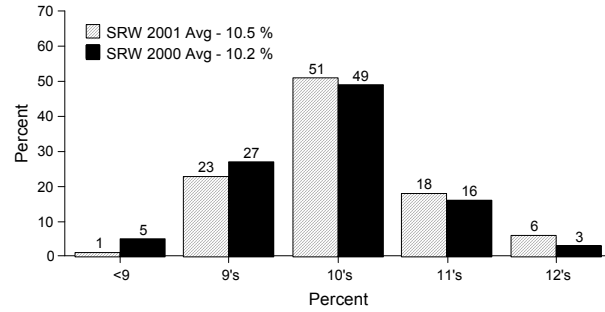
### Hectoliter Weight



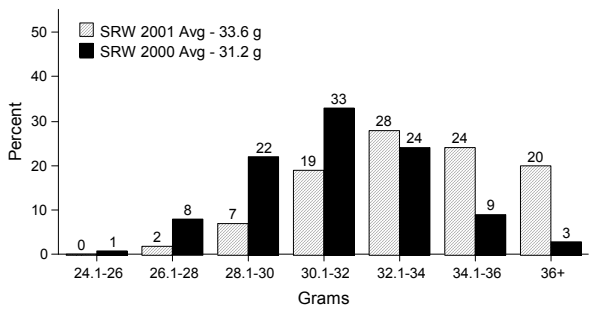
### Wheat Moisture



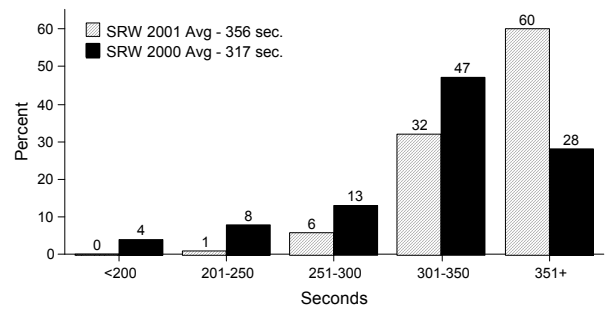
### Protein (12% mb)



### 1000 Kernel Weight



### Falling Number



Soft Red Winter

(continued from p. 18)

Wheat buyers should always specify important quality requirements such as protein, moisture content, and falling number. As there were areas of rain at in the southern portion of the SRW area, a specification for falling number is always recommended. Millers may wish to take advantage of the high protein content in SRW wheat this year for use in bread flours. Producers of cakes are pleased with baking performance. Bakers of cakes and biscuit products

(cookies) may find some amount of formulation adjustment necessary to account for the higher protein content.

### Export Cargo Survey

The export cargo data show the results of analysis of 166 individual subplot samples for marketing years 2001 and 2000 from Gulf of Mexico and East Coast ports. Samples were randomly selected from official Federal Grain Inspection Service samples. Grade data are the actual official grades on the individual sublots. Milling and baking analyses were conducted by CII Laboratory Services.

# Durum Wheat

## Northern Great Plains

The Northern Great Plains produced approximately 80% of the total estimated U.S. durum production of 2.27 mmt. Production was down by 24% for the U.S. and 27% for the region compared to the 2000 harvest. The southwestern states of California and Arizona accounted for approximately 20% of the total.

**Weather and Harvest:** The 2001 production season in the Northern Plains was characterized by a near normal development pace, variable and challenging weather conditions and a rapid, dry harvest. These conditions resulted in below-average yields and greater than normal diversity in quality but they also produced a crop that is improved in soundness, grade and color over 2000.

Planting began during the last week in April and was half complete by May 20, behind the 2000 pace but near the five-year average. Cool, dry conditions delayed plantings in parts of the region, although 92 percent of the crop was planted by June 3.

After good growing conditions in June initially improved yield potential, high humidity and very warm temperatures in July increased the incidences of disease (particularly fusarium head blight or scab) and insect pressures (orange wheat blossom midge) in northern portions of the region. This lowered overall crop conditions and sharply reduced yield potential across the north. Southern and western parts of the region had favorable growing conditions resulting in excellent crop ratings. As August approached, a return to hot, dry weather diminished disease pressures and advanced the maturity of the crop.

Nearly perfect harvest conditions allowed for excellent progress. The durum harvest was virtually complete by the first of October, ahead of last year and the five-year average.

**Quality:** The 2001 crop quality data were generated from 224 samples collected from five districts in North Dakota and one district in Montana. The 2001 quality is better than last year and similar to the five-year average. Test weight was 58.8 lb/bu, the same as last year and down from 59.8 for the five-year average. Damaged kernels decreased from 4.7% last year to 2.7% this year. Approximately 48% of the samples were graded at or above a No. 2 hard amber durum (HAD) and 23% graded No. 3 HAD. The regional grade average for the 2001 crop was No. 2 HAD, up from No. 3 HAD last year. Protein content (14.4%) was similar to last year (14.3%). The falling number was 355 sec this year compared to 216 sec last year, reflecting dry harvest conditions. Thousand-kernel weight was 36.7 g, up from 33.6 g last year and similar to the five-year average of 36.5 g.

Semolina extraction (64.3%), obtained using a Buhler laboratory mill, increased by 1.7 percentage units compared

to the yield reported for the 2000 crop (62.6%). The regional average obtained for ash increased slightly from 0.71% in 2000 to 0.75% in 2001. Gluten strength as estimated by the mixograph classification scored 5, down from last year's score of 6 and equal to a 5 for the five-year average. Pasta color was similar to last year, 8.9 in 2000 compared with 9.0 in 2001. Cooking loss remained the same as last year and equal to the five-year average of 5.9%, while the cooked firmness decreased from 6.6 g cm in 2000 to 6.2 g cm in 2001.

The 2001 durum crop has improved falling number and grade values compared with 2000 and end product quality that is considered average to good. However, quality does vary significantly among cropping regions due to adverse growing season conditions in northern areas. Buyers should exercise care in purchasing and consider appropriate contract specifications for maximum levels of damage and vomitoxin to be assured that they get the quality they need and want.

This report was extracted from "Quality of the Regional 2001 Durum Wheat Crop Report" prepared by the Department of Cereal Science, North Dakota State University, funded by the North Dakota Wheat Commission, Montana Wheat and Barley Committee, and U.S. Wheat Associates.

## Pacific Southwest

Durum wheat is usually delivered "Identity Preserved" to U.S. domestic and export markets which allows buyers to purchase grain of varieties having intrinsic quality parameters specific to their needs. Annual production requirements can be contracted ahead and then stored for season-long shipment at the buyers' schedule.

The milling, semolina and pasta analyses for these data were conducted at the California Wheat Commission wheat quality laboratory. The laboratory staff works closely with breeding companies and buyers to provide an accurate assessment of current crop quality and breeding material.

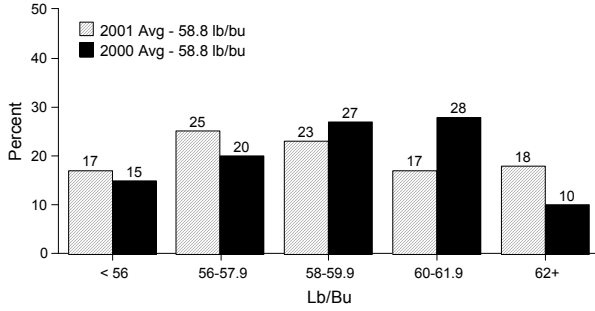
The data presented in this crop quality report are from samples that were traceable to known quantities of grain of each variety. Sampling techniques have been approved by an agricultural statistician, and at least 80% of the crop was sampled. Overall, the Desert Durum crop exhibited high protein (13.8%) and very good semolina color. Once again, the crop has low average moisture (6.8%), high test weight (83.1 kg/hl), large kernels with high 1000-kernel weight (46.8 g) and very consistent kernel size distribution (92,8,0).

(continued on p. 25)

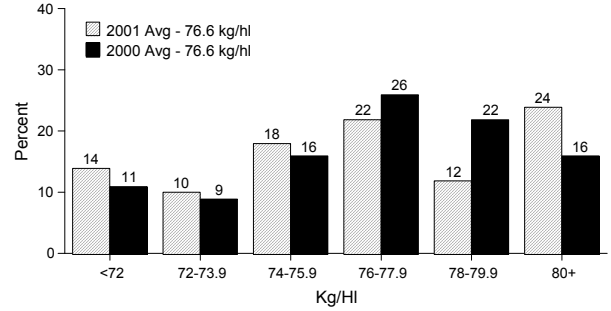
# Harvest and Export Data

Durum	Harvest Data					Export Cargo Data			
	Great Plains		5-Year	Pacific Southwest		Great Plains		Pacific Southwest	
	2001	2000	Avg.	2001	2000	2000	1999	2000	1999
<b>Wheat Grade Data:</b>									
Test Weight (lb/bu)	58.8	58.8	59.8	63.8	62.3	59.7	60.1	62.2	62.7
(kg/hl)	76.6	76.6	77.9	83.1	81.1	77.7	78.3	81.0	81.6
Damaged Kernels (%)	2.7	4.7	2.3	0.1	0.6	8.1	3.2	1.1	1.2
Foreign Material (%)	0.1	0.3	0.1	0.2	0.2	0.4	0.3	0.2	0.2
Shrunken and Broken (%)	2.2	1.8	2.0	0.5	0.6	1.9	1.8	0.8	0.5
Total Defects (%)	5.0	6.8	4.4	0.8	1.4	10.4	5.3	2.1	1.9
Contrasting Classes (%)	0.1	0.6	0.4	0.0	0.0	1.1	0.9	0.0	0.0
Vitreous Kernels (%)	88	75	81	93	96	73	78	96	96
Grade	2 HAD	3 HAD	2 HAD	1 HAD	1 HAD	4 AD	3 HAD	1 HAD	1 HAD
<b>Wheat Non-Grade Data:</b>									
Dockage (%)	1.5	1.5	2.2	0.8	0.5	0.7	0.7	0.6	0.5
Moisture (%)	11.0	11.5	11.7	7.2	6.7	11.7	12.2	7.0	7.8
Protein: 12% Moisture Basis (%)	14.4	14.3	14.0	13.8	13.5	14.1	13.2	13.8	13.2
0% Moisture Basis (%)	16.3	16.2	15.9	15.7	15.3	16.0	15.0	15.7	15.0
Ash: 14% Moisture Basis (%)	1.82	1.71	1.67	1.81	1.81	1.66	1.64	1.69	1.65
0% Moisture Basis (%)	2.12	2.00	1.95	2.10	2.10	1.93	1.91	1.97	1.92
1000 Kernel Weight (g)	36.7	33.6	36.5	46.8	49.3	38.9	36.1	49.8	52.2
Kernel Size (%) lg/md/sm	45/44/11	55/38/7	56/38/6	92/8/0	89/8/2	59/34/7	59/35/6	88/10/1	91/8/1
Single Kernel: Hardness	86.9	84.2							
Weight (mg)	35.7	35.8							
Diameter (mm)	2.44	2.53							
Falling Number (sec)	355	216	306	651	699	278	263	1036	930
Sedimentation (cc)	42	44	39						
<b>Semolina Data:</b>									
Total Extraction (%)	71.3	68.7	70.7	74.7	73.9	69.2	67.9	71.2	69.9
Semolina Extraction (%)	64.3	62.6	62.5	62.1	61.3	62.6	61.4	64.9	63.8
Ash: 14% Moisture Basis (%)	0.75	0.71	0.67	0.83	0.82	0.69	0.64	0.70	0.65
0% Moisture Basis (%)	0.87	0.83	0.78	0.97	0.95	0.80	0.74	0.82	0.76
Specks (no/10 sq in)	32	20	26	28	30	21	13	14	12
Protein: 14% Moisture Basis (%)	13.5	13.3	13.0	12.6	12.3	12.9	12.1	12.5	11.7
0% Moisture Basis (%)	15.7	15.5	15.2	14.7	14.3	15.0	14.1	14.5	13.6
Wet Gluten (%)	37.4	37.1	39.2	32.1	34.9				
Mixograph Classification	5.0	6.0	5.0			5.9	5.4	8.0	7.5
Alveograph: W (erg/gm)	67	81		194	210				
P (mm)	32	32							
L (mm)	94	119							
Color: L*	83.8	84.4				84.4	84.6	83.9	84.7
a*	-2.6	-2.7				-2.5	-2.7	-2.6	-2.6
b*	29.3	27.2		26.6	26.7	26.0	26.7	27.0	26.4
<b>Spaghetti Processing Data:</b>									
Color Score	9.0	8.9	9.2	9.0	9.0	8.7	9.2	9.3	9.5
Cooked Weight (gm)	31.7	31.1	31.3	29.5	29.5	30.9	31.6	31.1	32.0
Cooking Loss (%)	5.9	5.9	5.9	7.1	7.2	6.1	5.7	5.8	5.9
Cooked Firmness (g cm)	6.2	6.6	6.2	7.5	8.4	5.7	5.9	6.4	5.6
<b>Sample Count:</b>						32	45	5	16

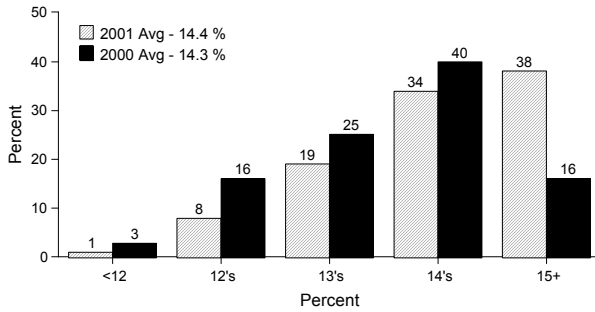
### Test Weight



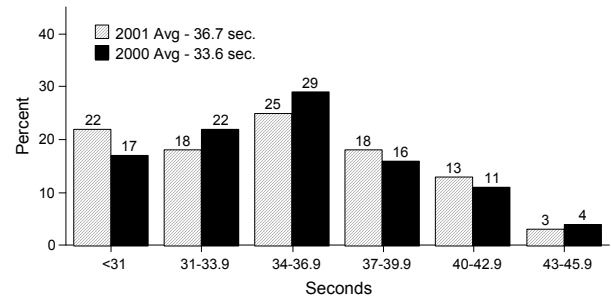
### Hectoliter Weight



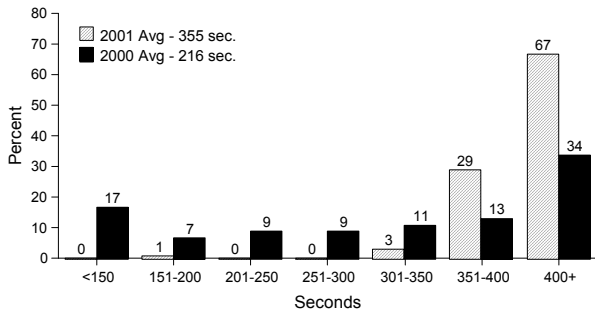
### Protein (12% mb)



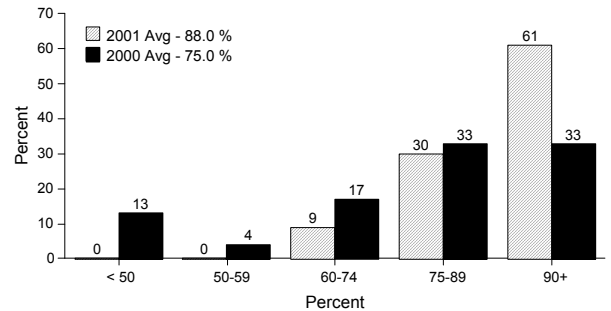
### 1000 Kernel Weight



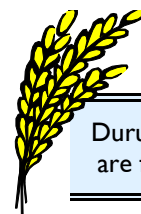
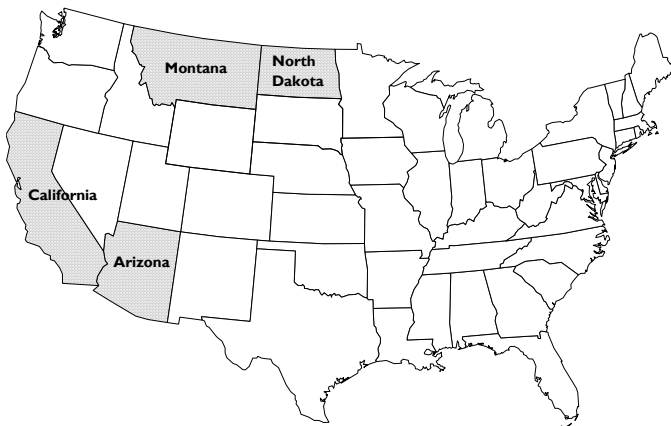
### Falling Number



### Vitreous Kernels



Note: Charts include Great Plains durum only.



Durum survey results are from four states.



## Durum Production by Crop Year

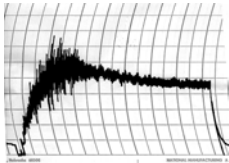
for the major producing states  
(million metric tons)

	2001	2000	1999	1998	1997
Arizona	0.22	0.22	0.20	0.41	0.22
California	0.23	0.26	0.24	0.43	0.37
Montana	0.32	0.36	0.26	0.33	0.21
North Dakota	1.49	2.13	1.96	2.57	1.57
<b>Total U.S.</b>	<b>2.27</b>	<b>2.99</b>	<b>2.70</b>	<b>3.76</b>	<b>2.39</b>

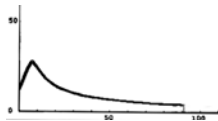
Based on USDA crop estimates of September 28, 2001.

### 2001 Great Plains Durum Mixogram and Alveogram

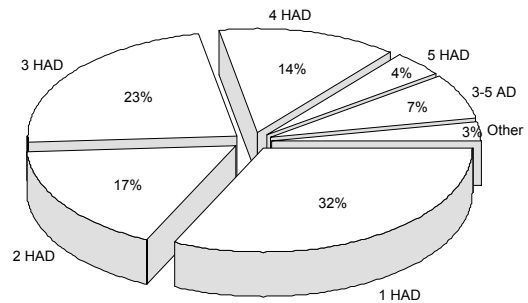
**Regional Average Mixogram:**  
(score = 5)



**Alveogram:**



### Great Plains Durum Grade Distribution



(continued from p. 22)

### Export Cargo Survey

The durum export cargo survey shows the results of analysis of 37 individual subplot samples for crop year 2000 (collected from October 2000 through June 2001) and 61 samples for 1999. The samples were randomly selected from official Federal Grain Inspection Service samples. Grade data are the actual official grades on the individual sublots. Processing analysis was conducted by North Dakota State University.

# Hard White Wheat

## Hard White Harvest Survey

Samples of specific varieties were submitted from five states: Avalanche and Trego from Colorado; ID 377S from Idaho; Golden Spike and Nuwest from Montana; Nuplains from Nebraska; and Macon, NuFrontier and NuHorizon from Washington. Each variety was composited into three protein levels if available: low protein – less than 11.5%, medium protein – between 11.5 and 12.5%, and high protein – greater than 12.5%. The hard white (HW) wheat production for the 2001 crop is estimated at 270,000 MT.

**Survey Methods:** All tests were conducted by the Wheat Marketing Center, Portland, Oregon. Wheat and flour tests were done according to the American Association of Cereal Chemists Methods (10th edition). Chinese raw noodle testing and Chinese northern-type steamed bread evaluation were conducted according to the protocols established by Chinese noodle and steamed bread makers and flour millers at the Wheat Marketing Center.

**Wheat and Grade Data:** Seven wheats were graded as U.S. No. 1, while Avalanche and Trego were graded as U.S. No. 2. Avalanche had a test weight of 59.6 lb/bu, and Trego had a test weight of 59.4 lb/bu.

**Flour, Dough, and Baking Data:** Straight grade flour extractions ranged from 69.2 to 73.3% and flour ash contents varied from 0.31 to 0.49% (14% mb). All but NuHorizon had amylograph peak viscosities higher than 700 Bu. Starch damage was in the range of 4.6 to 9.1%. Farinograph water absorption ranged from 57.4 to 62.2%, peak times varied from 6.5 to 33.1 min, and stability times were 17 min or longer for all samples. Alveograph and extensigraph data were in the typical ranges of hard wheat. Bread baking quality was acceptable and was comparable to last year's crop.

**Noodle Evaluation:** Initial noodle sheet color parameters for the control flour were:  $L^* = 84.28$ ,  $a^* = -0.19$ , and  $b^* = 14.65$ . Varieties Trego, Nuplains, Macon, NuFrontier and NuHorizon had initial whiteness values ( $L^*$  value at 0 hr) higher than the control noodle sheet, while Avalanche, ID 377S, Golden Spike and Nuwest had lower whiteness values. The initial  $b^*$  values (yellowness) of all samples were higher than the control. All except for Avalanche and NuHorizon showed less noodle color darkening from 0 to 24 hrs than the control flour (control noodle  $L^*_{0-24} = 9.4$ ). The control noodle sheet color at 24 hours were:  $L^*_{24} = 74.9$ ,  $a^*_{24} = 0.4$ , and  $b^*_{24} = 22.2$ . Visual evaluation indicated that

Nuplains, NuFrontier, Trego, and NuHorizon had acceptable noodle color scores.

Instrumental textural parameters of the cooked control noodles were: firmness, 1176 g; springiness, 96.7%; cohesiveness, 0.64, and chewiness, 726 g. Measurement of the test noodles showed that Nuplains, Nuwest, Macon, NuFrontier, Golden Spike, and NuHorizon had firmness values close to or greater than the control noodle. Avalanche and Trego had a soft bite. Compared to the 2000 crop, varieties Trego, ID 377S, and Nuplains showed consistent noodle firmness at similar protein levels.

**Chinese Northern-Type Steamed Bread:** Each HW wheat flour was blended with a composite 2001 crop soft white (SW) wheat flour at a 50:50 ratio to produce steamed bread because HW alone was too strong for steamed bread making. Steamed bread quality was evaluated against a Chinese commercial steamed bread flour. Four varieties ID 377S, Nuplains, NuFrontier, and NuHorizon had steamed bread specific volumes larger than the control flour (2.80 ml/g). Avalanche and Golden Spike had very small specific volumes due to severe steamed bread shrinkage. Nuplains and ID 377S had total steamed bread scores equal to or higher than the control flour (70). NuFrontier, NuHorizon, and Macon had steamed bread scores close to the control. Others performed poorly in steamed bread production at the current blending ratios. The main problem was shrinkage of steamed bread because of very strong gluten protein, even though 50% SW flour was blended with each of HW wheat flour. This year, SW had substantially higher protein content than previous years. The potential of HW wheat in northern-type steamed bread making can be optimized by further increasing SW flour in the blend of HW and SW wheat flours.

**Summary:** The 2001 crop HW wheats surveyed had acceptable breadmaking performance. Noodle color and color stability were acceptable for varieties Nuplains, NuFrontier, Trego, and NuHorizon. Others had poor noodle color due to too high protein content. Nuplains, Nuwest, Macon, NuFrontier, Golden Spike, and NuHorizon had cooked noodle firmness close to or greater than the control noodle. For the Chinese northern-type steamed bread making, Nuplains, ID 377S, NuFrontier, NuHorizon, and Macon showed overall quality close to or better than the control flour. Because the HW samples tested had high protein contents, steamed bread performance can be optimized by blending more than 50% SW in the hard/soft wheat flour blends.

# Harvest Data

Hard White	Colorado		Idaho	Montana		Nebraska	Washington		
	Avalanche	Trego	ID377S	Golden Spike	NuWest	NuPlains	Macon	Nu Frontier	Nu Horizon
	High	Med	High	High	High	Med	High	High	High
<b>Wheat Grade Data:</b>									
Test Weight (lb/bu)	59.6	59.4	61.4	60.4	60.9	62.0	61.2	63.7	64.2
(kg/hl)	78.4	78.2	80.7	79.4	80.0	81.5	80.4	83.7	84.4
Heat Damage (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Damaged Kernels Total (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Foreign Material (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shrunken & Broken (%)	0.1	0.0	0.0	0.3	1.1	0.6	1.1	0.1	0.1
Total Defects (%)	0.1	0.0	0.0	0.3	1.1	0.6	1.1	0.1	0.1
Grade	2 HW	2 HW	1 HW	1 HW	1 HW	1 HW	1 HW	1 HW	1 HW
<b>Wheat Non-Grade Data:</b>									
Dockage (%)	0.2	0.1	0.1	0.3	0.4	0.1	0.0	0.0	0.0
Moisture (%)	10.0	9.9	10.2	8.5	8.8	10.9	8.6	9.8	9.7
Protein: 12% Moisture Basis (%)	13.0	12.3	14.2	14.1	14.8	12.3	13.1	13.3	12.9
0% Moisture Basis (%)	14.8	13.9	16.1	16.0	16.9	14.0	14.9	15.1	14.7
Ash: 14% Moisture Basis (%)	1.60	1.50	1.66	1.39	1.44	1.76	1.24	1.69	1.69
0% Moisture basis (%)	1.85	1.74	1.93	1.62	1.68	2.04	1.45	1.97	1.96
1000 Kernel Weight (g)	28.6	28.0	37.5	29.2	27.4	28.6	33.1	33.0	36.5
Single Kernel: Hardness	73.7	75.1	78.7	65.4	60.8	79.2	75.3	83.5	83.5
Weight (mg)	28.6	28.0	37.5	29.2	27.4	28.6	33.1	33.0	36.5
Diameter (mm)	2.17	2.14	2.63	2.25	2.10	2.17	2.40	2.47	2.68
Sedimentation (cc)	12.6	9.5	22.4	27.4	43.2	17.7	50.5	13.0	13.2
Falling Number (sec)	457	450	396	473	452	521	401	414	431
<b>Flour Data:</b>									
Extraction Rate (%)	70.5	70.8	69.2	73.3	73.3	71.2	73.1	69.4	71.8
Color: L*	91.3	91.8	91.6	91.5	91.5	91.7	92.2	91.7	91.6
a*	-2.7	-2.6	-2.1	-3.1	-2.5	-2.6	-1.9	-2.0	-2.4
b*	8.3	9.0	7.7	11.6	8.9	8.6	6.3	7.3	8.6
Protein: 14% Moisture Basis (%)	11.5	10.2	12.6	12.3	13.3	10.5	11.6	12.2	11.1
0% Moisture Basis (%)	13.3	11.9	14.6	14.3	15.4	12.2	13.5	14.1	12.9
Ash: 14% Moisture Basis (%)	0.44	0.40	0.46	0.33	0.31	0.44	0.32	0.36	0.49
0% Moisture Basis (%)	0.52	0.47	0.53	0.39	0.36	0.51	0.37	0.42	0.57
Wet Gluten - 14% Mt Basis (%)	31.4	28.2	35.2	34.5	34.0	28.8	30.9	35.3	30.4
Falling Number (sec)	432	432	409	445	430	481	407	408	443
Amylograph Viscosity 65 g (BU)	960	965	985	935	925	845	930	740	495
Starch Damage (%)	5.9	5.6	6.8	5.4	4.6	5.9	6.5	6.9	9.1
<b>Dough Properties:</b>									
Farinograph:									
Peak Time (min)	6.5	22.7	8.3	12.4	13.3	8.7	33.1	11.7	9.6
Stability (min)	35.0	41.7	32.0	16.9	25.0	48.7	25.2	18.9	44.0
Absorption (%)	57.4	57.8	60.2	60.3	58.5	57.7	61.9	62.2	61.7
Alveograph: P (mm)									
L (mm)	79	90	99	120	81	110	92	120	133
W (erg/gm)	115	90	110	90	129	69	117	77	79
Extensigraph: Resistance (cm)									
(45 min) Extensibility (cm)	265	265	370	380	370	280	390	300	385
Area (sq cm)	6.0	9.2	9.7	11.5	11.3	11.3	11.7	15.5	7.8
(135 min) Extensibility (cm)	18.2	11.4	17.5	15.5	15.3	11.0	9.7	17.1	16.1
Area (sq cm)	80	71	123	117	120	82	71	67	84
Extensigraph: Resistance (cm)									
(135 min) Extensibility (cm)	9.6	11.7	14.7	15.5	14.9	13.2	14.9	8.7	11.7
Area (sq cm)	13.0	9.4	12.9	10.1	12.5	8.4	8.6	12.6	9.6
Area (sq cm)	91	70	122	103	122	74	78	78	73

\* Low: Less than 11.5%; Med: 11.5 - 12.5%; High: Greater than 12.5%

# Harvest Data

Hard White	Colorado		Idaho	Montana		Nebraska	Washington		
	Avalanche	Trego	ID377S	Golden Spike	NuWest	NuPlains	Macon	Nu Frontier	Nu Horizon
	High	Med	High	High	High	Med	High	High	High
<b>Baking Evaluation:</b>									
Bake Absorption (%)	54.4	56.3	61.7	60.3	62.5	58.5	60.3	58.7	61.5
Crumb Grain and Texture	7.5	7.5	8.5	7.5	8.0	6.5	7.0	8.0	8.0
Loaf Volume (cc)	750	738	819	863	838	732	851	776	782
<b>Noodle-Making Quality</b>									
Color at 0 hour: L*	81.4	85.4	83.5	83.5	82.9	86.7	84.4	84.9	86.2
a*	-1.0	-0.9	-0.0	-1.2	-0.5	-0.8	0.3	-0.1	-0.5
b*	17.0	19.4	18.6	26.3	21.9	16.8	17.5	17.0	16.1
Color at 24 hours: L*	70.4	76.6	74.4	74.9	73.8	77.9	76.2	76.4	76.1
a*	-0.7	-0.6	1.0	-0.3	0.5	-0.5	1.4	0.7	-0.4
b*	24.5	27.4	25.4	34.8	28.1	25.9	23.7	23.7	23.1
Cooking Yield (%)	127	128	119	121	117	119	121	115	122
Sensory Score:									
Machining	6.6	6.8	6.5	6.5	6.0	7.0	6.5	7.0	7.0
Dough Sheet	6.0	7.0	6.0	5.0	5.0	7.0	6.0	7.0	6.5
Color Stability	4.3	6.2	6.0	6.0	5.7	6.5	6.0	6.3	6.2
Instrumental Texture									
Firmness (g)	1091	1071	1100	1166	1240	1434	1169	1162	1158
Springiness (%)	96.6	96.5	96.1	95.2	94.8	95.8	95.1	95.1	95.5
Cohesiveness	0.65	0.64	0.65	0.64	0.65	0.61	0.61	0.61	0.65
Chewiness (g)	679	660	686	704	759	835	678	673	719
<b>Chinese Northern-Type Steamed Bread Evaluation:</b>									
Specific Volume (ml/g)	2.22	2.62	2.99	2.31	2.62	3.19	2.77	2.92	3.09
Total Score	53.5	61.1	69.9	56.6	59.2	71.7	67.6	68.9	67.9

## U.S. Production by Class

Crop Year (Beginning June 1)  
(million metric tons)

	2001	2000	1999	1998	1997
Hard Red Winter	20.87	23.03	28.60	32.10	29.89
Soft Red Winter	10.88	12.83	12.36	12.05	12.85
Hard Red Spring	12.95	13.67	12.19	13.24	13.37
Soft White	6.31	8.25	6.72	8.11	9.04
Hard White	0.27	0.33	0.26	n/a	n/a
Durum	2.27	2.99	2.70	3.76	2.39
<b>Total</b>	<b>53.28</b>	<b>60.76</b>	<b>62.57</b>	<b>69.33</b>	<b>67.54</b>

*Estimates are based on USDA crop estimates of September 28, 2001. The soft white and hard white estimates are made by US Wheat Associates; hard white includes some production which USDA has included in red wheats.*

## U.S. Supply and Demand

Estimated for 2001/2002 (year beginning June 1)  
(million metric tons)

	HRW	HRS	SRW	White	Durum	TOTAL
Supply:						
Beginning Stocks	11.2	5.7	3.7	2.0	1.2	23.8
Production	20.9	13.0	10.9	6.3	2.3	53.3
<b>Total Supply</b>	<b>32.1</b>	<b>20.0</b>	<b>14.6</b>	<b>8.6</b>	<b>4.3</b>	<b>79.6</b>
Demand:						
Domestic Use	13.0	8.8	7.1	2.5	2.5	33.9
Exports	10.9	6.4	5.0	4.4	1.2	27.9
<b>Total Demand</b>	<b>23.9</b>	<b>15.2</b>	<b>12.1</b>	<b>6.8</b>	<b>3.7</b>	<b>61.8</b>
<b>Ending Stocks</b>	<b>8.2</b>	<b>4.8</b>	<b>2.4</b>	<b>1.8</b>	<b>0.6</b>	<b>17.7</b>

*Based on USDA Supply/Demand estimates of October 12, 2001.*

## Analysis Methods

With the exception of the Mennel soft red winter survey, both the harvest samples and cargo samples for each class were evaluated in the same methods as described below. All flour, semolina and end-use tests utilize flour or semolina produced as documented below under the methods labeled "Extraction." The Mennel data were volunteered by individual participating mills which may have used other methods.

### Wheat and Grade Data

**Grade:** Official U.S. Standards for Grain.

**Dockage:** Official USDA procedure using the Carter Dockage Tester.

**Moisture:** HRS, Durum, SW, HW - Motomco Moisture Meter and AACC 44-15A. HRW, SRW - AACC 44-15A.

**Test Weight:** AACC 55-10; test weight is mathematically converted to hectoliter weight: for durum -  $\text{kg/hl} = \text{lb/bu} \times 1.292 + 0.630$ , for other wheats -  $\text{kg/hl} = \text{lb/bu} \times 1.292 + 1.419$ .

**Protein:** AACC 46-30 (Combustion Nitrogen Analysis technique).

**Single Kernel Characterization:** Perten method using Perten SKCS 4100.

**Sedimentation:** HRS, HRW(Plains), SRW, SW, HW - AACC 56-61A; Durum - AACC 56-70.

**1000 Kernel Weight:** HRS, Durum, HRW, SRW - based on a 10-gram sample of clean wheat counted by an electronic counter. SW, HW - Perten SKCS 4100.

**Ash:** AACC 08-01 expressed on a 14% moisture basis.

**Falling Number:** AACC 56-81B. An average value is a simple mean of sample results.

**Vitreous Kernels:** HRS & durum only - Percentage by weight of vitreous kernels hand-picked from a 50-gram sample of clean wheat.

**Kernel Size Distribution:** *Cereal Foods World (Cereal Science Today)* 5:(3), 71 (1960). Wheat is sifted with a RoTap sifter using a Tyler No. 7 screen (2.82 mm) and a Tyler No. 9 screen (2.00 mm). Kernels retained on the No. 7 screen are classified as "Large." Kernels passing through the No. 7 screen and retained on the No. 9 screen are "Medium." Kernels passing through the No. 9 screen are "Small."

### Flour Data

**Extraction:** Samples were cleaned and tempered according to AACC Method 26-10A. All samples within each class other than California HRW were milled with identical mill settings on a Buhler laboratory mill as described in the following procedures: SW - AACC 26-31; HW - AACC 26-31A; HRW (Midwestern), SRW, and HRS - AACC 26-21A. California HRW was milled on a Brabender Quadrumat Senior mill using the Brabender procedure. All extraction rates were calculated against total products on an "as is" moisture basis.

**Ash:** AACC 08-01, reported on a 14% moisture basis.

**Color:** HRW and SRW - Minolta Method using Minolta Chroma Meter CR-110 (for HRW and SRW) or CR-310

(for HRS, SW, and HW) with Granular-Materials Attachment CR-A50. CIE 1976 L\*a\*b\* color system: L\* indicates white-black, a\* - red-green, and b\* - yellow-blue.

**Protein:** AACC 46-30 (Combustion Nitrogen Analysis technique).

**Wet Gluten:** HRS, SRW, HW, HRW(Plains), Durum - AACC 38-12; SW - AACC 38-12 (water reduced from 4.8 to 4.2ml); HRW(CA) - Glutomatic Method (ICC 137); Semolina - AACC 38-12.

**Falling Number:** AACC 56-81B. An average value is a simple mean of sample results.

**MacMichael Test:** AACC Method 56-79 without conversion to cps.

**Farinograph:** AACC 54-21 with 50-gram bowl. Absorption except HRW (CA) is reported on 14% moisture basis. HRW (CA) reports "as is" absorption. Classification (HRS only) incorporates peak time, mixing tolerance, and general curve characteristics to assign rating based on a scale of 1-8. Higher numbers indicate stronger protein flours.

**Alveograph:** Durum - AACC 54-30A modified. Other classes - AACC 54-30A.

**Amylograph:** HRS (100g) - AACC 22-10. HRS (65g), SRW, SW, HRW, HW - AACC 22-10 modified to use 65g flour (14% moisture basis) and 450ml distilled water with paddle (HRS) or pins (other classes).

**Extensigraph:** AACC 54-10, modified 45 min. and 135 min. stretch, HRS, HRW, HW.

**Starch Damage:** AACC Method 76-31.

### Semolina Data (Durum only)

**Extraction:** Great Plains samples were milled using a modified Buhler laboratory mill with identical settings and equipped with Miag laboratory purifiers, as described by Vasiljevic and Banasik 1980: *Quality Testing Methods for Durum Wheat and its Products*, pp. 64-72, Dept. of Cereal Chemistry and Technology, NDSU, Fargo, ND. Roll gaps have been modified to (in mm): B1-0.762; B2-0.305; B3-0.254; R1-0.102; B4-0.076; B5-0.038. Extraction rates were calculated against total products on an "as is" moisture basis. Procedure is derived from AACC 26-41 based on research showing improved correlation between laboratory and commercially milled semolina quality. Pacific Southwest samples were milled on a Modified Chopin CD2 mill.

**Ash:** AACC 08-01 on 14.0% moisture basis.

**Protein:** AACC 46-30 (Combustion Nitrogen Analysis technique).

**Wet Gluten:** Glutomatic procedure.

**Specks:** Sample is pressed under 3x4 inch glass plate, and number of specks within one-inch square marked on plate are counted. Average of three determinations is expressed as specks per 10 square inches.

**Mixogram:** Ten grams of semolina are mixed in a 10-gram mixograph bowl with 5.8 ml of distilled water to give maximum dough consistency. An overall empirical classification incorporating peak height and general curve characteristics is assigned based on comparison with eight reference mixograms. The higher the number, the stronger the curve type.

## **Baking, Noodle, Steamed Bread and Spaghetti Data**

**HRW & SRW:** AACC Method 10-10B producing two loaves per batch using wet compressed yeast and ascorbic acid. After mixing, dough is divided into two equal portions, fermented for 160 min., proofed and baked in “pup loaf” pans. Loaf volume is measured immediately after baking by rapeseed displacement. California HRW only - AACC Method 10-10B producing two loaves per batch using wet compressed yeast, malt flour, 45 ppm ascorbic acid, and 120 min. fermentation. Loaf volume measured immediately after baking. SRW cookie spread ratio - AACC Method 10-50D. **HRS:** AACC Method 10-09, modified: fungal amylase (15 SKB units/100 g flour) replacing malt dry powder; instant dry yeast (1%); 10 ppm bromate, where added oxidants are required; 2% added shortening. Doughs are mechanically punched, moulded, and baked in “Shogren-type” pans. Scoring based on a scale of 1-10. Higher numbers indicate preferred quality attributes.

**SW:** Cookie diameter - AACC Method 10-52. Sponge cake volume and score - Japanese standard method described by Nagao in *Cereal Chemistry* 53:977-988, 1976.

**Durum:** Pasta is made using the laboratory procedure described by Walsh, Ebeling, and Dick, *Cereal Foods World*: 16:(11) 385 (1971). Water (32.0% based on semolina weight) is added to semolina and mixed in a Hobart mixing bowl 3.5 min. Semolina-water mixture is extruded using a DeMaco laboratory pasta extruder. Spaghetti is dried using modified Buhler high-temperature drying cycle as described by Debbouz, Pitz, Moore, and D'Appolonia, *Cereal Chemistry*: 72 (1):128-131. Color scores are determined by the procedure described by Walsh, *Macaroni Journal* 52:(4) 20 (1970), using a Minolta Color Difference Meter (Model: CR 310). Higher values (scale 1-12) are preferred. Cooked weight, cooking loss and firmness are determined by AACC Method 16-50.

**HW Baking:** AACC Method 10-10B. 180 min fermentation time is used. Loaf volume is measured by rapeseed displacement immediately after baking.

**HW Noodle:** Each of the HW wheat flours was made into Chinese raw noodles using the following formula: flour,

1000 g; salt, 12 g; and distilled water, 280 g. Noodle sheet color is measured by stacking three dough sheets and taking two readings from each side of two dough sheets (a total of eight readings) using a Minolta CR-310 Chroma Meter; the mean value is reported. Cooking Yield is % of weight gain after cooking for 5 min, rinsing in 27°C water and draining. Each Sensory Score property is rated compared with a control sample (a score of 7) and is reported based on a scale of 1-10; higher scores indicate better quality. The Instrumental Texture is determined on five strands of cooked noodles (2.5 x 1.2 mm, W x T) using a TA.XT2 Texture Analyzer. *Firmness* indicates noodle bite; *springiness* indicates the degree of recovery after first bite; *cohesiveness* is a measure of the extent to which noodle structure is disrupted during first bite; and *chewiness* is a product of firmness, cohesiveness and springiness (firmness x cohesiveness x springiness) and thus, a single parameter that incorporates the three textural parameters. High values of these textural parameters are generally more desirable for Chinese-style noodles.

**Chinese Steamed Bread:** Two types of Chinese steamed breads were prepared: southern-type steamed bread from each of the SW and club wheat flours and northern-type steamed bread from each of HW wheat flours.

Southern-type steamed bread was made using the following formula: flour, 400 g; sugar, 60 g; shortening, 16 g; baking powder, 4 g; yeast, 4 g; and water, 160-165 g.

Northern-type steamed bread was made using the following formula: flour, 400 g, yeast, 4 g; and water, 180-208 g. Yeast was dissolved in water before use. Both steamed breads were prepared using straight dough methods (Wheat Marketing Center Protocol). The Total Score of steamed bread is the sum of Process Score (15% total score) and Product Score (85% total score). Process Score includes mixing, sheeting, rolling, cutting and fermentation scores. Product Score comprises volume, external characteristics, internal characteristics, eating quality and flavor. Each property was rated compared with a control sample. The control flour was scored 70.

## Wheat Grades and Grade Requirements Table

Grading Factors	Grades U.S. Nos.				
	1	2	3	4	5
<b>Minimum limits:</b>					
<b>Test Weight (lbs/bu)</b>					
Hard Red Spring or White Club	58.0	57.0	55.0	53.0	50.0
All other classes and subclasses	60.0	58.0	56.0	54.0	51.0
<b>Test Weight (kg/hl)</b>					
Hard Red Spring or White Club	76.4	75.1	72.5	69.9	66.0
Durum	78.2	75.6	73.0	70.4	66.5
All other classes and subclasses	78.9	76.4	73.8	71.2	67.3
<b>Maximum percent limits:</b>					
<b>Defects</b>					
Damaged kernels:					
- Heat (part of total)	0.2	0.2	0.5	1.0	3.0
- Total	2.0	4.0	7.0	10.0	15.0
Foreign material	0.4	0.7	1.3	3.0	5.0
Shrunken and broken kernels	3.0	5.0	8.0	12.0	20.0
Total 1/	3.0	5.0	8.0	12.0	20.0
<b>Wheat of Other Classes 2/</b>					
Contrasting classes	1.0	2.0	3.0	10.0	10.0
Total 3/	3.0	5.0	10.0	10.0	10.0
<b>Stones</b>	0.1	0.1	0.1	0.1	0.1
<b>Maximum count limits:</b>					
<b>Other material</b>					
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 substance	3	3	3	3	3
Total 4/	4	4	4	4	4
<b>Insect-damaged kernels in 100 grams</b>	31	31	31	31	31
<b>U.S. Sample grade:</b>					
Wheat that:					
(a) Does not meet the requirements for U.S. Nos. 1, 2, 3, 4, 5; or					
(b) Has a musty, sour or commercially objectionable foreign odor (except smut or garlic odor); or					
(c) Is heating or of 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% 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.					
<b>Conversion Factors</b>					
<b>Wheat Equivalents:</b>			<b>Metric Equivalents:</b>		
1 bushel =	60 pounds (27.2 kg)	1 pound =	0.4536 kg		
36.74 bushels =	1 metric ton	1 metric ton (MT) =	2204.6 lbs		
37.33 bushels =	1 long ton	1 short ton (2000 lbs) =	0.9072 MT, or 907.2 kg		
33.33 bushels =	1 short ton	1 long ton (2240 lbs) =	1.0160 MT, or 1016.0 kg		
3.67 bushels =	1 quintal	1 metric ton =	10 quintals		
tons/ha =	0.06725 bu/acre	1 hectare =	2.47 acres		
durum kg/hl =	lbs/bu x 1.292 + 0.630	1 acre =	0.40 hectare		
other wheat kg/hl =	lbs/bu x 1.292 + 1.419	1 hundredweight =	100 pounds or 45.36 kg		



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