

Milling and Baking Test Results  
for  
Eastern Soft Winter Wheats  
Harvested in 2008

SUPPORTED BY

The Quality Evaluation Committee  
of the  
Soft Wheat Council

Edward Souza, Committee Chair  
USDA Soft Wheat Quality Laboratory  
OARDC-OSU  
1680 Madison Ave.  
Wooster, Ohio 44691  
330-263-3891

Ben Hancock,  
Executive Vice President,  
Wheat Quality Council  
P.O. Box 966  
Pierre, South Dakota 57501-0966

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## **Soft Wheat Quality Council**

### **Mission, Policy, and Operating Procedure**

The Soft Wheat Quality Council (SWQC) will provide an organization structure to evaluate the quality of soft wheat experimental lines and variety that may be grown in the traditional growing regions of the United States. The SWQC also will establish other activities as requested by the membership. The SWQC operates under the direction and supervision of the Wheat Quality Council (WQC). The mission of the SWQC is to provide a forum for leadership and communication in promoting continuous quality improvement among the various elements of the community of soft wheat interests.

### **Objectives:**

- Encourage wide participation by all members of the soft wheat industry.
- Determine, through technical consulting expertise, the parameters which adequately describe the performance characteristics which members seek in new variety.
- Promote the enhancement of soft wheat quality in new variety.
- Emphasize the importance of communication across all sectors and to provide resources for education on the continuous improvement of soft wheat quality.
- Encourage the organizations vital to soft wheat quality enhancement to continue to make positive contributions through research and communications.
- Offer advice and support for the U.S.D.A. - A.R.S. Soft Wheat Quality Laboratory in Wooster, Ohio

### **Membership**

- The membership of the SWQC will consist of members of the WQC.

### **SWQC Technical Board**

- The Technical Board shall be the administrative unit responsible for managing the functions of the council.
- The Technical Board shall consist of three Officers elected from the membership.
- Officers of the Technical Board shall consist of a chair, vice-chair, and secretary.
- Each officer serves one year in their office.
- Terms start the day after the annual meeting of the SWQC.
- The vice-chair replaces the chair at the conclusion of the chair's term and the secretary replaces the vice-chair at the conclusion of the vice-chair's term.
- Officers (normally only the secretary) shall be elected annually at the annual meeting of the SWQC by nomination and majority vote.
- Any eligible member may be reelected after being out of office for one year.
- Vacancies that occur during the term of office of the members of the Technical Board shall be filled by nomination and majority vote of the remaining members of the board and the WQC Executive Vice President. The appointee will serve the remaining term of the vacancy (up to 3 years).
- Exceptions to the above may be granted if voted on by Technical Board or by majority vote of the SWQC at the annual meeting.

**Duties of the Technical Board**

- The chair shall be responsible to establish a meeting place and preside at all meetings of the Technical Board and SWQC (selected elements of the General Meeting WQC).
- The vice-chair shall preside at meetings in absence of the chair and assume such duties as may be assigned by the chair of the Technical Board.
- The secretary shall be responsible for taking minutes of the Technical Board and the SWQC meetings.
- The Technical Board will direct the Executive Vice President of the WQC on disbursement of allocated funds.
- The chair shall be responsible for communicating budget needs to the Executive Vice President.
- The Technical Board is responsible for presenting budget updates to the general membership at the annual meeting.

**Compensation**

- Technical Board members shall serve without compensation.

**Expenses**

- Certain paid expenses may be authorized for some technical board functions.

## **Quality Evaluation Committee of the SWQC**

### **Committee Purpose**

A technical committee entitled "Quality Evaluation Committee" shall be established and consist of the three Technical Board officers and other key members working on soft wheat. Those other key members should include, but are not limited to:

- The research leader of the USDA Soft Wheat Quality Laboratory, Wooster, OH.
- A grow out coordinator who is a soft wheat breeder.
- Technical collaborators from Soft Wheat Milling and Baking Laboratories.
- Collaborating soft wheat breeders.

### **Evaluation and Responsibilities**

- Establish procedures and requirements for the annual grow out, handling, evaluation and reporting of the experimental test line quality evaluation program.
- Annual approval of the samples and check variety submitted by soft wheat breeders.
- The milling of the experimental and check samples.
- Distribution of samples to collaborators (member companies willing to conduct testing and baking evaluations on the samples prepared)
- Preparation of a quality report.

### **Sample/Locations**

- Each breeder entity shall have the privilege of submitting two experimental test lines and one check variety each year for evaluation. If slots are available by some breeders not submitting the full allotment, other breeders may submit more than two up to a maximum of 20 samples annually.

### **Annual Meeting**

- The annual meeting of the SWQC shall coincide with the annual meeting of the WQC. If for some reason the WQC annual meeting is not held, it shall be the duty of the Technical Board chair to establish an annual meeting time and place.
- The purpose of the meeting shall be to discuss the results of the test line quality testing program, elect board members and carry on other business as required by the SWQC.
- Other meetings determined to be necessary may be established by the Technical Board.

### **Finances and Budget**

- The finances required to meet the operating expenses of the council shall be designated by the Executive Board of the WQC.
- The budget shall be presented for membership approval at the annual meeting.

### **Amendments**

- Amendments to the policy and operation procedure of the SWQC can be made by majority vote of the council members present.
- The proposed changes must be submitted in writing and must be in the hands of the membership two weeks prior to voting on the change.

**Contributors of Test Lines****USDA Soft Wheat Quality Laboratory Seed Production at Wooster OH**

The first set of cultivars in the 2008 Wheat Quality Evaluation Council were produced at Wooster Ohio by the Soft Wheat Quality Laboratory. They were planted in side-by-side drill strips and managed according to standard small grains production guidelines for the northeastern Ohio region. Samples were harvested at 16 to 20% grain moisture after the seed had reached maturity and before rain events. Samples were dried using forced air and processed the same as other samples in the quality council.

Control Cultivar Hopewell: Hopewell is a public cultivar developed by Ohio State University and adapted to the eastern Corn Belt of the US. It is widely grown in Ohio. Hopewell is a bronze chaffed, awnless wheat, that is semi-dwarf in stature. It has moderate powdery mildew, Stagonospora, and Fusarium head blight resistance. It is average for milling yield and break flour yield among all soft wheats evaluated by the Soft Wheat Quality Laboratory. Hopewell has average to above average cookie quality and is a relatively weak gluten soft wheat among soft red winter wheats.

**Pioneer Seed Company**

Greg Marshall and Bill Laskar: contributors and plant breeders

DuPont/Pioneer Hi-Bred International, 3850 North 100 E, Windfall, IN 46076.

(765) 945-7906, [Greg.Marshall@pioneer.com](mailto:Greg.Marshall@pioneer.com) [bill.laskar@pioneer.com](mailto:bill.laskar@pioneer.com) .

Experimental Line: Pioneer 25R39

25R39 (formerly XW06M) is a soft red winter wheat that was developed by Pioneer Hi-Bred International, Inc., derived from a single cross of a Pioneer experimental variety and previously released Pioneer variety, using a modified pedigree selection breeding method. 25R39 is primarily intended for grain production and it has shown good adaptation to the soft winter wheat region based on tests conducted in Arkansas, Kentucky, Missouri, Illinois, Indiana, Ohio, Michigan, Maryland and Ontario, Canada.

25R39 is awnless and heads about 1 day later than 25R47 on average. It has shown very good winter hardiness and moderate resistance to straw lodging. It has demonstrated excellent resistance to leaf rust and stripe rust and moderate resistance to powdery mildew. It has also shown moderate resistance to the complex of fungal organisms that incite leaf blights. It also exhibits moderate resistance to wheat spindle streak and soil borne wheat mosaic viruses.

**Purdue University**

Herb Ohm: contributor and plant breeder

Purdue University, Dept. of Agronomy, 915 State Street, West Lafayette IN 47907-2054.

765.494.8072, [hohm@purdue.edu](mailto:hohm@purdue.edu).

Experimental Line: Pur 02444A1-23-9: In seed increase for possible release in 2009, pending performance data in the current year trials. The line has significant levels of resistance to Fusarium head blight (FHB). It is known to carry the resistance allele Fhb1 for resistance to FHB.

Experimental Line: Pur 03112A1-7-3: In seed increase for possible release in 2009, pending performance data in the current year trials. It is a very stiff straw cultivar. The line has significant levels of resistance to Fusarium head blight derived from the cultivar Ernie. ). It is known to carry the resistance allele Byd3 for resistance to Barley yellow dwarf virus.

Experimental Line: Pur 04287A1-10: This line is not being considered for release at this time.



Experimental Line: Pur 99600A2-4-32: In seed increase for possible release in 2009, pending performance data in the current year trials. It is a very stiff straw cultivar. The line has significant levels of resistance to Fusarium head blight (FHB) derived from the cultivars Freedom and F201R. The line also carries significant resistance to leaf rust, powdery mildew, Septoria tritici leaf blotch, Stagonospora nodorum leaf and glume blotch.

**AgriPro-Syngenta**

Barton Fogleman: contributor and plant breeder

AgriPro Syngenta Seeds, Inc. 520 East 1050 South P.O. Box 411, Brookston IN 47923.  
(765) 563-3111, [barton.fogleman@syngenta.com](mailto:barton.fogleman@syngenta.com).

Experimental Line: W 1377:

W1377 is a soft red winter wheat bred by Syngenta Seeds, Inc. for grain and wheat straw production. W1377 has consistently produced very high test weight grain. It is a medium-tall height wheat with medium heading (about 2 days later than Branson). W1377 has shown very good resistance to stripe rust. It has shown moderate resistance to leaf rust in the Midwest and upper Mid-south. W1377 has shown susceptibility to powdery mildew in Michigan and the Northeast. It has demonstrated very good forage and straw production in the Kentucky trials. At maturity its straw has an attractive “snowy” bright color.

## ***Seed Produced by Individual Cooperators in their State***

### **Virginia Tech University**

Carl Griffey: contributor and plant breeder

Dept. of Crop & Soil Environ. Science, 334-A Smyth Hall, Blacksburg, VA 24061-0404,  
(540) 231-9789, [cgriffey@vt.edu](mailto:cgriffey@vt.edu).

Control Cultivar USG 3209: Standard cultivar for the mid-Atlantic region. It is noted for its grain yield and disease resistance. It commonly has less than average break flour and milling yield. USG3209 also typically has greater than average water absorption for a soft wheat.

### **Experimental line VA01W-205 named Southern States Brand 5205**:

The soft red winter wheat cultivar Southern States Brand 5205 (SS'5205') was derived from the three-way cross Pioneer Brand '2684'/VA93-54-185/'Pocahontas'. Parentage of VA93-54-185 is 'Wheeler'/3/'Massey'\*3/'Balkan'/'Saluda'. SS'5205' is a broadly adapted, high yielding, short stature, mid-season soft red winter wheat cultivar that provides producers and end users in the Deep South, mid-South, mid-Atlantic, and southern Corn Belt regions of the U.S. with a cultivar having very good milling and baking qualities. In the southern SRW wheat region, SS'5205' on average is 0 to 1 days earlier heading than 'McCormick' and 1 to 4 days later than 'USG 3209'. Plant height of SS'5205' (30 inch) on average is 1 to 2 inches shorter than those of USG 3209 and McCormick and 5 to 6 inches shorter than SS 'MPV57'. Straw strength (0-9 scale) of SS'5205' (1.4) in the eastern SRW on average is better than those of USG 3209 (2.1) and McCormick (2.4).

SS'5205' was evaluated at 17 locations in the 2006-07 USDA-ARS Uniform Southern Soft Red Winter Wheat Nursery, and ranked 6th among 39 entries for grain yield (66.8 Bu/ac). SS'5205' produced yields that were similar to or significantly higher than the test averages at all 17 locations. SS'5205' also was evaluated in this uniform nursery in 2005-06 over 26 locations, and ranked 13th among 45 entries for grain yield (79.8 Bu/ac). SS'5205' produced yields similar to or significantly higher than the test average at 24 of the 26 test sites. Average test weight of SS'5205' in both years (59.1 Lb/Bu) was similar to that of McCormick and higher than that of USG 3209 (58.1 Lb/Bu). On the basis of winter kill ratings (0 = no injury to 9 = complete kill) reported at 4 of the 19 locations in 2007 and at 3 of the 26 test sites in 2006, winter hardiness of SS'5205' (5.1 and 1.0, respectively) is similar to that of USG 3209 and Pioneer 26R61, but less than that of McCormick (2.7 and 0.7).

SS'5205' is resistant to leaf rust (*Puccinia triticina*) and stripe rust (*Puccinia striiformis*). SS'5205' has expressed moderate resistance to powdery mildew (*Blumeria graminis*), stem rust (*Puccinia graminis*), Barley Yellow Dwarf Virus, Wheat Spindle Streak Mosaic Virus, Soil Borne Mosaic Virus, *Septoria tritici* leaf blotch, and *Stagonospora nodorum* glume blotch. It has expressed a moderate level of resistance to fusarium head blight [*Fusarium graminearum* (Schwabe)] with disease index scores (0 – 100) ranging from 2.7 to 16 and DON toxin concentrations ranging from 0.3 to 1.3 ppm in Virginia Tech's inoculated, mist-irrigated FHB nursery. SS'5205' is moderately susceptible to black chaff (*Xanthomonas campestris*) and Hessian fly [*Mayetiola destructor* (Say)].

On the basis of eight independent milling and baking quality evaluations over five crop years (2003-2007), SS'5205' has consistently exhibited very good milling and pastry baking

quality. The very good to excellent milling quality of SS'5205' is attributed to its soft grain texture, low endosperm separation indices (9.1%), high break flour yields (32.6 – 36.6%), and high straight grade flour yields (77.2 – 78.9%) on an Allis mill. Flour protein concentration of SS'5205' (8.61%) is lower than that of McCormick (9.23%), yet on the basis of Lactic Acid Retention Capacity, gluten strength of SS'5205' (113.3%) is higher than that of McCormick (109.7%). Thus, flour from SS'5205' likely can be used in the production of crackers, requiring moderate to high gluten strength, as well as production of excellent pastry products such as cookies and cakes. See tables VA1 and VA2 for summary of quality data.

#### Experimental line VA03W-409 named Shirley:

The soft red winter wheat cultivar SHIRLEY (VA03W-409) was derived from the three-way cross VA94-52-25 / 'Coker 9835'// VA96-54-234. The parentage of VA94-52-25 is CI 13836/9\* 'Chancellor'//2\* 'Tyler'/3/2\* 'Massey'/4/'Hunter'/5/'Saluda'. The parental line VA96-54-234 is a sib of 'Sisson' and 'Choptank'. SHIRLEY is a broadly adapted, high yielding, short stature, full season soft red winter wheat cultivar that provides producers and end users in the mid-South, mid-Atlantic, Corn Belt, and Northeastern regions of the U.S. with a cultivar that has very good milling and pastry baking qualities. Head emergence of SHIRLEY in the eastern SRW wheat region on average is 0 to 3 days later heading than 'Roane'. Average plant height of SHIRLEY (32 inches) is 3 inches shorter than SS 'MPV57' and 1 to 2 inches taller than 'Jamestown'. Straw strength (0 – 9 scale) of SHIRLEY (1.5 – 2.0) in the eastern SRW region is better than that of Roane (3.2 – 4.1).

SHIRLEY was evaluated at 22 locations in the 2006-07 USDA-ARS Uniform Eastern Soft Red Winter Wheat Nursery, and ranked 1<sup>st</sup> among 44 entries for grain yield (81.2 Bu/ac). SHIRLEY ranked among the top ten entries at 17 of the 22 locations and produced yields that were similar to or significantly higher than the test averages at all 22 locations. Average test weight of SHIRLEY (57.6 Lb/Bu) was similar to those of check cultivars Patton (57.7 Lb/Bu) and INW 0411 (57.3 Lb/Bu). SHIRLEY also was evaluated in this uniform nursery in 2005-06 over 29 locations, and ranked 1<sup>st</sup> among 46 entries for grain yield (91.6 Bu/ac). SHIRLEY ranked among the top 10 entries at 17 of the 29 locations and produced yields that were similar to or significantly higher than the test average at all replicated test sites. Average test weight of SHIRLEY (56.8 Lb/Bu) was similar to that of check cultivar INW 0411 (56.6 Lb/Bu). On the basis of winter kill ratings (0 = no injury to 9 = complete kill) reported at 9 of the 22 locations in 2007, SHIRLEY had an average score of 2.0 compared to 1.7 for Roane.

SHIRLEY is resistant to leaf rust (*Puccinia triticina*), stem rust (*Puccinia graminis*), powdery mildew (*Blumeria graminis*), Barley Yellow Dwarf Virus, Wheat Spindle Streak Mosaic Virus, *Septoria tritici* leaf blotch, *Stagonospora nodorum* leaf and glume blotch. SHIRLEY is moderately resistant to black chaff (*Xanthomonas campestris*). It has expressed a moderate level of resistance to Fusarium head blight [*Fusarium graminearum* (Schwabe)] with disease index scores (0 – 100) ranging from 6.5 to 18 and DON toxin concentrations ranging from 0.2 to 3.1 ppm in Virginia Tech's inoculated, mist-irrigated FHB nursery. SHIRLEY expresses resistance to Hessian fly [*Mayetiola destructor* (Say)] biotype C, but is susceptible to biotypes B, D, and L. SHIRLEY is susceptible to stripe rust (*Puccinia striiformis*).

On the basis of four independent milling and baking quality evaluations over three crop years (2005-2007), SHIRLEY has consistently exhibited very good milling and pastry baking quality. SHIRLEY's very good milling quality is attributed to its soft grain texture, low endosperm

separation indices (8.9%), high break flour yields (32.3 – 32.8%), and high straight grade flour yields (77.7 – 77.9%) on an Allis mill. Flour protein concentrations of SHIRLEY are lower than average ranging from 7.62% to 8.65%, and protein gluten strength is weak on the basis of low Lactic Acid Retention Capacity values ranging from 84.6% to 93.6%. The aforementioned quality attributes of SHIRLEY and the low Sucrose Retention Capacity (87.6% – 90.8%) of its flour contribute to its very good pastry baking quality as exemplified by high values for cookie spread diameter (17.15 – 18.65 cm). See tables VA1 and VA2 for summaries of quality data.

#### Experimental line VA03W-434 named Renwood Brand 3434:

The soft red winter wheat cultivar Renwood Brand 3434 (Renwood '3434') was derived from the three-way cross 'Roane'/'Coker 9835'//VA96W-270. Parentage of VA96W-270 is VA88-54-612 ('Massey'\*2/'Balkan')/'FFR511W'. Renwood '3434' is a broadly adapted, high yielding, short stature, full-season soft red winter wheat cultivar that provides producers and end users in the mid-South, mid-Atlantic, Northeast, and Corn-Belt regions of the U.S. with a stiff-straw cultivar having good baking quality. Head emergence of Renwood '3434' (124 d, Julian) is 1 day later than 'McCormick' and 1 day earlier than Roane. Plant height of Renwood '3434' is very short (28 inches) and on average is 2 inches shorter than 'USG 3209' and 6 inches shorter than SS 'MPV57'. Straw strength (0 – 9) of Renwood '3434' is better than that of USG 3209 (1.7 vs. 2.5) in the southern region and that of Roane (1.9 vs. 4.1) in the eastern SRW winter wheat region.

Renwood '3434' was evaluated at 17 locations in the 2006-07 USDA-ARS Uniform Southern Soft Red Winter Wheat Nursery, and ranked 7<sup>th</sup> among 39 entries for grain yield (66.3 Bu/ac). Renwood '3434' produced yields that were similar to or significantly higher than the test averages at all 17 locations. Average test weight of Renwood '3434' (57.5 Lb/Bu) was most similar to that of USG 3209 (58.1 Lb/Bu). Renwood '3434' also was evaluated at 22 locations in the 2006-07 USDA-ARS Uniform Eastern Soft Red Winter Wheat Nursery, and ranked 20<sup>th</sup> among 44 entries for grain yield (72.1 Bu/ac). Renwood '3434' produced yields similar to or significantly higher than the test averages at 21 of the 22 test sites. Average test weight of Renwood '3434' (57.9 Lb/Bu) was similar to those of check cultivars Patton (57.7 Lb/Bu) and Foster (58.1 Lb/Bu). On the basis of winter kill ratings (0 = no injury to 9 = complete kill) reported at 4 of the 19 southern nursery locations and at 9 of the 22 eastern nursery test sites, winter hardiness of Renwood '3434' (2.8 and 2.1, respectively) is similar to that of McCormick (2.7) and slightly less than that of Roane (1.7).

Renwood '3434' is resistant to powdery mildew (*Blumeria graminis*). It is moderately resistant to leaf rust (*Puccinia triticina*), stem rust (*Puccinia graminis*), Barley Yellow Dwarf Virus, Soil Borne Mosaic Virus, *Septoria tritici* leaf blotch, and *Stagonospora nodorum* glume blotch. Renwood '3434' has expressed a moderate level of resistance to fusarium head blight [*Fusarium graminearum* (Schwabe)] with disease index scores (0 – 100) ranging from 2.1 to 21.5 and DON toxin concentrations ranging from 0 to 1.5 ppm in Virginia Tech's inoculated, mist-irrigated FHB nursery. Renwood '3434' is moderately susceptible to stripe rust (*Puccinia striiformis*) and black chaff (*Xanthomonas campestris*). It is susceptible to Hessian fly [*Mayetiola destructor* (Say)].

On the basis of five independent milling and baking quality evaluations over three crop years (2005-2007), Renwood '3434' has exhibited acceptable milling and good pastry baking

qualities. While endosperm separation indices (10.5 to 10.9%) of Renwood '3434' tend to be high, it has soft grain texture (70.8% – 88.0%) and moderately high break flour yields (31.4% – 32.7%). Straight grade flour yields of Renwood '3434' from an Allis Chalmers Mill have been 75.7% to 76.2%. Flour protein concentration of Renwood '3434' is moderately low and has varied from 7.57% to 9.46%. Gluten strength of Renwood '3434' is moderately weak with Lactic Acid Retention Capacity values varying from 98.8% to 110.1%. The aforementioned quality attributes of Renwood '3434' and the low Sucrose Retention Capacity (85.8% – 88.5%) of its flour contribute to its good pastry baking quality as exemplified by relatively high values for cookie spread diameter (17.08 – 18.81 cm). See tables VA1 and VA2 for summaries of quality data.

Table 1VA. Summary of advance milling and baking quality means data of wheat cultivars evaluated in uniform soft red winter wheat nurseries in 2006 and 2007: SS'5205' (2006 and 2007 uniform southern nurseries), Renwood '3434' (2007 uniform southern and eastern nurseries), and 'Shirley' (2006 and 2007 uniform eastern nurseries)

	<b>MILLING</b>	<b>BAKING</b>	<b>SOFT.</b>	<b>MICRO</b>	<b>FLOUR</b>	<b>FLOUR</b>	<b>LACTIC</b>	<b>SUCROSE</b>	<b>COOKIE</b>	<b>TOP</b>
	<b>QUALITY</b>	<b>QUALITY</b>	<b>EQUIV.</b>	<b>T.W.</b>	<b>YIELD</b>	<b>PROT.</b>	<b>ACID</b>	<b>SRC</b>	<b>DIAM.</b>	<b>GR.</b>
<b>VARIETY</b>	<b>SCORE</b>	<b>SCORE</b>	<b>SCORE</b>	<b>LB/BU</b>	<b>%</b>	<b>%</b>	<b>SRC</b>	<b>%</b>	<b>CM.</b>	
<b>Pion.26R61=STD</b>	<b>69.3</b>	<b>52.2</b>	<b>64.6</b>	<b>62.5</b>	<b>69.4</b>	<b>9.35</b>	<b>108.6</b>	<b>93.1</b>	<b>17.32</b>	<b>3.3</b>
<b>AGS 2000</b>	80.9	66.5	76.3	62.0	71.7	8.72	106.9	92.2	17.75	4.0
<b>McCormick</b>	66.5	61.8	86.5	61.5	68.8	8.60	117.2	93.6	17.61	4.3
<b>USG 3209</b>	<b>67.1</b>	<b>46.3</b>	<b>65.1</b>	<b>61.4</b>	<b>68.9</b>	<b>8.53</b>	<b>110.6</b>	<b>101.9</b>	<b>17.14</b>	<b>3.3</b>
<b>SS '5205'</b>	<b>75.1</b>	<b>94.3</b>	<b>86.9</b>	<b>61.9</b>	<b>70.5</b>	<b>8.28</b>	<b>117.7</b>	<b>86.4</b>	<b>18.58</b>	<b>5.5</b>
<b>Renwood '3434'</b>	<b>67.5</b>	<b>79.7</b>	<b>77.2</b>	<b>62.0</b>	<b>69.0</b>	<b>8.42</b>	<b>107.5</b>	<b>86.9</b>	<b>18.49</b>	<b>5.7</b>
<b>Patton=STD</b>	<b>71.9</b>	<b>68.3</b>	<b>69.1</b>	<b>61.7</b>	<b>70.4</b>	<b>8.76</b>	<b>101.8</b>	<b>89.4</b>	<b>17.87</b>	<b>3.0</b>
<b>Foster</b>	87.4	87.8	75.3	61.8	73.5	8.18	106.6	88.2	18.46	5.5
<b>Roane</b>	62.7	48.3	72.0	64.0	68.6	8.22	114.2	96.4	17.27	2.0
<b>INW0411</b>	68.0	61.3	64.3	60.7	69.6	8.62	98.5	92.7	17.66	4.0
<b>Shirley</b>	<b>75.4</b>	<b>90.3</b>	<b>68.7</b>	<b>61.1</b>	<b>71.1</b>	<b>7.74</b>	<b>93.5</b>	<b>89.2</b>	<b>18.53</b>	<b>6.0</b>

Table 2VA. Summary of Allis milling and baking quality means data of wheat cultivars SS'5205', 'Shirley', and Renwood '3434' evaluated in 2005 & 2006 Virginia State Wheat Tests

	MILLING	BAKING	TEST	BREAK	ST.			FLOUR	FLOUR	LACTIC	COOKIE	
	QUALITY	QUALITY	WT.	FLOUR	GR.	E.S.I.	FRIAB.	PROT.	ASH	ACID	DIAM.	TOP
VARIETY	SCORE	SCORE	LB/BU	YIELD	YIELD	%	%	%	%	9% Prot.	CM.	GR.
<b>Sisson</b>	<b>65.8</b>	<b>53.5</b>	<b>64.1</b>	<b>29.7</b>	<b>76.9</b>	<b>10.1</b>	<b>28.7</b>	<b>8.53</b>	<b>0.39</b>	<b>90.6</b>	<b>17.04</b>	<b>2.5</b>
<b>McCormick</b>	<b>67.6</b>	<b>50.0</b>	<b>65.6</b>	<b>30.5</b>	<b>77.0</b>	<b>9.7</b>	<b>28.7</b>	<b>9.61</b>	<b>0.40</b>	<b>107.1</b>	<b>16.93</b>	<b>3</b>
<b>Jamestown</b>	<b>62.7</b>	<b>44.0</b>	<b>65.2</b>	<b>28.4</b>	<b>76.5</b>	<b>10.3</b>	<b>28.3</b>	<b>9.38</b>	<b>0.39</b>	<b>103.5</b>	<b>16.75</b>	<b>2</b>
<b>USG 3555</b>	<b>57.6</b>	<b>46.2</b>	<b>63.7</b>	<b>29.3</b>	<b>76.1</b>	<b>10.3</b>	<b>27.2</b>	<b>8.89</b>	<b>0.42</b>	<b>103.9</b>	<b>16.82</b>	<b>3.5</b>
<b>USG 3209</b>	<b>59.7</b>	<b>38.4</b>	<b>64.7</b>	<b>27.5</b>	<b>76.7</b>	<b>10.2</b>	<b>27.1</b>	<b>9.04</b>	<b>0.43</b>	<b>99.0</b>	<b>16.58</b>	<b>2</b>
<b>SS '5205'</b>	<b>75.1</b>	<b>68.2</b>	<b>65.0</b>	<b>32.6</b>	<b>77.5</b>	<b>9.0</b>	<b>29.9</b>	<b>8.61</b>	<b>0.37</b>	<b>109.2</b>	<b>17.48</b>	<b>5.5</b>
<b>Renwood '3434'</b>	<b>59.9</b>	<b>61.0</b>	<b>63.6</b>	<b>32.1</b>	<b>75.9</b>	<b>10.7</b>	<b>28.4</b>	<b>8.76</b>	<b>0.39</b>	<b>99.3</b>	<b>17.26</b>	<b>2.5</b>
<b>Shirley</b>	<b>75.0</b>	<b>69.2</b>	<b>62.7</b>	<b>32.6</b>	<b>77.8</b>	<b>8.9</b>	<b>29.4</b>	<b>8.55</b>	<b>0.41</b>	<b>85.3</b>	<b>17.51</b>	<b>5.0</b>

**Michigan State University**

Janet Lewis, Plant Breeder and Contributor  
Crop and Soils Dept, 286 PSSB, Michigan State University, East Lansing MI, 48824-1325,  
[lewisja6@msu.edu](mailto:lewisja6@msu.edu).

**Experimental line: Envoy (E1009)**

'Envoy', experimental name MSU Line E1009, is a soft white winter wheat developed at Michigan State University (MSU). Envoy was selected from breeding population 950542, which was created from a cross in 1995 with the parentage 'MSU Line DC076' / 'PIONEER 2552'. Envoy is a high yielding soft white winter wheat well adapted to Michigan and Ontario, Canada. In addition to having acceptable grain quality and good yield, Envoy has high testweight, reduced deoxynivalenol mycotoxin accumulation from Fusarium head blight (in comparison with many soft white winter wheats), and is short. Its primary weakness is susceptibility to barley yellow dwarf virus.

**Experimental line: Coral (E2017)**

'Coral', experimental name MSU Line E2017, is a soft white winter wheat developed at Michigan State University (MSU). Coral was selected from breeding population 950302, which was created from a cross in 1995 with the parentage 'D3913'/'D0331'. In addition to being adapted to Michigan, having good yield and acceptable grain quality, Coral's strengths include improved resistance to Fusarium head blight (visual), reduced levels of the Fusarium head blight mycotoxin deoxynivalenol (DON) in comparison to many other high yielding white wheats grown in MI. Furthermore, Coral has good test weight, and lacks awns. Its primary weaknesses are susceptibility to powdery mildew and stripe rust.

**Experimental line: Ambassador (E0028)**

'Ambassador', experimental name MSU Line E0028, is soft white winter wheat developed at Michigan State University (MSU). Ambassador was selected from breeding population 940310, which was created from a cross in 1994 with the parentage 'Pioneer Brand 2737W' / 'MSU Line D1148'. Ambassador is a very high yielding soft white winter wheat with high flour yield and better winter hardiness than 'Caledonia'. Ambassador is adapted to Michigan and Ontario. Its primary weaknesses include lower than average testweight and susceptibility to Fusarium head blight and associated deoxynivalenol accumulation.

**Experimental line: Red Amber (D8006R)**

'Red Amber' (known in this report as 'Amber'), experimental name MSU Line D8006R, is a soft red winter wheat developed at Michigan State University (MSU). Red Amber was selected from breeding population 910009, which was created from a cross in 1995 with the parentage 'Pioneer Brand 2555'/'Lowell'. Red Amber is a sister line to 'D8006'. Red Amber adapted to Michigan and has good grain yield, high flour yield and good powdery mildew resistance. Its primary weakness is susceptibility to what has been documented at MSU as "leaf blotch" (whose causal organisms are likely to be a combination of *Stagonospora tritici* - formerly known as *Septoria tritici* - and *Septoria nodorum*).



Control line: D 8006W

MSU D8006W is a soft white winter wheat, is awned, and is white chaffed. MSU D8006 is moderately resistant to stripe rust and wheat spindle streak mosaic virus and has superior

**University of Missouri**

Ann McKendry, Plant Breeder and Contributor  
Dept. of Agronomy, University of Missouri, 106 Curtis Hall, Columbia MO 65211  
[McKendryA@missouri.edu](mailto:McKendryA@missouri.edu).

Experimental line: MO 011126

MO 011126 soft red winter wheat (*Triticum aestivum* L.) is an experimental wheat variety developed by the Missouri Agricultural Experiment Station. It is on track to be released during the summer of 2009 as a public variety and it is expected that U.S. Plant Variety Protection for the line will be filed under Title IV. As yet, it has not been named. MO 011126 will be released because of its high yield and test weight, excellent levels of disease resistance and above average grain milling and baking quality.

MO 011126 originated in 1997 from the cross Hart/W8376//Pioneer variety 2555/3/Pioneer 2552 where W8376 is Lewis/4/Clarkan/Vigo//Norin 66/3/Redcoat. The F<sub>1</sub> through F<sub>4</sub> generations were advanced in the field using the bulk breeding method. F<sub>3</sub>-derived selections were made based on maturity, height, general disease resistance, and overall plant architecture. MO 011126 was entered into preliminary yield testing in 2001 and is currently in the F<sub>12</sub> generation.

MO 011126 has been evaluated in the US Eastern Soft Red Winter Wheat Nursery and in the US Southern Soft Red Winter Wheat Nursery as well as in the Missouri Winter Wheat Performance Tests where across all locations it finished second in 2006 (79.5 bu/acre), not significantly different from the top yielding variety Pioneer 25R47 (80.0 bu/acre), and won the three-year average for these commercial trials in 2008 (61.6 bu/acre) across 21 location years of data. MO 011126 is best adapted to the southern region of Missouri but clearly has been above average across all locations. Test weight has consistently been above average, over years averaging 1.0 lb/bu less than Roane in non-scab years. On average, its test weight is about 0.5 lb/bu higher than Truman and 0.5 lb/bu lower than Bess.

MO 011126 is a white-chaffed, large kernel, awned, wheat with robust straw and good standability. Both height and maturity are approximately equal to Bess. It is moderately resistant to BYDV, Septoria leaf blotch, and stripe rust. Although most researchers consider MO 011126 to have some resistance to Fusarium head blight, under Missouri screening conditions it would be classified as moderately susceptible.

Breeder's evaluations over years from the USDA-ARS Winter Wheat Quality Laboratory in Wooster, OH have shown MO 011126 to have very good milling and baking quality. It appears to carry the Bxoe7 allele for gluten strength.

Check cultivar: Bess

Bess is a soft red winter wheat developed by the University of Missouri. It is an early cultivar that currently is among the best cultivars for resistance to Fusarium head blight. Bess has slightly less than average straight grade and break flour yield. It is moderate gluten strength and has average to less than average flour water absorption. Bess is best adapted to the southern and western parts of the Corn Belt.

## **Milling Analysis and Ash Curves**

### **Miag Multomat Mill:**

The Miag Multomat Mill is a pneumatic conveyance system consisting of eight pair of 254 mm diameter x 102 mm wide rolls, and ten sifting passages. Three pairs are corrugated employed as break rolls and five pair are smooth rolls utilized in the reduction process. Each sifting passage contains six separate sieves. The two top sieves for each of the break bolls are intended to be used as scalp screens for the bran. The third break sieving unit of the Soft Wheat Quality Laboratory (SWQL) Miag Multomat Mill was modified so that the top four sieves are employed to scalp bran. That modification increased the final bran sieving surface by 100% and essentially eliminated any loss of flour. Thus, the mill very closely approximates full scale commercial milling.

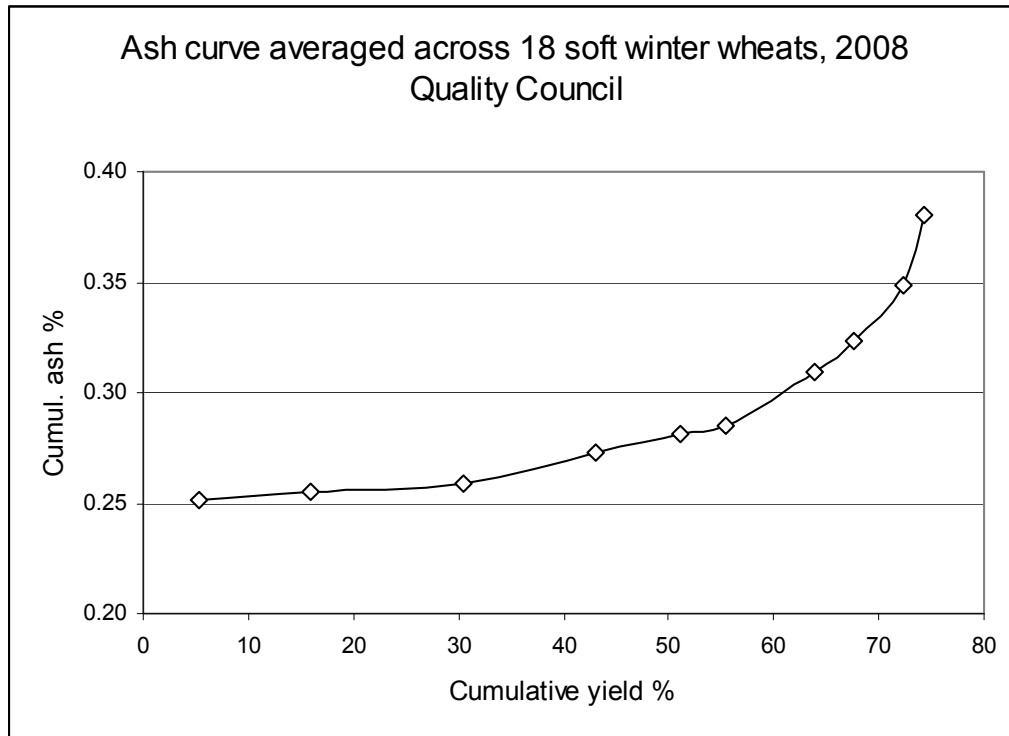
### **Experimental Milling Procedure:**

All SRW varieties are tempered to a 14.0% moisture level. Generally tempered wheat is held for at least 24 hours in order for the moisture to equilibrate throughout the grain. Wheat is introduced into the first break rolls at a rate of 54.4 Kg/hour (90 #/hour). Straight grade flour is a blend of the three break flour streams including the grader flour and the five reduction streams including the duster flour. The straight grade flour mean volume diameter will be about 50 microns with an ash content usually between .42% and .52%. Flour generated by the (SWQL) Miag Multomat Mill very nearly represents that of commercially produced straight grade flour. Bran, head shorts, tail shorts and red dog are by-products which are not included with the flour. Flour yields will vary between 70% and 78% which is variety dependent due to milling quality differences and/or grain condition. Sprouted and/or shriveled kernels will negatively impact flour production. Recovery of all mill products will usually be about 99%. Least significant differences for straight grade flour yield and break flour yield are 0.75% and 0.82%, respectively.

### **Ash Curves:**

Flour was collected from each of the 10 flour streams used to compose straight grade flour fractions. Flour ash on the fractions was determined using the basic method (AACC Method 08-01), expressed on 14% moisture basis. Then starting with the lowest ash flour streams, the percent flour recovery was estimated by arithmetically calculating the average ash and total flour recovery predicted by sequentially adding flour streams by order of their flour ash (lowest to highest). Those values are graphically represented in Figure 1.

Figure 1. Milling ash curves for eighteen soft winter wheat varieties, Wheat Quality Council samples for 2008. Cumulative flour streams in figures are arranged from the lowest ash stream to the highest ash stream. Tables are arranged with the lowest ash content stream to the highest ash content stream. Mill stream abbreviations are: 2RED – 2<sup>nd</sup> reduction, 1RED – 1<sup>st</sup> reduction, DUST – duster, 2BR – 2<sup>nd</sup> break, 1BR – 1<sup>st</sup> break, GRA – grader, 3RED – 3<sup>rd</sup> reduction, 3BR – 3<sup>rd</sup> break, 4RED – 4<sup>th</sup> reduction, 5<sup>th</sup> reduction, 5RED – 5<sup>th</sup> reduction, RD – Red Dog flour, HS – Head shorts, TS – Tail shorts, and Bran - Bran.



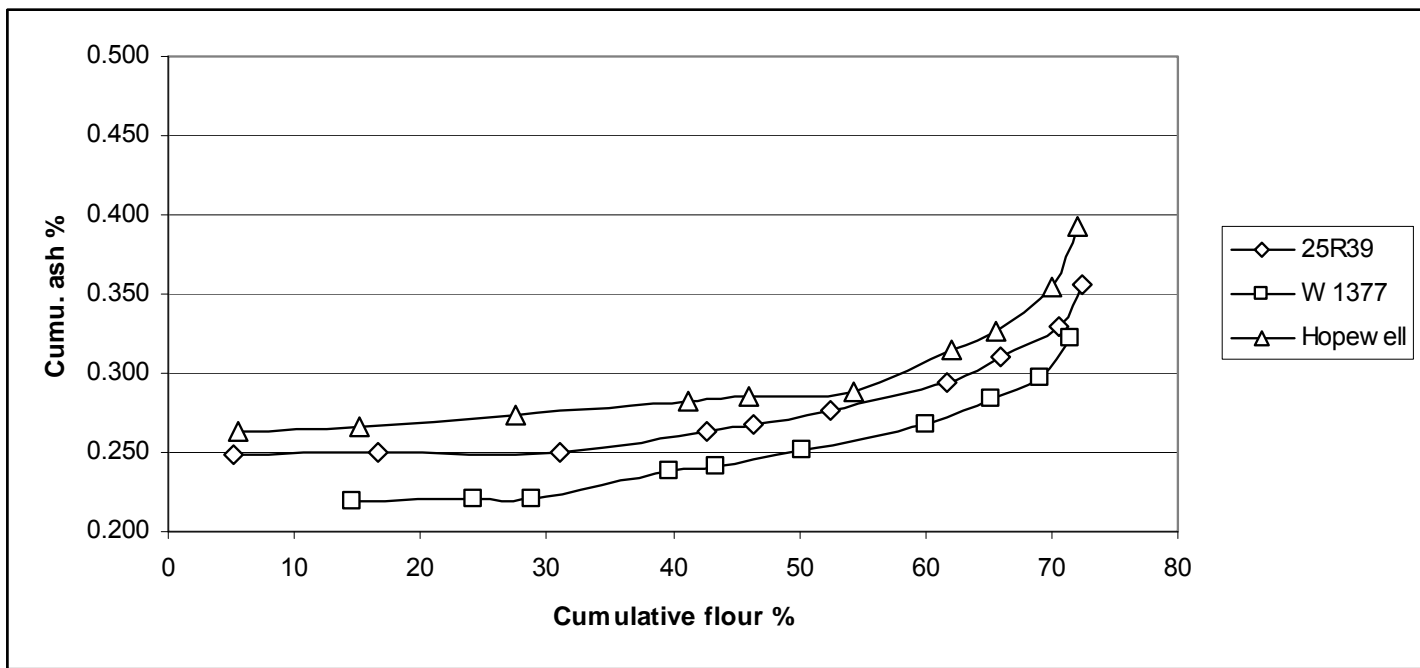
**Ash and flour recovery from Miag Mill stream fractions, averaged across 18 cultivars, Wheat Quality Evaluation Council samples, 2008**

Mill stream	Ash %	Flour recovered %
Dust	0.251	5.4
1st Red	0.255	15.9
2nd Red	0.259	30.6
2nd Br	0.273	43.1
1st Br	0.281	51.0
Gra	0.285	55.4
3rd Red	0.310	63.9
3rd Br	0.323	67.6
4th Red	0.348	72.3
5th Red	0.380	74.3
RD	0.430	75.7
TS	0.448	76.2
HS	0.837	85.3
Bran	1.498	100.0

Ash curve for Pioneer 25R39		
Mill stream	Cumulative ash %	Cumulative flour %
Dust	0.249	5.2
1st Red	0.249	16.5
2nd Red	0.250	31.0
2nd Br	0.263	42.6
Gra	0.267	46.4
1st Br	0.276	52.5
3rd Red	0.294	61.7
3rd Br	0.310	65.9
4th Red	0.330	70.6
5th Red	0.356	72.5
RD	0.405	73.8
TS	0.423	74.2
HS	0.833	83.5
Bran	1.548	100.0

Ash curve for W 1377		
Mill stream	Cumulative ash %	Cumulative flour %
2nd Red	0.220	14.6
1st Red	0.220	24.1
Dust	0.220	28.7
2nd Br	0.238	39.7
Gra	0.242	43.4
1st Br	0.251	50.3
3rd Red	0.267	60.0
4th Red	0.285	65.2
3rd Br	0.297	69.0
5th Red	0.322	71.6
RD	0.375	73.2
TS	0.397	73.8
HS	0.827	84.4
Bran	1.433	100.0

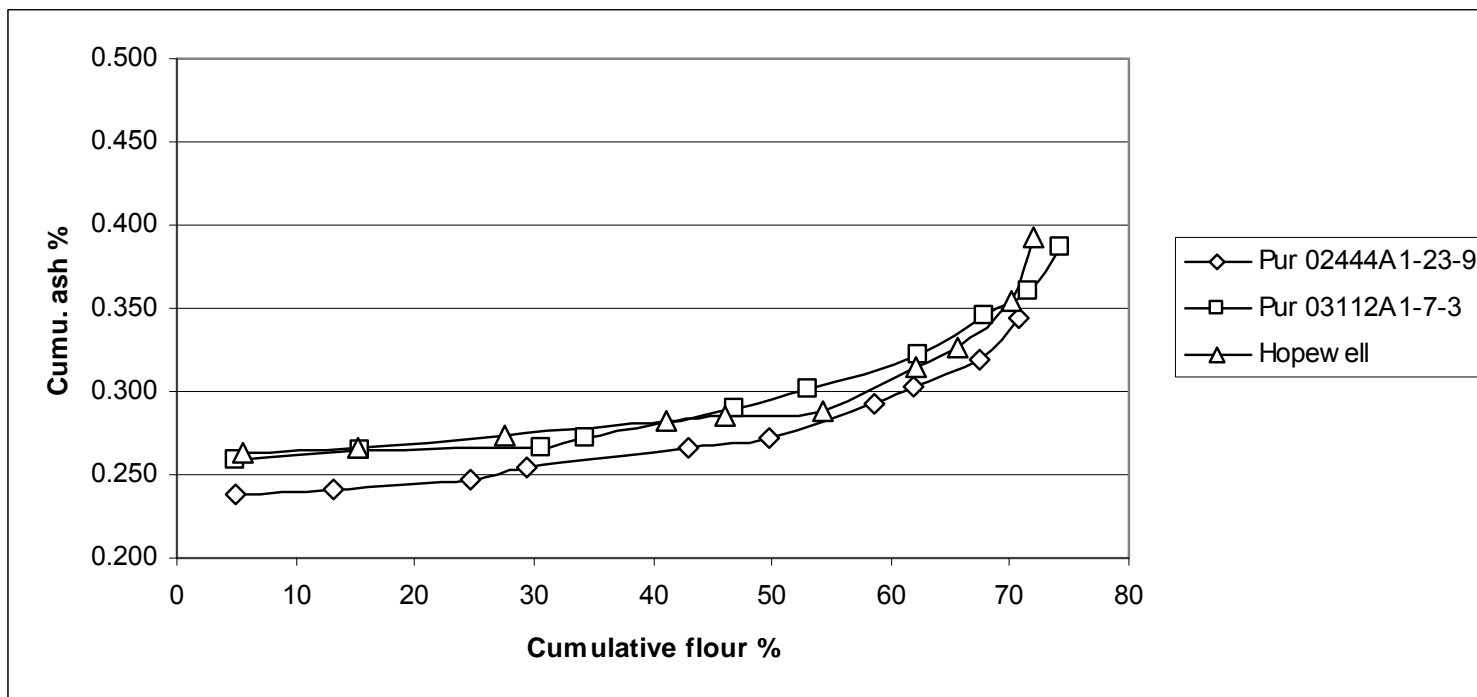
Ash curve for Hopewell		
Mill stream	Cumulative ash %	Cumulative flour %
Dust	0.264	5.6
1st Red	0.266	15.2
2nd Red	0.273	27.5
2nd Br	0.282	41.2
Gra	0.285	46.0
1st Br	0.289	54.3
3rd Red	0.315	62.1
3rd Br	0.327	65.6
4th Red	0.355	70.0
5th Red	0.393	72.0
RD	0.438	73.4
TS	0.455	73.8
HS	0.828	82.5
Bran	1.573	100.0



Ash curve for Pur 02444A1-23-9		
Mill stream	Cumulative ash %	Cumulative flour %
Dust	0.238	5.0
1st Red	0.241	13.1
2nd Red	0.248	24.6
Gra	0.254	29.5
2nd Br	0.266	42.9
1st Br	0.273	49.8
3rd Red	0.293	58.5
3rd Br	0.304	61.8
4th Red	0.320	67.5
5th Red	0.345	70.8
RD	0.400	73.3
TS	0.416	73.8
HS	0.814	83.6
Bran	1.538	100.0

Ash curve for Pur 03112A1-7-3		
Mill stream	Cumulative ash %	Cumulative flour %
Dust	0.259	5.0
1st Red	0.264	15.5
2nd Red	0.266	30.6
Gra	0.272	34.4
2nd Br	0.290	47.0
1st Br	0.301	53.0
3rd Red	0.323	62.3
4th Red	0.346	67.8
3rd Br	0.360	71.5
5th Red	0.386	74.2
RD	0.449	76.1
TS	0.471	76.6
HS	0.874	85.5
Bran	1.562	100.0

Ash curve for Hopewell		
Mill stream	Cumulative ash %	Cumulative flour %
Dust	0.264	5.6
1st Red	0.266	15.2
2nd Red	0.273	27.5
2nd Br	0.282	41.2
Gra	0.285	46.0
1st Br	0.289	54.3
3rd Red	0.315	62.1
3rd Br	0.327	65.6
4th Red	0.355	70.0
5th Red	0.393	72.0
RD	0.438	73.4
TS	0.455	73.8
HS	0.828	82.5
Bran	1.573	100.0



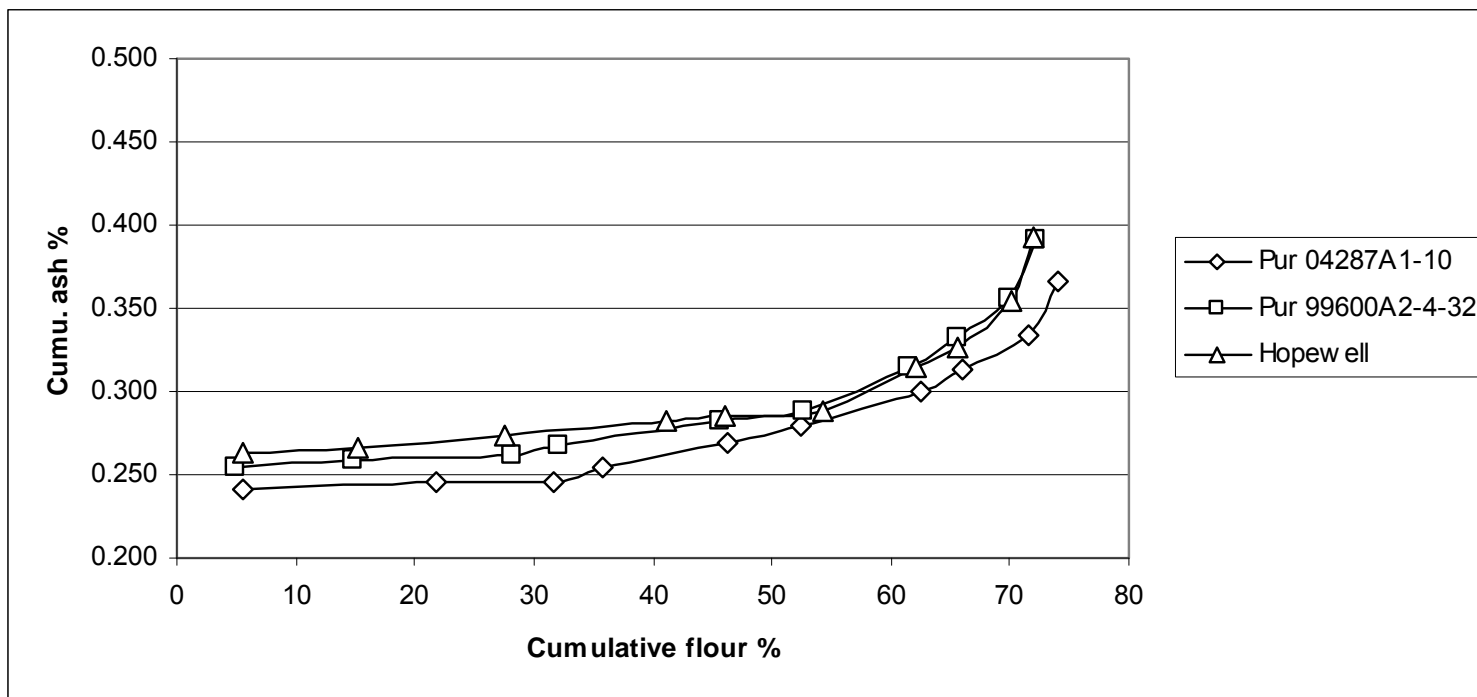
2008 Soft Winter Wheat

Wheat Quality Council

Ash curve for Pur 04287A1-10		
Mill stream	Cumulative ash %	Cumulative flour %
Dust	0.241	5.5
2nd Red	0.245	21.8
1st Red	0.246	31.7
Gra	0.254	35.7
2nd Br	0.269	46.3
1st Br	0.279	52.5
3rd Red	0.300	62.5
3rd Br	0.314	66.0
4th Red	0.334	71.5
5th Red	0.366	74.1
RD	0.419	75.6
TS	0.440	76.1
HS	0.825	85.4
Bran	1.466	100.0

Ash curve for Pur 99600A2-4-32		
Mill stream	Cumulative ash %	Cumulative flour %
Dust	0.255	4.9
1st Red	0.258	14.8
2nd Red	0.261	28.1
Gra	0.267	32.1
2nd Br	0.282	45.7
1st Br	0.288	52.7
3rd Red	0.315	61.5
3rd Br	0.333	65.5
4th Red	0.356	70.0
5th Red	0.391	72.2
RD	0.444	73.6
TS	0.468	74.1
Bran	1.239	91.0
HS	1.629	100.0

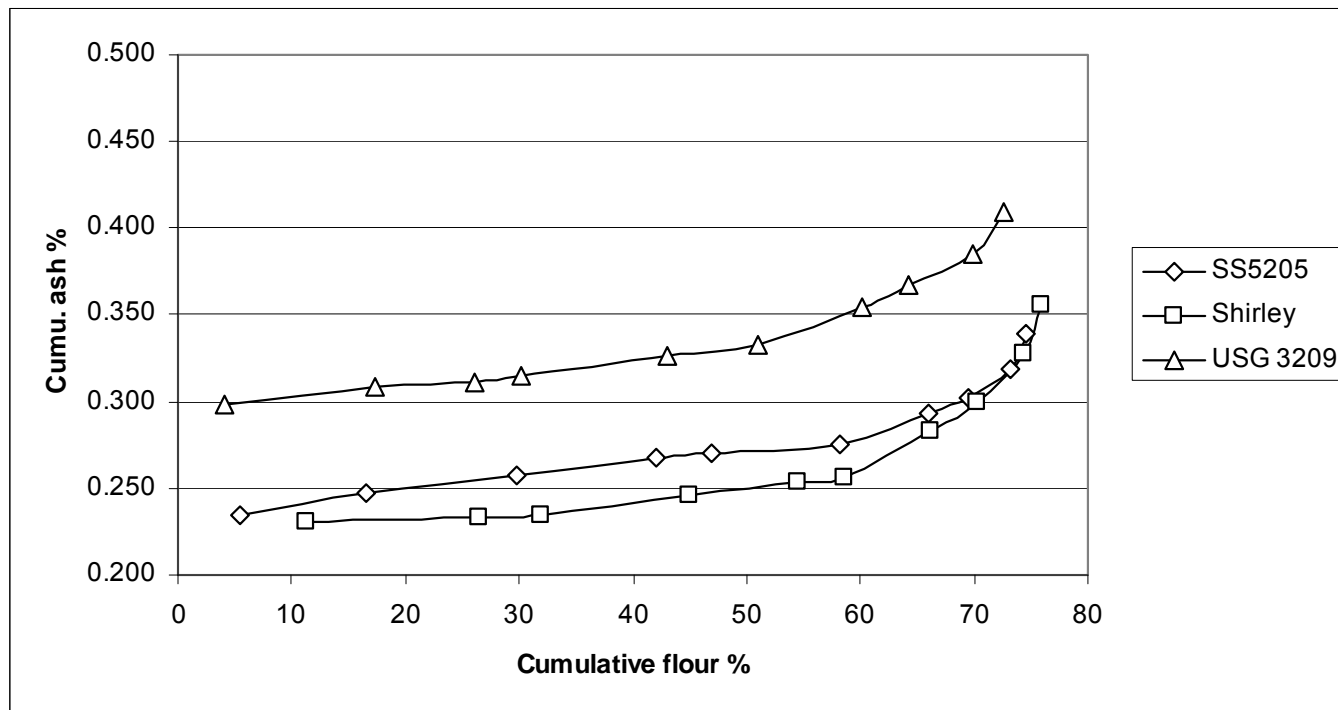
Ash curve for Hopewell		
Mill stream	Cumulative ash %	Cumulative flour %
Dust	0.264	5.6
1st Red	0.266	15.2
2nd Red	0.273	27.5
2nd Br	0.282	41.2
Gra	0.285	46.0
1st Br	0.289	54.3
3rd Red	0.315	62.1
3rd Br	0.327	65.6
4th Red	0.355	70.0
5th Red	0.393	72.0
RD	0.438	73.4
TS	0.455	73.8
HS	0.828	82.5
Bran	1.573	100.0



Ash curve for SS5205 (VA01W-205)		
Mill stream	Cumulative ash %	Cumulative flour %
Dust	0.234	5.5
1st Red	0.247	16.5
2nd Red	0.258	29.8
2nd Br	0.267	42.1
Gra	0.270	47.0
1st Br	0.275	58.2
3rd Red	0.294	65.9
3rd Br	0.303	69.4
4th Red	0.319	73.1
5th Red	0.339	74.6
TS	0.348	75.0
RD	0.386	76.1
HS	0.712	84.4
Bran	1.447	100.0

Ash curve for Shirley (VA03W-409)		
Mill stream	Cumulative ash %	Cumulative flour %
1st Red	0.231	11.3
2nd Red	0.233	26.4
Dust	0.234	32.0
2nd Br	0.247	44.9
1st Br	0.253	54.4
Gra	0.256	58.6
3rd Red	0.283	66.2
3rd Br	0.300	70.2
4th Red	0.327	74.3
5th Red	0.356	75.9
RD	0.404	77.4
TS	0.440	78.4
HS	0.832	88.2
Bran	1.330	100.0

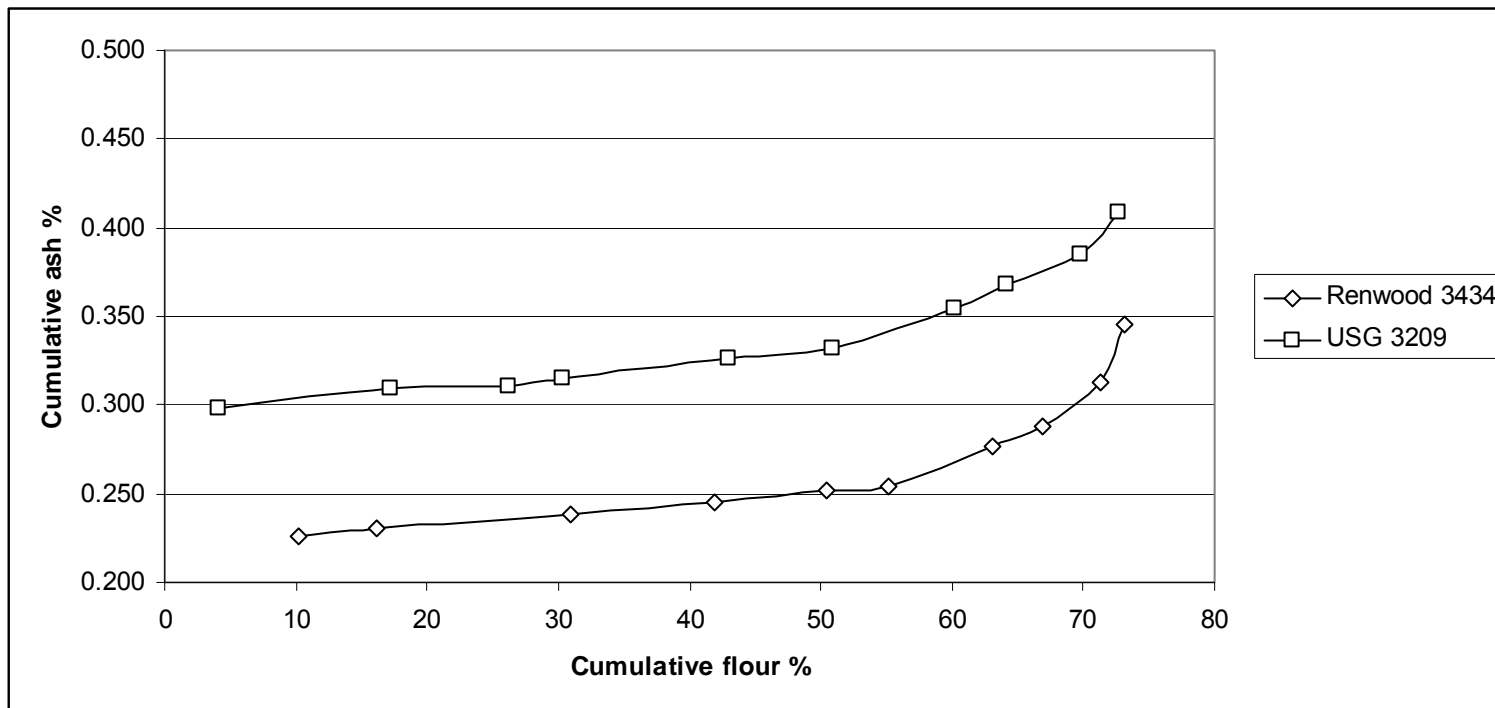
Ash curve for USG 3209		
Mill stream	Cumulative ash %	Cumulative flour %
Dust	0.298	4.1
2nd Red	0.309	17.3
1st Red	0.311	26.1
Gra	0.315	30.3
2nd Br	0.327	43.0
1st Br	0.332	51.0
3rd Red	0.355	60.2
3rd Br	0.368	64.2
4th Red	0.385	69.8
5th Red	0.409	72.7
RD	0.477	75.0
TS	0.503	75.6
HS	0.899	86.6
Bran	1.391	100.0





Ash curve Renwood 3434 (VA03W-434)		
Mill stream	Cumulative ash %	Cumulative flour %
1st Red	0.226	10.2
Dust	0.231	16.2
2nd Red	0.238	31.0
2nd Br	0.245	41.9
1st Br	0.251	50.5
Gra	0.254	55.1
3rd Red	0.277	63.1
3rd Br	0.288	66.8
4th Red	0.313	71.4
5th Red	0.345	73.1
RD	0.386	74.3
TS	0.402	74.7
HS	0.756	83.3
Bran	1.484	100.0

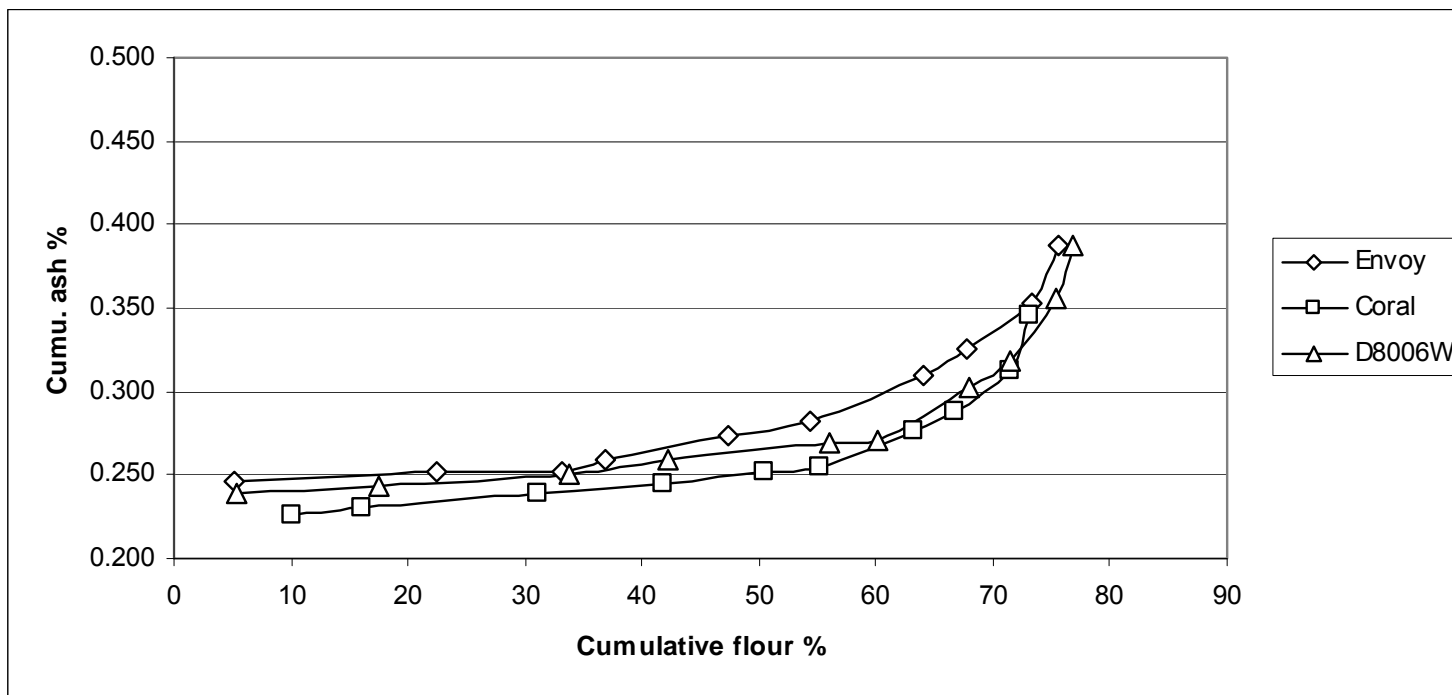
Ash curve for USG 3209		
Mill stream	Cumulative ash %	Cumulative flour %
Dust	0.298	4.1
2nd Red	0.309	17.3
1st Red	0.311	26.1
Gra	0.315	30.3
2nd Br	0.327	43.0
1st Br	0.332	51.0
3rd Red	0.355	60.2
3rd Br	0.368	64.2
4th Red	0.385	69.8
5th Red	0.409	72.7
RD	0.477	75.0
TS	0.503	75.6
HS	0.899	86.6
Bran	1.391	100.0



Ash curve for Envoy (E1009)		
Mill stream	Cumulative ash %	Cumulative flour %
Dust	0.246	5.1
2nd Red	0.252	22.4
1st Red	0.252	33.2
Gra	0.259	36.9
2nd Br	0.273	47.4
1st Br	0.282	54.3
3rd Red	0.309	64.1
3rd Br	0.325	67.7
4th Red	0.353	73.4
5th Red	0.388	75.5
RD	0.433	76.9
TS	0.449	77.3
HS	0.812	86.0
Bran	1.474	100.0

Ash curve for Coral (E2017)		
Mill stream	Cumulative ash %	Cumulative flour %
1st Red	0.226	10.2
Dust	0.231	16.2
2nd Red	0.238	31.0
2nd Br	0.245	41.9
1st Br	0.251	50.5
Gra	0.254	55.1
3rd Red	0.277	63.1
3rd Br	0.288	66.8
4th Red	0.313	71.4
5th Red	0.345	73.1
RD	0.386	74.3
TS	0.402	74.7
HS	0.756	83.3
Bran	1.484	100.0

Ash curve for D8006W		
Mill stream	Cumulative ash %	Cumulative flour %
Dust	0.239	5.3
1st Red	0.243	17.6
2nd Red	0.250	33.7
1st Br	0.259	42.1
2nd Br	0.269	56.0
Gra	0.271	60.2
3rd Red	0.303	68.0
3rd Br	0.319	71.4
4th Red	0.356	75.4
5th Red	0.388	76.7
RD	0.433	77.7
TS	0.452	78.1
HS	0.848	86.6
Bran	1.556	100.0



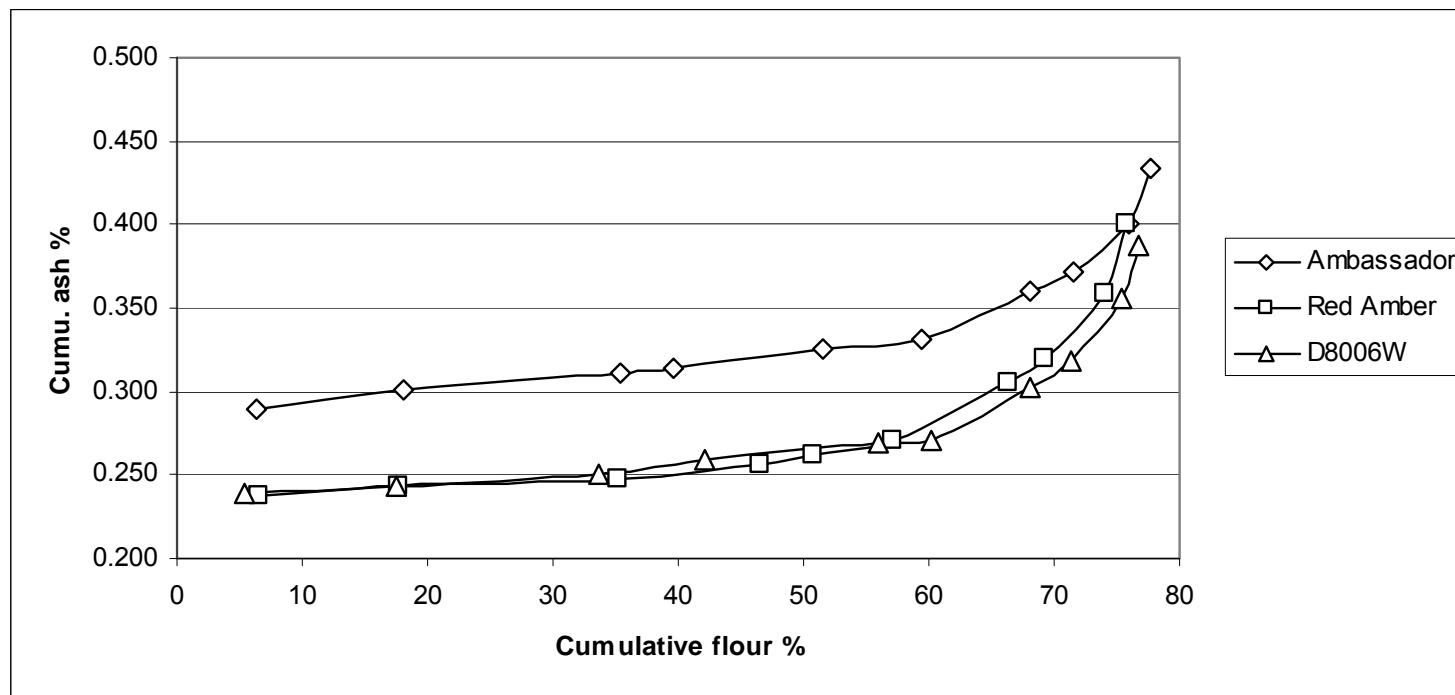
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Ash curve for Ambassador (E0028)		
Mill stream	Cumulative ash %	Cumulative flour %
Dust	0.289	6.4
1st Red	0.301	18.1
2nd Red	0.310	35.3
Gra	0.314	39.7
2nd Br	0.326	51.6
1st Br	0.331	59.4
3rd Red	0.360	68.1
3rd Br	0.372	71.5
4th Red	0.401	75.9
5th Red	0.434	77.6
RD	0.477	79.0
TS	0.493	79.4
HS	0.801	87.8
Bran	1.354	100.0

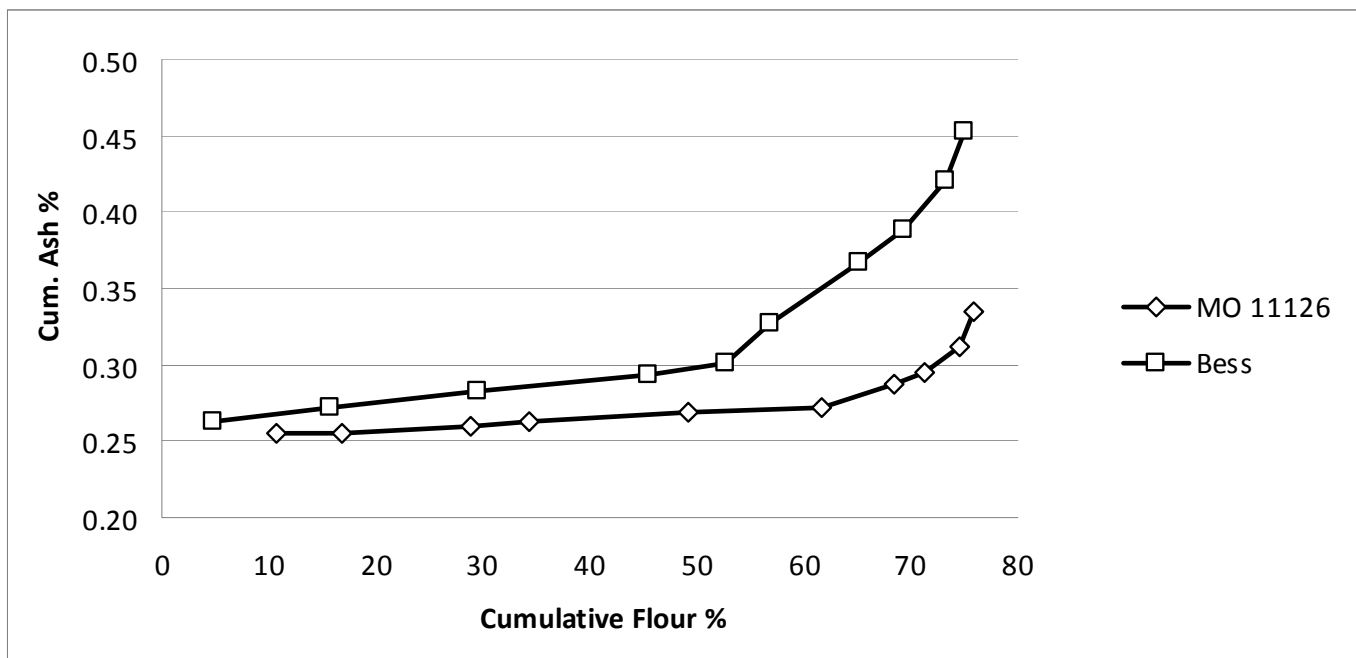
Ash curve for Red Amber (D8006R)		
Mill stream	Cumulative ash %	Cumulative flour %
Dust	0.237	6.6
1st Red	0.243	17.7
2nd Red	0.248	35.2
2nd Br	0.256	46.6
Gra	0.262	50.8
1st Br	0.271	57.2
3rd Red	0.305	66.3
3rd Br	0.320	69.2
4th Red	0.359	74.0
5th Red	0.400	75.7
RD	0.447	76.9
TS	0.468	77.4
HS	0.892	86.7
Bran	1.529	100.0

Ash curve for D8006W		
Mill stream	Cumulative ash %	Cumulative flour %
Dust	0.239	5.3
1st Red	0.243	17.6
2nd Red	0.250	33.7
1st Br	0.259	42.1
2nd Br	0.269	56.0
Gra	0.271	60.2
3rd Red	0.303	68.0
3rd Br	0.319	71.4
4th Red	0.356	75.4
5th Red	0.388	76.7
RD	0.433	77.7
TS	0.452	78.1
HS	0.848	86.6
Bran	1.556	100.0



Ash curve for MO 011126		
Mill stream	Cumulative ash %	Cumulative flour %
1st Red	0.255	10.8
Dust	0.256	16.8
2nd Red	0.260	28.8
Gra	0.263	34.3
2nd Br	0.268	49.2
1st Br	0.272	61.5
3rd Red	0.287	68.3
3rd Br	0.295	71.2
4th Red	0.312	74.6
5th Red	0.334	75.9
RD	0.362	76.9
TS	0.372	77.2
HS	0.660	83.8
Bran	1.535	100.0

Ash curve for Bess		
Mill stream	Cumulative ash %	Cumulative flour %
Dust	0.263	4.7
1st Red	0.273	15.8
2nd Red	0.283	29.5
2nd Br	0.293	45.4
1st Br	0.301	52.6
3rd Br	0.326	56.9
3rd Red	0.367	65.2
Gra	0.389	69.3
4th Red	0.421	73.2
5th Red	0.452	74.9
RD	0.506	76.3
TS	0.522	76.6
HS	0.990	86.8
Bran	1.642	100.0



**Source of Test Data: Cooperator Data**

<b>Dave Green</b>	<b>ADM Milling</b>
<b>Scott Baker</b>	<b>ConAgra Foods Omaha, Nebraska</b>
<b>Jill BryanEhr</b>	<b>Horizon Milling Minneapolis, Minnesota</b>
<b>Grace Lai</b>	<b>Kellogg Kalamazoo Michigan</b>
<b>Diane Gannon</b>	<b>Kraft-Nabisco, Inc. Toledo, Ohio</b>
<b>C.J. Lin</b>	<b>The Mennel Milling Co. Fostoria, Ohio</b>
<b>Marianne Teagler</b>	<b>Siemer Milling Co. Teutopolis, Illinois</b>
<b>Laurie Murphy</b>	<b>Star of the West Milling Co. Frankenmuth, Michigan</b>
<b>Bon Lee</b>	<b>Wheat Marketing Center US Wheat Associates Portland Oregon</b>
<b>Doug Engle</b>	<b>USDA-ARS Western Wheat Quality Laboratory Pullman, Washington</b>
<b>Scott Beil</b>	<b>USDA-ARS Soft Wheat Quality Laboratory Wooster, Ohio</b>

Table 3. ADM Milling end-product ratings and comments for 18 soft wheat varieties, 2008 Wheat Quality Council.

Sample#	End-Product Performance Cookies		Overall Acceptability		Mitigating Physical/Chemical Properties & Comments
	Score	Liked/Disliked Comments	Score	Liked/Disliked Comments	
Pioneer 25R39 (XW 06M)	6	Dry dough / Blank look	7	No cracking on top / Smaller spread	Crunchy cookie
Pur 02444A1-23-9	8	SI dry dough / Checkered app.	8	Large spread / Performed well	Crispy cookie
Pur 03112A1-7-3	8	Good soft dough / Nice appearance	8	SI darker / Good spread	Slightly crunchy
Pur 04287A1-10	8	SI dry dough / Nice appearance	8	Light in color / Smaller spread	Chewy
Pur 99600A2-4-32	8	Dry tough dough / Nice appearance	8	Light in color / Avg spread	Chewy
W 1377	8	Dry tough dough / Good spread	8	Checkered look / SI smaller spread	SI chewy
Hopewell (Ck)	7	Soft dough / Lrg checkered	7	Thin cookie / V large spread	Crispy / chewy
USG 3209 (Ck)	8	Soft dough / Nice appearance	8	Smaller spread / Dark color	SI Chewy
SS 5205 (VA01W-205)	8	Soft dough / Lrg spread	8	Checkered look / Thin cookie	Crispy
Shirley (VA03W-409)	8	SI dry dough / Nice appearance	8	Good spread / SI thicker	Chewy
Renwood 34334 (VA03W-434)	8	Soft dough / Checkered look	8	Good spread / Average	Crispy

Table 3 (Cont.). ADM Milling end-product ratings and comments for 18 soft wheat varieties, 2008 Wheat Quality Council.

Envoy	8 Soft / Thick	8 Smallest spread / Med. Checkered	Crunchy
Coral	8 Sl dry / Large Checkered	8 Avg spread / Light color	Sl chewy
Ambassador	8 Soft dough / Med Checkered	8 Good spread / Light color	Chewy
Red Amber	8 Soft dough / Nice Appearance	8 Good spread / Average	Sl chewy
D8006W (Ck)	8 Soft dough / Good spread	8 Lrg checkered app / Sl thin cookie	Sl chewy
MO 11126	7 Sl soft / Large Checkered	7 Thin Cookie / Light in color	Crispy / crunchy
Bess (Ck)	7 Sl soft / Large Checkered	7 Thin Cookie / Light in color	Sl chewy

COMMENTS FROM COOPERATOR

We baked cookies and did MAP.

Cookies were measured for width and height in mm.

Most all the doughs performed well. They had a nice appearance and acceptable spreads.

In set one, we didn't like Hopewell CK.

It produced a thin cookie and large checkered look.

We also didn't like the Pioneer XW 06M, it had no cracking on top and a smaller spread.

In Set 4, both samples were large checkered & thin. We didn't like the appearance of these either.

Table 4. ADM Flour Milling flour analytical values for 18 soft wheat cultivars, 2008 Wheat Quality Evaluation Council.

Variety	Flour moisture %	Flour ash %	Flour protein %	Sugar-snap cookie test		
				Width mm	Thickness mm	Spread mm
Pioneer 25R39	13.6	0.38	9.4	50.0	5.2	9.6
PUR 02444 A1-23-9	13.7	0.37	8.9	51.1	4.6	11.1
PUR 03112A1-7-3	13.2	0.40	10.4	50.3	5.0	10.1
PUR 04287A1-10	13.5	0.38	10.4	49.0	5.0	9.8
PUR 99600A2-4-32	13.8	0.40	9.4	50.2	5.0	10.0
W 1377	13.7	0.35	9.5	49.3	9.3	9.3
Hopewell (Check)	13.4	0.40	9.5	51.6	11.5	11.5
USG 3209 (Check)	13.9	0.43	7.1	49.5	9.0	9.0
SS 5205	13.5	0.36	7.7	54.7	12.2	12.2
Shirley	14.3	0.40	8.4	50.1	10.0	10.0
Renwood 3434	13.2	0.41	10.3	50.5	10.1	10.1
Envoy	13.3	0.40	9.7	49.6	9.5	9.5
Coral	13.9	0.41	9.0	51.6	11.5	11.5
Ambassador	13.5	0.44	7.7	51.3	11.2	11.2
Red Amber	13.4	0.41	8.3	50.3	10.5	10.5
D8006 W (Check)	13.5	0.38	7.6	50.8	10.4	10.4
MO 11126	13.4	0.35	8.3	52.7	12.0	12.0
Bess (Check)	12.7	0.47	9.1	50.4	11.0	11.0



Table 5. ConAgra end-product ratings and comments for 18 soft wheat varieties, 2008 Wheat Quality Council.

Sample#	End-Product Performance Cookies		Overall Acceptability		Mitigating Physical/Chemical Properties & Comments
	Score	Liked/Disliked Comments	Score	Liked/Disliked Comments	
Pioneer 25R39 (XW 06M)	3		3		
Pur 02444A1-23-9	5		5		
Pur 03112A1-7-3	5		5		
Pur 04287A1-10	5		5		
Pur 99600A2-4-32	4		4		
W 1377	4		4		
Hopewell (Ck)	6		6		
USG 3209 (Ck)	4		4		
SS 5205 (VA01W-205)	9		9		
Shirley (VA03W-409)	5		5		
Renwood 34334 (VA03W-434)	6		6		

Table 5 (Cont.). ConAgra end-product ratings and comments for 18 soft wheat varieties, 2008 Wheat Quality Council.

Envoy	5	5	
Coral	7	7	
Ambassador	7	7	
Red Amber	6	6	
D8006W (Ck)	6	6	
MO 11126	9	9	
Bess (Ck)	5	5	

Table 6. ConAgra Flour Milling flour analytical values for 18 soft wheat cultivars, 2008 Wheat Quality Evaluation Council.

Variety	Flour moisture %	Flour ash %	Flour protein %	Solvent retention capacity				Cookies (10-50D)			Comments
				Water %	Sodium carb. %	Sucrose %	Lactic acid %	Width mm	Thickness mm	Width/ thick	
Pioneer 25R39	13.52	0.367	9.36	57.41	74.34	97.44	109.52	492	65	75.7	dry dough
Pur 02444 A1-23-9	13.55	0.358	8.82	56.17	78.41	109.49	117.70	507	61	83.1	dry dough
Pur 03112A1-7-3	13.01	0.395	10.15	90.47	71.80	56.36	90.52	508	61	83.3	dry dough
Pur 04287A1-10	13.33	0.381	10.51	54.88	73.02	91.27	100.62	501	61	82.1	dry dough
Pur 99600A2-4-32	13.77	0.411	9.40	59.25	83.24	111.18	117.08	500	63	79.4	dry dough
W 1377	13.57	0.357	9.45	57.79	78.12	104.29	121.82	495	64	77.3	slightly dry dough
Hopewell (Check)	13.35	0.405	9.21	54.61	76.64	96.71	112.17	517	59	87.6	
USG 3209 (Check)	13.78	0.429	7.04	62.58	83.06	111.37	91.58	493	63	78.3	slightly dry dough
SS 5205	13.42	0.349	7.85	53.81	67.36	92.45	109.18	534	55	97.1	slightly dry dough
Shirley	14.14	0.401	7.26	57.48	74.75	100.31	81.63	500	60.5	82.6	dry dough
Renwood 3434	13.18	0.373	9.52	53.30	67.68	95.24	110.37	512	60	85.3	dry dough
Envoy	13.19	0.398	8.86	55.86	71.81	93.44	122.45	506	62.5	81	dry dough
Coral	13.76	0.396	8.69	50.42	69.08	84.67	109.57	526	57	92.3	
Ambassador	13.35	0.431	7.70	52.66	72.18	87.39	90.25	517	57.5	89.9	
Red Amber	13.31	0.438	8.44	53.68	69.76	87.57	105.70	512	59	86.8	
D8006 W (Check)	13.34	0.398	7.00	51.52	71.69	87.83	97.92	508	58	87.6	
MO 11126	13.29	0.330	8.22	48.30	66.75	92.23	119.36	528	53.5	98.7	
Bess (Check)	12.64	0.463	9.04	49.81	72.88	88.26	95.82	506	60	84.3	

Table 7. Horizon Milling end-product ratings and comments for 18 soft wheat varieties, 2008 Wheat Quality Council.

Sample#	End-Product Performance Cookies		Overall Acceptability		Mitigating Physical/Chemical Properties & Comments
	Score	Liked/Disliked Comments	Score	Liked/Disliked Comments	
Pioneer 25R39 (XW 06M)	4.0	Low spread factor	5.5	Fair overall, average dough	High SRC values for sodium carbonate & sucrose
Pur 02444A1-23-9	5.0	Good crust	5.5	Fair overall, below average dough	Firm dough; high SRC values for sodium carbonate & sucrose
Pur 03112A1-7-3	4.5	Average spread factor, crust	5.0	Worst dough characteristics - firm and dry, second lowest overall score	Firm, dry dough; better SRC profile for cracker applications
Pur 04287A1-10	4.0	Below average spread factor, average crust	5.5	Fair overall, average dough	Better SRC profile for cracker applications
Pur 99600A2-4-32	4.0	Below average spread factor, average crust	5.5	Fair overall, average dough	High SRC values for sodium carbonate & sucrose
W 1377	4.0	Low spread factor	5.0	Tied for third lowest overall score	Firm dough; good SRC sucrose levels, other values high
Hopewell (Ck)	6.0	Good crust	7.0	Average overall	Good SRC sucrose levels, other values mixed
USG 3209 (Ck)	3.0	Poor spread factor	4.5	Lowest spread factor of the set, yellow color, lowest overall score	Yellowish end product color; high SRC profile values other than lactic acid
SS 5205 (VA01W-205)	6.5	Good spread factor, good crust	7.5	Tied for second highest overall score, great dough characteristics	Good SRC sucrose levels, other values high
Shirley (VA03W-409)	4.0	Below average spread factor, average crust	5.0	Yellow dough, color; tied for third lowest overall score	Firm dough; yellow dough & end product color; high SRC sodium carbonate, other values better profile for crackers
Renwood 34334 (VA03W-434)	4.0	Below average spread factor, average crust	5.5	Fair overall, average dough	Better SRC profile for cracker applications

Table 7 (Cont.). Horizon Milling end-product ratings and comments for 18 soft wheat varieties, 2008 Wheat Quality Council.

Envoy	4.0 Low spread factor	5.0 Fair overall, below average dough characteristics	Better SRC profile for cracker applications
Coral	6.5 Good spread factor, good crust	7.5 Tied for second highest overall score, great dough characteristics	Good SRC levels for water & sucrose
Ambassador	6.5 Above average spread factor, average crust	7.0 Average overall, below average dough	Tacky dough; High SRC values for sodium carbonate, otherwise good cookie profile
Red Amber	4.5 Average spread factor, crust	5.5 Fair overall, average dough	Good SRC sucrose levels, other values high
D8006W (Ck)	6.0 Good crust	6.5 Average overall, below average dough	Good SRC values for sucrose & lactic acid
MO 11126	8.5 Excellent spread factor, good crust	9.0 Highest spread factor of the set, highest overall score, great dough characteristics	Lowest SRC values for water and sodium carbonate, good sucrose levels, high lactic acid
Bess (Ck)	6.0 Good crust	7.0 Average overall	Good SRC values for sucrose & lactic acid

Table 8. Horizon Milling solvent retention capacity and cookie data (10-50D method) for 18 soft wheat varieties, 2008 Wheat Quality Council.

Variety	Solvent retention capacity				Cookies (10-50D)					
	Water %	Sodium carb. %	Sucrose %	Lactic acid %	Width mm	Thick mm	W/T Ratio mm	Spread factor	Crust	Score 1-5
Pioneer 25R39	53.9	74.9	98.7	107.3	466	59	7.90	77.6	4.0	56
PUR 02444 A1-23-9	53.5	79.2	109.2	121.4	480	56	8.57	84.2	3.5	60
PUR 03112A1-7-3	49.6	71.8	95.1	104.5	474	57	8.32	81.7	4.0	51
PUR 04287A1-10	55.5	73.3	92.3	100.0	465	57	8.16	80.1	4.0	56
PUR 99600A2-4-32	56.7	83.9	99.1	119.3	471	58	8.12	79.8	4.0	56
W 1377	55.1	97.5	76.5	123.4	468	59	7.93	77.9	4.0	52
Hopewell (Check)	53.3	98.4	78.6	83.1	481	55	8.75	85.9	3.5	73
USG 3209 (Check)	56.7	112.5	111.2	93.6	464	59	7.86	77.2	4.0	48
SS 5205	53.2	69.1	87.0	114.7	496	53	9.36	91.9	3.5	79
Shirley	54.4	78.7	94.5	117.6	473	58	8.16	80.1	4.0	52
Renwood 3434	52.0	69.6	93.7	114.2	472	58	8.14	79.9	4.0	56
Envoy	53.5	70.3	92.4	125.6	475	60	7.92	77.7	4.0	54
Coral	50.0	69.2	84.1	111.7	493	53	9.30	91.3	3.5	79
Ambassador	49.9	71.9	83.2	90.9	491	54	9.09	89.3	4.0	72
Red Amber	54.3	69.8	84.9	111.8	484	56	8.64	84.9	4.0	60
D8006 W (Check)	53.0	73.2	82.4	98.6	487	54	9.02	88.6	3.5	68
MO 11126	48.4	66.6	87.7	122.5	500	50	10.00	98.2	3.5	96
Bess (Check)	52.6	72.0	69.9	96.0	483	54	8.94	87.8	3.5	73

Table 9. Kellogg Company end-product ratings and comments for 18 soft wheat varieties, 2008 Wheat Quality Council.

Sample#	End-Product Performance		Overall Acceptability		Mitigating Physical/Chemical Properties & Comments
	Score	Liked/Disliked Comments	Score	Liked/Disliked Comments	
Pioneer 25R39 (XW 06M) Pur 02444A1-23-9 Pur 03112A1-7-3 Pur 04287A1-10 Pur 99600A2-4-32 W 1377 Hopewell (Ck)					Overall a potential  Good potential: Good Stability (as per Farinograph) and high SRC-LA  Not a potential :High protein however very low SRC-LA (not enough sample for Farinograph)  Fair potential: High protein, high water absorption, stability (Farinograph); acceptable SRC-LA  Good potential: Good Stability (as per Farinograph) and good SRC-water and LA values  Good Potential: High water absorption and fair stability (Farinograph); high SRC-LA  Marginal potential: Low stability (Farinograph) low SRC-Water however good SRC-LA
USG 3209 (Ck) SS 5205 (VA01W-205) Shirley (VA03W-409) Renwood 34334 (VA03W-434)					No potential: Very low Protein; high ash and low Stability (Farinograph) and low SRC-LA  No potential: Low SRC-Water and low protein and low stability (Farinograph)  No potential: Low protein and very low SRC-LA  Excellent potential: Good protein, high water absorption and stability (Farinograph); good SRC-LA

Table 9 (Cont.). Kellogg Company end-product ratings and comments for 18 soft wheat varieties, 2008 Wheat Quality Council.

Envoy			Excellent potential: high water absorption and stability ; good protein; and SRC-LA
Coral			Low potential: good stability (Farinograph); good SRC-LA however low SRC -water
Ambassador			Not a potential: Low protein, low SRC-water and LA and low stability high degree softness (Farinograph)
Red Amber			Low potential: good stability (Farinograph); good SRC-LA however low SRC -water
D8006W (Ck)			Not a potential: low stability (Farinograph); Low protein and SRC-LA
MO 11126			Low potential: slightly low protein; Low stability (Farinograph); low SRC-water however good SRC-LA
Bess (Ck)			Low Potential: low SRC-water and protein however good stability (Farinograph)



Table 10. Kellogg Company flour analytical values for 18 soft wheat cultivars, 2008 Wheat Quality Evaluation Council.

Variety	Flour moisture %	Flour ash %	Falling number sec	Flour pH	Flour protein %	Alveograph				
						P mm	L mm	P/L ratio	le	W(40) (10 <sup>-4</sup> joules)
Pioneer XW 06M	13.44	0.44	367	6.17	9.41	49	94	0.52	38.3	73
PUR 02444 A1-23-9	13.60	0.37	364	6.07	9.01	40	123	0.33	35.6	58
PUR 03112A1-7-3	12.96	0.48	364	6.13	10.49	30	77	0.39	30.9	42
PUR 04287A1-10	13.36	0.36	336	6.11	10.72	31	93	0.33	36.6	45
PUR 99600A2-4-32	13.91	0.52	411	6.16	9.75	44	123	0.36	33.0	62
W 1377	13.47	0.41	365	6.24	9.58	44	91	0.48	35.5	64
Hopewell (Check)	13.32	0.41	364	6.22	9.18	29	129	0.22	39.3	43
USG 3209 (Check)	13.64	0.62	398	6.28	6.67	56	42	1.33	33.1	80
VA01W-205	13.31	0.34	377	6.28	7.87	33	84	0.39	47.1	53
VA03W-409	13.88	0.34	417	5.70	6.84	32	55	0.58	23.9	41
VA03W-434	13.17	0.37	384	6.41	9.69	33	102	0.32	42.4	51
Envoy	13.14	0.40	359	6.18	9.06	50	107	0.47	55.3	86
Coral	13.64	0.41	337	6.27	8.84	21	159	0.13	41.0	32
Ambassador	13.33	0.67	355	6.24	7.81	17	134	0.13	30.2	23
Red Amber	13.23	0.43	355	6.32	8.55	24	123	0.20	46.2	39
D8006 W (Check)	13.27	0.40	357	6.26	7.07	25	87	0.29	42.8	39
MO 11126	13.32	0.33	365	6.19	8.32	30	107	0.28	51.4	49
Bess (Check)	12.35	0.48	371	6.25	9.23	28	123	0.23	32.3	38

Table 11. Kellogg Company SRC and Farinograph values for 18 soft wheat cultivars, 2008 Wheat Quality Evaluation Council.

Variety	Solvent Retention Capacity				Farinograph			
	Water %	Sodium carb. %	Sucrose %	Lactic acid %	Water absorp min	Develop. time min	Stability min	Degree of softening Bu units
Pioneer XW 06M	53.1	69.5	89.4	103.7	56.1	1.5	4.9	90
PUR 02444 A1-23-9	50.9	72.1	93.6	112.5	53.9	1.7	6.9	61
PUR 03112A1-7-3	51.0	68.9	83.0	83.5				
PUR 04287A1-10	50.9	67.9	85.0	94.4	55.7	2.0	6.3	68
PUR 99600A2-4-32	53.9	74.0	92.1	109.3	56.3	2.3	5.5	73
W 1377	52.3	72.2	86.5	114.9	57.4	1.5	4.0	80
Hopewell (Check)	49.2	74.1	85.0	107.6	53.0	1.2	2.2	123
USG 3209 (Check)	55.3	75.5	100.1	80.8	54.4	1.4	2.3	64
VA01W-205	47.3	64.5	79.9	106.7	52.5	1.2	3.0	73
VA03W-409	52.4	70.2	86.1	74.4	54.1	1.0	3.0	115
VA03W-434	50.2	64.0	82.8	103.4	54.9	1.5	8.0	69
Envoy	51.3	68.8	84.8	114.7	55.5	1.7	9.5	60
Coral	49.0	66.0	76.7	100.0	51.0	1.2	8.7	69
Ambassador	48.4	67.8	75.9	81.9	50.4	1.2	2.4	122
Amber	49.9	67.8	82.2	99.7	51.8	1.0	5.8	84
D8006 W (Check)	49.5	68.1	79.3	92.4	50.9	1.2	2.0	113
MO 11126	47.4	64.0	80.0	112.5	51.2	1.2	3.3	91
Bess (Check)	47.6	68.0	80.5	85.9	53.9	1.4	6.6	77

Table 12. Kraft Foods flour analytical values for 18 soft wheat cultivars, 2008 Wheat Quality Evaluation Council.

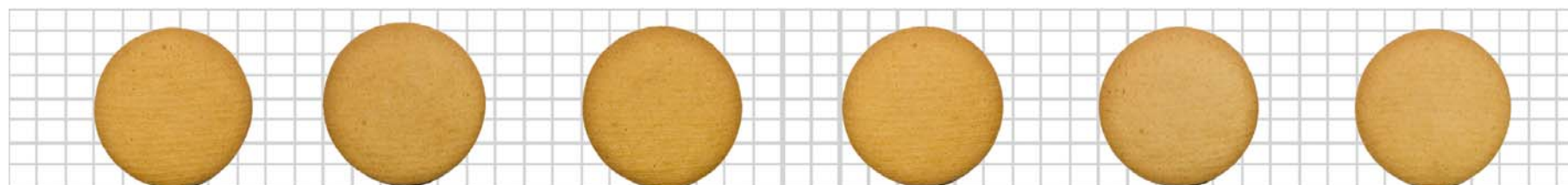
Variety	Wire-cut Cookie Evaluation AACC 10-53									
	Flour moist. %	Flour protein %	Flour ash %	Dough Firmness g	Dough Stickiness g	Cookie Stack Height cm, X4	Cookie Width cm, X4	Cookie Length cm, X4	Weight loss %	Final moisture %
Pioneer 25R39 (XW 06M)	13.30	8.90	0.38	246.9	142.4	4.36	30.4	30.2	13.48	4.16
PUR 02444 A1-23-9	13.20	8.61	0.36	220.8	131.9	4.24	31.1	31.2	13.93	3.71
PUR 03112A1-7-3	12.80	10.00	0.39	249.6	151.6	4.14	31.0	31.2	14.26	3.38
PUR 04287A1-10	13.00	10.22	0.38	221.4	137.2	4.15	30.7	30.5	13.74	3.90
PUR 99600A2-4-32	13.50	9.15	0.41	253.5	146.5	4.36	30.6	30.5	13.36	4.28
W 1377	13.40	9.15	0.34	258.5	146.1	4.40	30.2	30.3	13.34	4.30
Hopewell (Check)	13.20	8.79	0.40	220.1	138.9	4.20	31.8	31.3	13.74	3.90
USG 3209 (Check)	13.60	6.67	0.43	276.1	153.8	4.57	29.4	29.6	13.39	4.25
SS 5205 (VA01W-205)	13.20	7.53	0.35	203.8	121.1	4.16	32.5	32.0	14.03	3.61
Shirley (VA03W-409)	14.00	6.96	0.40	213.8	130.6	4.56	30.0	30.3	13.61	4.03
Renwood 3434 (VA03W-434)	13.00	9.29	0.39	294.7	151.4	4.52	30.3	29.9	13.31	4.33
Envoy (E1009)	12.90	8.54	0.39	237.9	146.1	4.26	30.8	30.9	13.84	3.80
Coral (E2017)	13.60	8.36	0.41	204.6	127.2	4.18	32.2	31.7	14.21	3.43
Ambassador (E0028)	13.20	7.45	0.45	172.1	105.0	4.00	32.6	32.2	14.27	3.37
Red Amber (D8006R)	13.00	8.17	0.44	180.6	116.2	4.02	32.0	31.8	14.32	3.32
D8006 W (Check)	13.10	6.65	0.41	164.7	107.6	4.06	31.7	31.6	14.13	3.51
MO 11126	13.20	7.96	0.35	208.1	120.1	3.91	33.1	32.8	14.66	2.98
Bess (Check)	12.40	8.88	0.45	199.9	120.4	3.95	32.3	32.0	14.28	3.36

Table 13. Kraft Foods alveograph and solvent retention capacity analysis for 18 soft wheat cultivars, 2008 Wheat Quality Council.

Variety	Alveograph				Solvent retention capacity					
	P mm	L mm	W	W@ L=100 (10 <sup>-4</sup> joules)	Water %	Sodium carb. %	Sucrose %	Lactic acid %	LA/ (SC+S)	
Set 1	Pioneer 25R39 (XW 06M)	47	82	107	118	53.12	75.43	96.77	102.44	0.59
	PUR 02444 A1-23-9	38	133	100	88	52.22	75.21	109.63	110.65	0.60
	PUR 03112A1-7-3	30	72	52	59	50.87	70.83	91.00	87.52	0.54
	PUR 04287A1-10	33	121	88	80	52.11	72.82	95.57	99.00	0.59
	PUR 99600A2-4-32	42	105	94	92	53.17	78.89	105.72	112.57	0.61
	W 1377	44	97	102	103	52.45	76.19	97.17	114.34	0.66
	Hopewell (Check)	29	107	77	75	53.28	76.43	91.19	108.90	0.65
Set 2	USG 3209 (Check)	62	29	71	118	57.64	82.88	108.99	91.58	0.48
	SS 5205 (VA01W-205)	34	86	84	92	50.08	66.77	90.49	107.38	0.68
	Shirley (VA03W-409)	34	44	44	55	55.11	73.36	98.13	77.62	0.45
	Renwood 3434 (VA03W-434)	33	113	94	89	52.88	68.68	95.13	109.11	0.67
Set 3	Envoy (E1009)	50	99	160	161	52.70	70.51	95.22	119.83	0.72
	Coral (E2017)	21	144	68	55	47.23	70.23	85.35	104.51	0.67
	Ambassador (E0028)	19	116	42	39	51.24	70.69	83.23	84.23	0.55
	Red Amber (D8006R)	27	148	103	80	49.17	69.46	86.43	104.37	0.67
	D8006 W (Check)	26	96	63	65	52.17	72.62	87.72	95.76	0.60
Set 4	MO 11126	31	117	105	95	47.24	67.87	90.89	115.17	0.73
	Bess (Check)	28	99	60	60	50.63	70.49	90.20	86.16	0.54

# Wooster/USDA Flour Evaluation 2008

## AACC 10-53 Wire Cut Cookie Test



PIONEER XW 06M

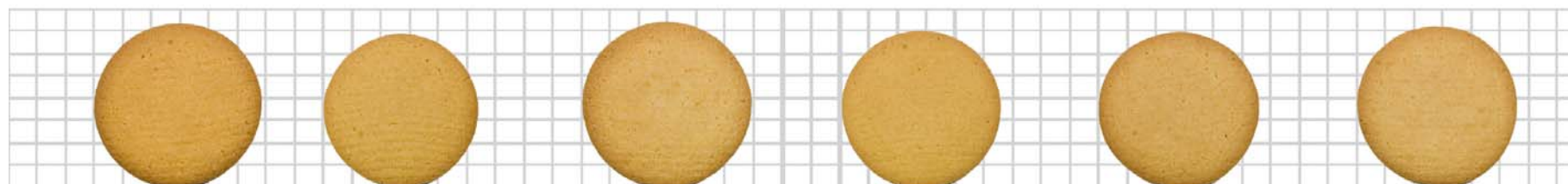
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PUR 03112A1-7-3

PUR 04287A1-10

PUR 99600A2-4-32

W 1377



HOPEWELL (CK)

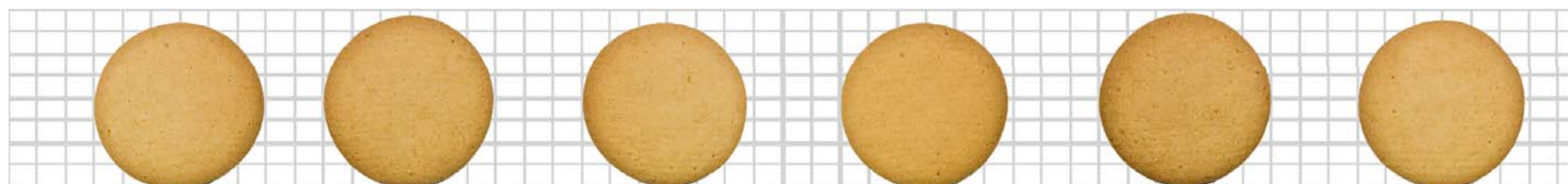
USG 3209 (CK)

VA01W-205

VA03W-409

VA03W-434

ENVOY ( E 1009)



CORAL (E2017)

AMBASSADOR(E0028)

AMBER (D8006R)

D8006 W

MO 11126

BESS

# Wooster/USDA Flour Evaluation 2008

## AACC 10-53 Wire Cut Cookie Test



PIONEER XW 06M

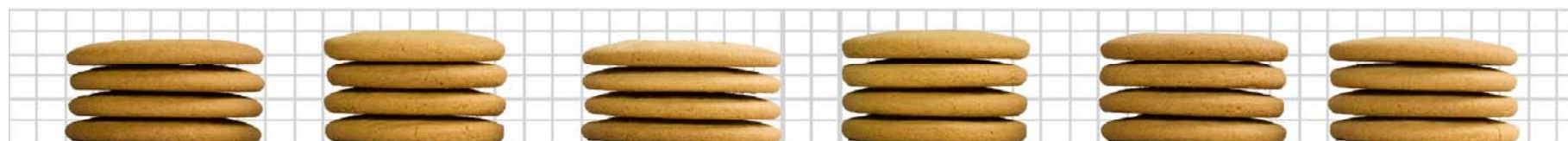
PUR 02444 A1-23-9

PUR 03112A1-7-3

PUR 04287A1-10

PUR 99600A2-4-32

W 1377



HOPEWELL (CK)

USG 3209 (CK)

VA01W-205

VA03W-409

VA03W-434

ENVOY ( E 1009)



CORAL (E2017)

AMBASSADOR(E0028)

AMBER (D8006R)

D8006 W

MO 11126

BESS

Table 14. Mennel Milling end-product ratings and comments for 18 soft wheat varieties, 2008 Wheat Quality Council.

Sample#	End-Product Performance Cakes		Overall Acceptability		Mitigating Physical/Chemical Properties & Comments
	Score	Liked/Disliked Comments	Score	Liked/Disliked Comments	
Pioneer 25R39 (XW 06M)	4	dislike	4.5	like	I think the Bake results I got from the different wheats could have been better, if we where working with chlorinated flour.
Pur 02444A1-23-9	3	dislike	3.5	dislike	
Pur 03112A1-7-3	2	dislike	2	dislike	
Pur 04287A1-10	2	dislike	2	dislike	
Pur 99600A2-4-32	3	dislike	2.5	dislike	
W 1377	3	dislike	3.5	dislike	
Hopewell (Ck)	3	dislike	3	dislike	
USG 3209 (Ck)	5.5	Like	5	like	
SS 5205 (VA01W-205)	5	Like	5.5	like	
Shirley (VA03W-409)	5.5	Like	5	like	
Renwood 34334 (VA03W-434)	4.5	Like	4.5	like	

Table 14 (Cont.). Mennel Milling end-product ratings and comments for 18 soft wheat varieties, 2008 Wheat Quality Council.

Envoy	4	dislike	3.5	dislike	
Coral	4	dislike	4	like	
Ambassador	4.5	like	4	like	
Red Amber	4	dislike	4	like	
D8006W (Ck)	4	dislike	3.5	dislike	
MO 11126	3.5	dislike	4	like	
Bess (Ck)	1	dislike	1.5	dislike	



Table 15. Mennel Flour Milling cake baking results for 18 soft wheat cultivars, 2008 Wheat Quality Evaluation Council.

Variety	Cake baking quality				
	Moisture loss %	Edge height %	Center height %	Shape factor Ctr/edge	
Set 1	Pioneer 25R39 (XW 06M)	5.63	30.0	30.5	1.02
	PUR 02444 A1-23-9	5.25	29.0	27.0	0.93
	PUR 03112A1-7-3	5.31	29.0	25.5	0.88
	PUR 04287A1-10	5.25	29.0	24.0	0.83
	PUR 99600A2-4-32	5.32	28.5	26.0	0.91
	W 1377	5.24	29.5	28.0	0.95
	Hopewell (Check)	5.20	29.5	28.5	0.97
Set 2	USG 3209 (Check)	5.35	28.0	34.5	1.23
	SS 5205 (VA01W-205)	5.20	30.0	34.5	1.15
	Shirley (VA03W-409)	5.25	29.0	36.0	1.24
	Renwood 3434 (VA03W-434)	5.20	29.0	31.0	1.07
Set 3	Envoy (E1009)	5.24	28.0	28.5	1.02
	Coral (E2017)	5.29	29.0	28.5	0.98
	Ambassador (E0028)	5.49	29.0	32.0	1.10
	Red Amber (D8006R)	5.27	28.0	27.5	0.98
	D8006 W (Check)	5.10	29.5	29.5	1.00
Set 4	MO 11126	5.12	29.0	28.0	0.97
	Bess (Check)	5.21	28.5	20.5	0.72

Table 16. Siemer Milling end-product ratings and comments for 18 soft wheat varieties, 2008 Wheat Quality Council.

Sample#	End-Product Performance Cakes		Overall Acceptability		Mitigating Physical/Chemical Properties & Comments
	Score	Liked/Disliked Comments	Score	Liked/Disliked Comments	
Pioneer 25R39 aa(XW 06M)	7	good volume	7	grain somewhat tight.	whiter crumb color- due to lower pH 4.09 ( accidentally went too far when chlorinating)  tender cake- soft
Pur 02444A1-23-9	8	tender cake	8	a little tighter grain	
Pur 03112A1-7-3	9	good volume	9		
Pur 04287A1-10	8	good volume	7	slightly open grain	
Pur 99600A2-4-32	8	excellent volume	8	slightly open grain	
W 1377	9	excellent volume	9	Tender cake	
Hopewell (Ck)	8	good volume	9	Tender cake	
USG 3209 (Ck)	7	excellent volume	6	but cake too tender & too soft	Cake breaks apart easy. Is this due to the lower protein?
SS 5205 (VA01W-205)	9	excellent volume	9	Tender cake	
Shirley (VA03W-409)	8	excellent volume	9	Tender cake	
Renwood 34334 (VA03W-434)	7	lower volume	7		

Table 16 (Cont.). Siemer Milling end-product ratings and comments for 18 soft wheat varieties, 2008 Wheat Quality Council.

Envoy (E1009)  Coral (E2017)  Ambassador (E0028) Red Amber (D8006R) D8006W (Ck)	7 lower volume	7 very soft cake	
MO 11126  Bess (Ck)			

Table 17. Siemer Flour Milling analytical values and cake evaluation for 18 soft wheat cultivars, 2008 Wheat Quality Council.

Variety	Flour moisture %	Flour ash %	Flour protein %	Flour pH	Cake geometry			Cake texture				
					Volume	Sym- metry	Uni- formity	Cell size (1-10)	Grain (1-10)	Tender- ness (1-10)	Soft- ness (1-10)	Crumb color (1-10)
Pioneer 25R39	13.28	0.380	9.07	4.69	138	18	0	8	7	8	8	9
PUR 02444 A1-23-9	13.50	0.361	8.77	4.09- pH is low	140	16	2	8	8	8	7	10- whiter color 9
PUR 03112A1-7-3	13.05	0.398	10.00	4.86	139	20	0	9	8	8	9	9
PUR 04287A1-10	13.28	0.380	10.28	4.79	142	17	1	8	8	8	9	9
PUR 99600A2-4-32	13.60	0.403	9.19	4.60	144	24	2	8	9	8	8	9
W 1377	13.42	0.338	9.16	4.48	141	21	1	9	9	8	8	9
Hopewell (Ck)	13.28	0.402	9.17	4.75	139	17	1	8	8	8	8	9
USG 3209 (Ck)	13.65	0.393	6.62 (low)	4.55	145	26	0	10	9	10	10	9
SS 5205	13.28	0.357	7.30	4.47	141	24	0	8	9	9	9	9
Shirley	13.95	0.403	6.90	4.64	142	23	1	8	8	8	8	9
Renwood 3434	12.98	0.395	9.17	4.47	132	21	3	8	8	8	8	9
Envoy	13.08	0.421	8.38	4.83	135	18	0	8	8	8	9	9
Coral	13.60	0.411	8.37	4.80								
Ambassador	13.10	0.416	7.28	4.91								
Red Amber	13.00	0.453	8.21	4.90								
D8006 W (Ck)	13.15	0.424	6.46 (low)	4.72								
MO 11126	13.12	0.362	7.75	4.60								
Bess (Ck)	12.40	0.479	8.90	4.70								

Table 18. Star-of-the-West Milling end-product ratings and comments for 18 soft wheat varieties, 2008 Wheat Quality Council.

Sample#	End-Product Performance		Overall Acceptability		Mitigating Physical/Chemical Properties & Comments
	Score	Liked/Disliked Comments	Score	Liked/Disliked Comments	
Pioneer 25R39 (XW 06M)	5	Small but uniform cookie, top grain comparable to Hopewell (makeup: firm slightly dry dough)	6		High protein, SRC sucrose and moderately high sodium carbonate. Farinograph absorption indicates good for cookies and crackers. Higher absorption and RVA peak viscosity possibly from to higher damaged starch. Cookie spread factor 6.70
Pur 02444A1-23-9	8	Good cookie spread, top grain comparable to Hopewell, somewhat irregular shape (makeup: firm dough)	7		Good protein content, high SRC sucrose and sodium carbonate. Spread factor 7.82 and top grain comparable to the check. Possibly better for crackers. Stronger RVA pasting profile good for soups and gravies.
Pur 03112A1-7-3	5	Small cookie (makeup: Slightly dry dough)	5	Darkest cookie bake in set, but comparable to Hopewell.	High protein 10.20. Low SRC lactic acid, good sodium carbonate value. Lower absorption. Cookie spread factor 7.09.
Pur 04287A1-10	7	Good cookie spread (makeup: slight dry dough)	6	Lighter cookie color.	High protein 10.20. Low SRC lactic acid, good sodium carbonate value. Lower absorption. Cookie spread factor 7.99.
Pur 99600A2-4-32	6	Smaller cookie spread (makeup: slightly stiff dough)	6	Lighter cookie color.	Moderately high SRC sucrose and high sodium carbonate good lactic acid. Stronger RVA pasting profile good for soups and gravies. Cookie spread factor 6.82.
W 1377	6	Smaller cookie spread (makeup: firm dough)	6	Lighter cookie color.	Low ash 0.296. Similar SRC profile to Hopewell. Produced a much smaller cookie then Hopewell. Weaker lactic acid for crackers. Cookie spread factor 6.74.
Hopewell (Ck)	8	Good cookie spread (makeup: dough is sticky and adheres to mixing bowl.)	7	Mixing properties. Dark cookie bake.	Cookie spread factor 8.05. Minimal lactic acid crackers.
USG 3209 (Ck)	4	Hard small cookie (makeup: stiff dough)	6	but cake too tender & too soft	Highest SRC water, sucrose and sodium carbonate of the 18 flours. Strong Farinograph MTI.
SS 5205 (VA01W-205)	8	Best cookie in set (makeup: best dough of the 18 flours - good consistency.	9	Tender cake	Low protein content. Good SRC profile. Minimal lactic acid value for crackers. Good sodium carbonate value. Cookie spread factor 8.02 and top grain. Good cookie color.
Shirley (VA03W-409)	6	Smaller cookie but good top appearance	9	Tender cake	Low protein content. SRC lactic acid is low for cookies and very low for crackers. RVA pasting profile good for soups and gravies.
Renwood 34334 (VA03W-434)	5	Cookie open cell structure (makeup: somewhat stiff dough)	7		Higher protein. Good SRC profile. Lactic acid marginally low for crackers. Good sodium carbonate value.

Table 18 (Cont.). Star-of-the-West Milling end-product ratings and comments for 18 soft wheat varieties, 2008 Wheat Quality Council.

Envoy (E1009)	6	Smallest cookie in set. (makeup: dough hydrates slowly during mixing)	6	Mixing properties.	Higher protein and lower ash. Stronger absorption profile for white wheat flour. Cookie spread factor 7.13.
Coral (E2017)	7	Smaller cookie but good top appearance. (makeup: dough slightly sticky).	7		Strong Farinograph MTI. Cookie spread factor 7.98.
Ambassador (E0028)	8	Good cookie spread and top appearance similar to D8006W (makeup: dough is soft wet and sticky).	8	Mixing properties. Slightly darker bake color.	Slightly lower SRC lactic acid value. Spread factor 8.49 (best width)
Red Amber (D8006R)	7	Good cookie spread. (makeup: dough is wet and sticky).	7	Mixing properties.	Spread factor 8.49
D8006W (Ck)	8	Best cookie in this set	8		Low protein content. Good absorption. Spread factor 8.64
MO 11126	8	Better cookie than Bess. (makeup: good dough consistency)	8	Should do well in most soft wheat applications.	Best cookie among the red wheat cultivars. Performed better than samples previously evaluated. Great SRC profile. Should do well with cookies and crackers. Strong RVA profile should go well in soups and gravies. Cookie spread factor 8.84. Slightly lower water absorption for coatings and other batter products.
Bess (Ck)	7	Good cookie spread. (makeup: somewhat sticky).	5	Mixing properties.	SRC lactic acid is low for cookies and very low for crackers. Lower water absorption.

Table 19. Star of the West Milling flour analysis and Rapid Visco-Analyzer profile for 18 soft wheat cultivars, 2008 Wheat Quality Council.

Variety	Flour moisture %	Flour protein %	Flour ash %	Falling number sec	Rapid Visco-Analyzer Profile					
					Peak time min	Peak cP	Trough cP	Break-down cP	Setback cP	Final cP
Pioneer XW 06M	13.70	9.19	0.374	363	5.60	2966	1411	1555	1375	2786
PUR 02444 A1-23-9	13.68	8.78	0.370	378	6.07	3109	1620	1489	1276	2896
PUR 03112A1-7-3	13.19	10.20	0.438	371	6.20	2848	1548	1300	1236	2784
PUR 04287A1-10	13.54	10.20	0.385	351	5.93	2182	1088	1094	1082	2170
PUR 99600A2-4-32	13.53	9.34	0.378	378	6.20	3107	1689	1418	1347	3036
W 1377	13.41	9.32	0.296	357	6.00	2568	1367	1201	1278	2645
Hopewell (Check)	13.21	9.25	0.413	381	5.87	2671	1402	1269	1407	2809
USG 3209 (Check)	13.46	8.98	0.468	395	6.07	2390	1618	772	1499	3117
VA01W-205	13.18	6.86	0.344	366	6.00	2679	1743	936	1612	3355
VA03W-409	13.76	7.11	0.411	402	6.07	2489	1831	658	1740	3571
VA03W-434	12.88	9.53	0.379	426	5.87	2208	1394	814	1442	2836
Envoy	13.20	8.66	0.345	373	6.07	2730	1570	1160	1326	2896
Coral	13.75	8.67	0.411	328	5.73	1917	989	928	1048	2037
Ambassador	13.48	7.54	0.453	345	5.87	2543	1486	1057	1424	2910
Red Amber	13.04	8.40	0.417	373	6.20	2726	1546	1180	1204	2750
D8006 W (Check)	13.31	6.84	0.400	349	6.00	2924	1561	1363	1333	2894
MO 11126	13.05	8.16	0.317	406	6.33	3228	2073	1155	1333	3406
Bess (Check)	12.69	9.10	0.442	386	6.33	3281	1928	1353	1235	3163

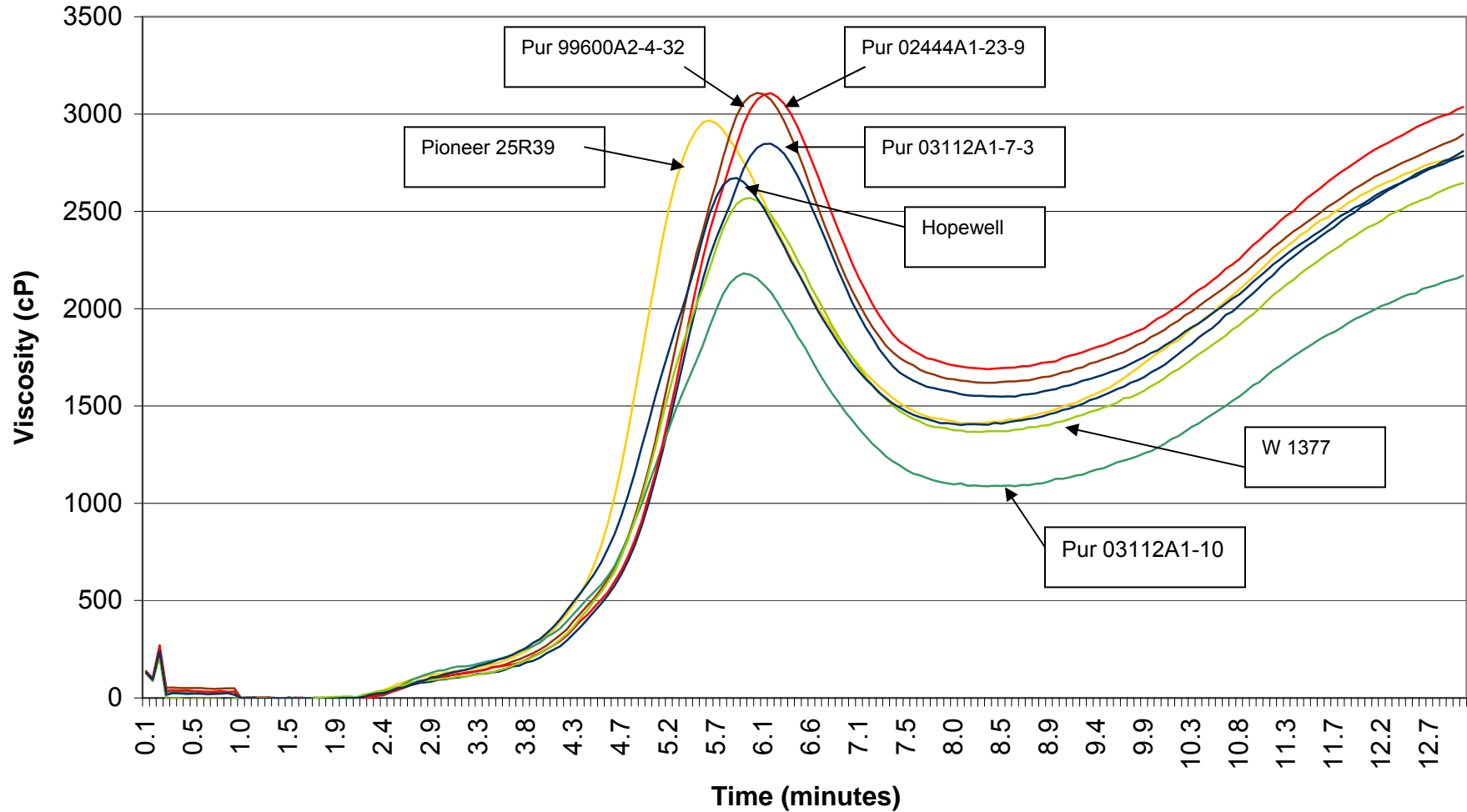
Table 20. Star of the West Milling solvent retention capacity tests, Farinograph data (adjusted to a 14% basis) and Macro Wire-Cut Cookie evaluation for 18 soft wheat cultivars, 2008 Wheat Quality Council.

Variety	Solvent Retention Capacity				Farinograph					Macro Wire-Cut Cookie 10-53		
	Water %	Sodium carb. %	Sucrose %	Lactic acid %	Water absorp %	Develop. time min	Stability min	Mixing tolerance index	Time to break- down min	Width cm	Thickness cm	W/T ratio
Pioneer XW 06M	49.91	74.89	100.50	101.45	55.1	1.3	2.0	160	2.2	596.0	89.0	6.70
PUR 02444 A1-23-9	52.49	78.12	115.41	103.62	50.0	1.4	2.2	113	2.0	641.0	82.0	7.82
PUR 03112A1-7-3	51.77	71.25	99.58	87.10	52.7	1.8	2.6	73	3.5	617.0	87.0	7.09
PUR 04287A1-10	51.47	70.86	97.37	102.12	53.8	1.3	2.2	149	2.0	631.0	79.0	7.99
PUR 99600A2-4- 32	53.54	78.38	103.79	109.61	50.6	1.2	2.3	134	2.1	614.0	90.0	6.82
W 1377	54.32	74.61	98.05	107.91	55.3	1.2	1.7	190	1.7	623.0	92.5	6.74
Hopewell (Check)	52.54	76.43	97.97	107.24	48.3	1.0	1.5	124	1.5	652.0	81.0	8.05
USG 3209 (Check)	57.22	82.47	120.66	90.60	52.3	1.0	1.1	89	1.6	610.0	90.0	6.78
VA01W-205	50.09	66.72	91.70	106.33	47.3	1.0	1.4	109	1.4	665.5	83.0	8.02
VA03W-409	54.36	73.68	96.31	78.36	50.9	0.7	0.8	156	1.1	632.0	88.0	7.18
VA03W-434	50.89	67.33	93.26	104.96	51.8	1.0	1.8	162	1.5	627.0	86.5	7.25
Envoy	52.82	69.67	92.52	119.62	51.0	1.0	1.6	120	1.4	627.0	88.0	7.13
Coral	50.35	69.14	85.26	105.42	47.6	1.0	3.0	70	2.7	646.5	81.0	7.98
Ambassador	51.70	71.76	87.96	84.85	47.6	1.2	1.8	116	1.5	658.0	77.5	8.49
Red Amber	50.36	68.17	90.41	106.70	48.0	0.9	1.4	88	1.4	645.0	76.0	8.49
D8006 W (Check)	52.01	71.48	94.05	95.34	47.3	0.7	0.9	105	1.2	648.0	75.0	8.64
MO 11126	47.85	66.82	89.37	114.74	46.8	0.7	1.6	92	1.4	671.5	76.0	8.84
Bess (Check)	50.51	71.53	93.31	89.39	48.6	0.8	1.2	126	1.3	648.0	78.5	8.25

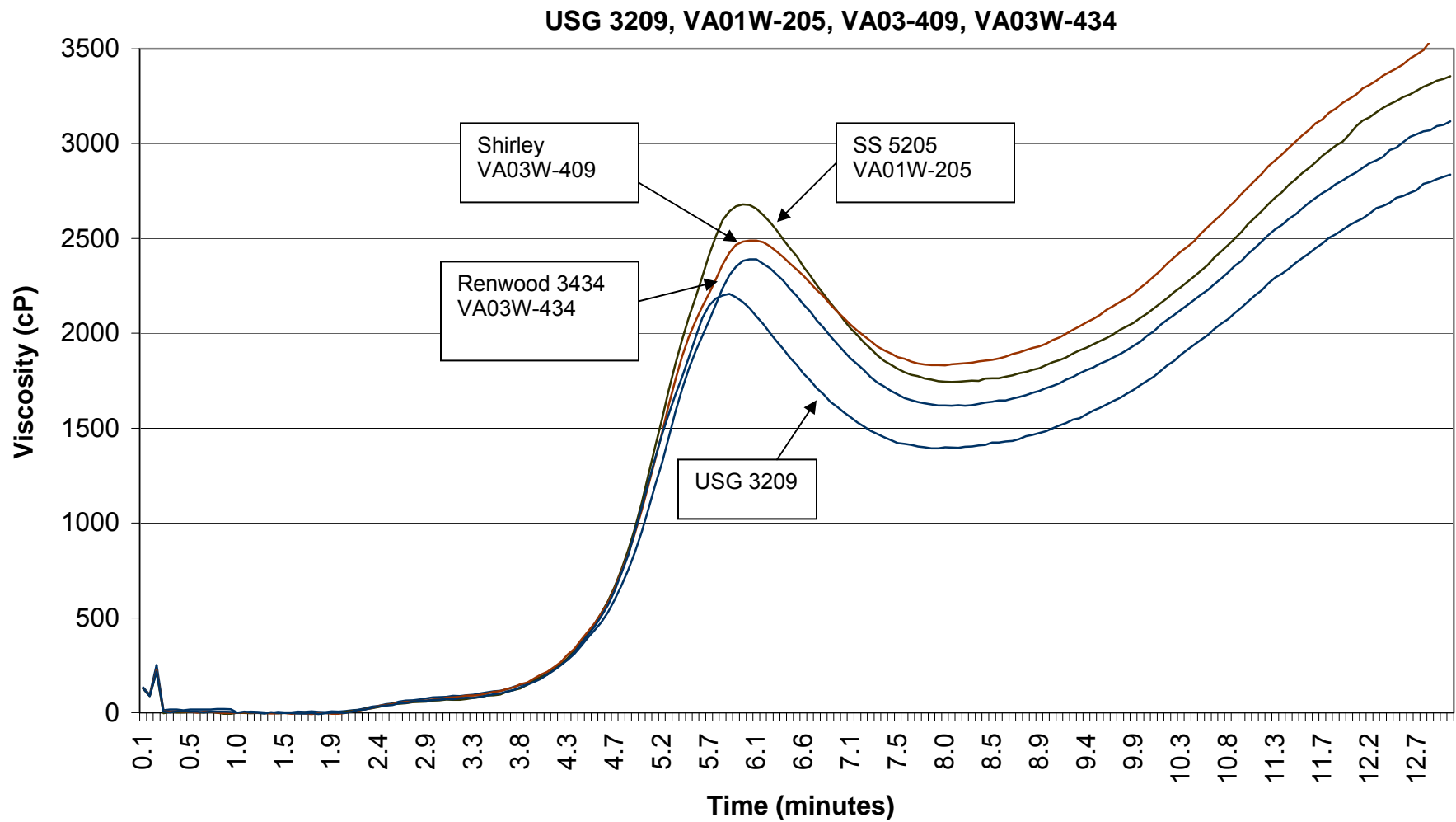


**Figure 2. Star of the West Milling RVA graphs for Set 1, 2008 QEC**

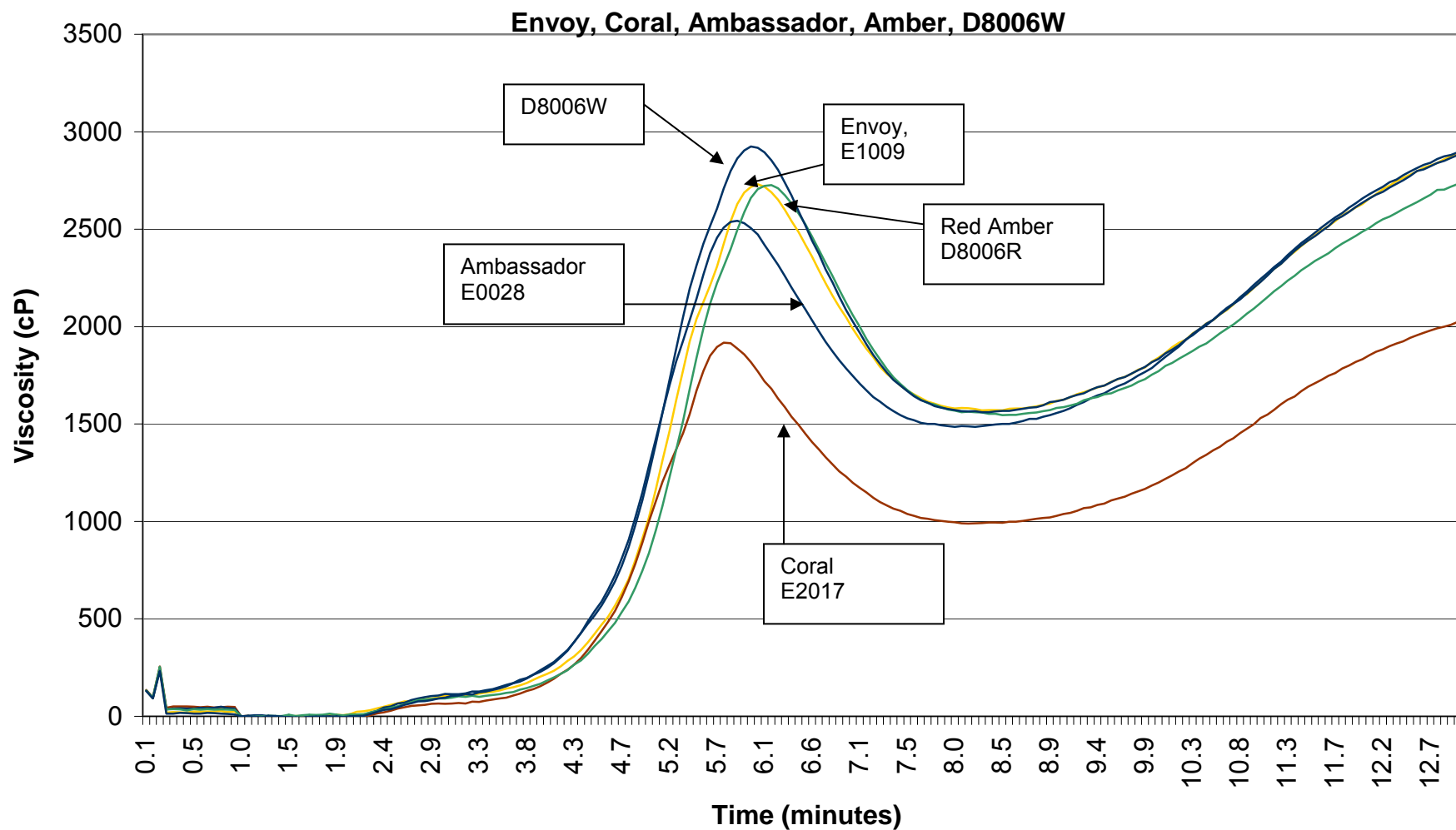
**Hopewell, Pioneer XW 06M, Pur 02444A1-23-9,  
Pur 03112A1-7-3, Pur 04287A1-10, Pur 99600A2-4-32, W 1377**



**Figure 3. Star of the West Milling RVA graphs for Set 2, 2008 QEC**



**Figure 4. Star of the West Milling RVA graphs for Set 3, 2008 QEC**



**Figure 5. Star of the West Milling RVA graphs for Set 4, 2008 QEC**

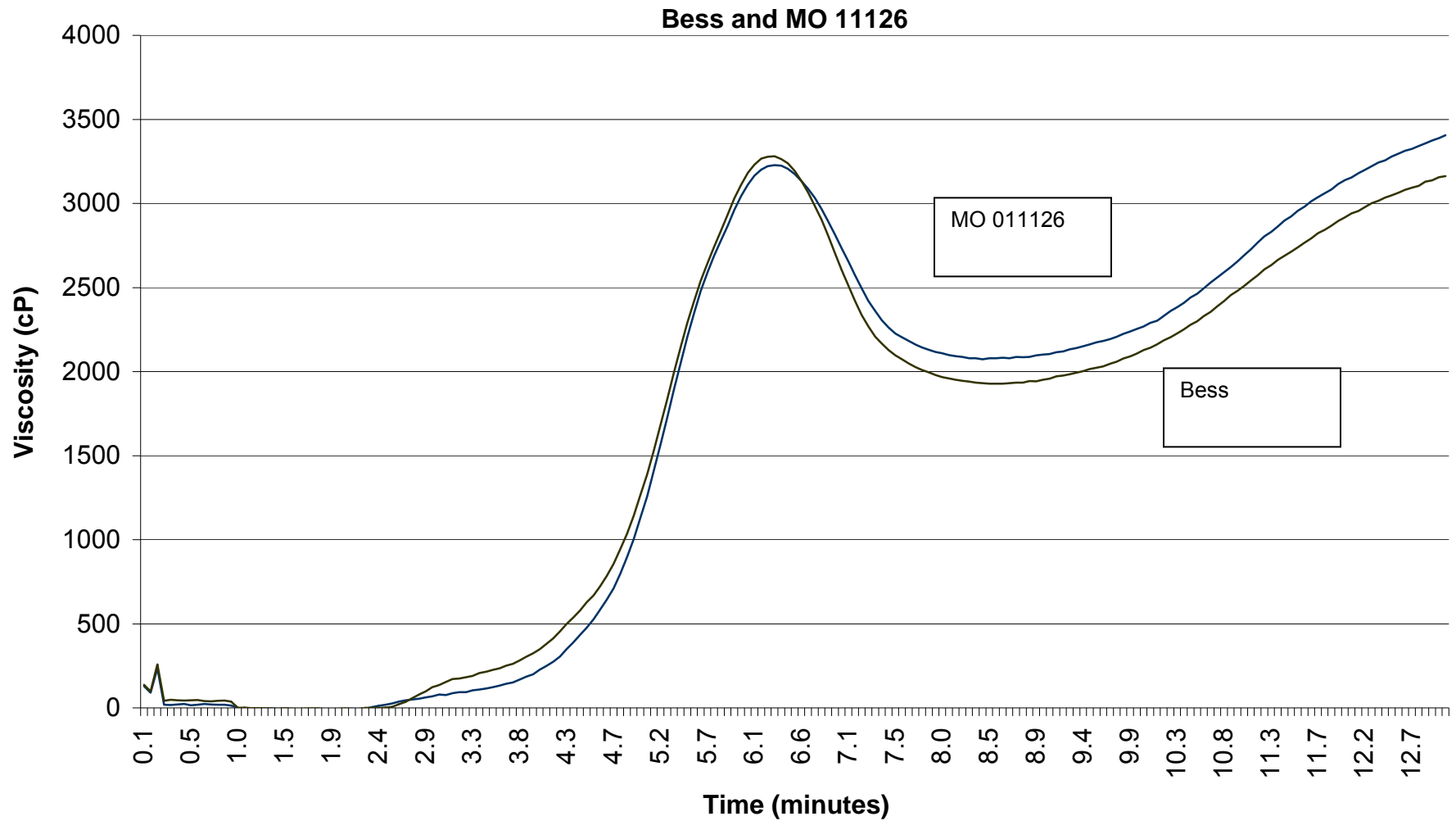


Table 21. US Wheat Associates Wheat Marketing Center evaluation of Japanese sponge cake results for 18 soft wheat cultivars, 2008 Wheat Quality Evaluation Council.

Variety	Cake Factors			Cake Scores		
	External	Crumb grain	Texture	Volume cc	Score	
Set 1	Pioneer 25R39 (XW 06M)	12	17	27	1204	56
	PUR 02444 A1-23-9	12	19	24	1221	55
	PUR 03112A1-7-3	12	18	21	1178	51
	PUR 04287A1-10	12	19	21	1198	52
	PUR 99600A2-4-32	13	17	24	1246	54
	W 1377	13	18	24	1177	55
	Hopewell (Check)	13	17	18	1214	48
Set 2	USG 3209 (Check)	12	15	27	1180	54
	SS 5205 (VA01W-205)	13	20	30	1275	63
	Shirley (VA03W-409)	13	19	27	1216	59
	Renwood 3434 (VA03W-434)	13	17	24	1175	54
Set 3	Envoy (E1009)	14	18	24	1209	56
	Coral (E2017)	12	19	27	1265	58
	Ambassador (E0028)	13	19	24	1232	56
	Red Amber (D8006R)	12	18	30	1247	60
	D8006 W (Check)	13	20	24	1217	57
Set 4	MO 11126	12	20	27	1275	59
	Bess (Check)	12	18	18	1206	48

Table 22. USDA-ARS Western Wheat Quality Laboratory comments for 18 soft wheat varieties, 2008 Wheat Quality Council.

Sample#	End-Product Performance		Overall Acceptability		Mitigating Physical/Chemical Properties & Comments
	Cookie score	Cake score	Score	Liked/Disliked Comments	
Pioneer 25R39 aa(XW 06M)	4	4	4		higher FSV & RVA partial waxy? Bright noodle color
Pur 02444A1-23-9	5	6	5.5		
Pur 03112A1-7-3	6	5	6.5		
Pur 04287A1-10	5	5	6		higher protein
Pur 99600A2-4-32	5	3	4		higher protein
W 1377	5	7	6		
Hopewell (Ck)	7	6	6.5		best overall baking of set
USG 3209 (Ck)	6	7	6		higher carbonate but not higher Break flr yield
SS 5205 (VA01W-205)	10	9	9		bright noodle color/ excellent all round/ <b>best of show</b>
Shirley (VA03W-409)	8	4	5.5		
Renwood 34334 (VA03W-434)	7	3	5		good cookie/ poor cake mixed results

Table 22 (Cont.). Western Wheat Quality Laboratory comments for 18 soft wheat varieties, 2008 Wheat Quality Council.

Envoy (E1009)	6	4	5	
Coral (E2017)	8	5	6.5	
Ambassador (E0028)	8	8	7.5	low pro an advantage
Red Amber (D8006R)	8	8	8	
D8006W (Ck)	8	9	8	low pro an advantage
MO 11126	9	9	8.5	low pro an advantage
Bess (Ck)	6	8	7	

Table 23. USDA-ARS Western Wheat Quality Laboratory grain evaluation of 18 soft winter wheat cultivars for 2008 Wheat Quality Council.

	Variety	Flour protein %	Flour protein %	Flour swelling volume MI	RVA peak Units	Flour SDS ml	Solvent retention capacity			
							Water %	Sodium carbon. %	Sucrose %	Lactic acid %
Set 1	Pioneer 25R39 (XW 06M)	0.38	9.4	21.0	182	89.6	56.4	73.9	100.8	99.8
	PUR 02444 A1-23-9	0.36	8.7	23.0	211	91.1	55.9	76.9	114.4	114.6
	PUR 03112A1-7-3	0.40	10.2	22.4	201	89.6	53.9	72.4	95.6	85.9
	PUR 04287A1-10	0.39	10.3	21.1	132	96.9	54.6	71.2	95.8	100.4
	PUR 99600A2-4-32	0.41	9.2	22.0	213	101.2	54.8	77.0	105.4	106.8
	W 1377	0.35	9.3	21.4	156	92.5	55.1	74.3	100.0	109.8
	Hopewell (Check)	0.40	9.0	20.5	167	95.4	53.9	78.0	98.4	108.2
Set 2	USG 3209 (Check)	0.43	6.8	22.0	156	57.7	59.8	80.2	111.2	88.6
	SS 5205 (VA01W-205)	0.36	7.6	21.7	169	78.0	52.0	68.2	90.6	108.6
	Shirley (VA03W-409)	0.39	7.0	23.4	148	44.7	54.2	71.7	97.8	79.2
	Renwood 3434 (VA03W-434)	0.38	9.4	20.1	124	98.3	54.2	70.6	101.0	106.4
Set 3	Envoy (E1009)	0.40	8.7	21.3	163	120.1	55.9	69.6	97.2	119.5
	Coral (E2017)	0.40	8.3	19.5	95	101.2	50.4	69.6	85.7	103.4
	Ambassador (E0028)	0.45	7.5	22.4	152	72.2	51.4	70.5	85.8	83.3
	Red Amber (D8006R)	0.44	8.1	22.5	166	99.8	52.3	71.2	87.2	102.4
	D8006 W (Check)	0.40	6.7	23.7	185	63.5	52.2	70.7	88.8	94.8
Set 4	MO 11126	0.33	7.9	23.3	233	85.3	49.9	67.6	95.0	115.8
	BESS (Check)	0.47	8.8	22.2	238	92.5	52.6	73.3	96.0	90.0



Table 24. USDA-ARS Western Wheat Quality Laboratory cookie and cake evaluation of 18 soft winter wheat cultivars for 2008 Wheat Quality Council.

	Variety	Mixograph		Sugar snap cookie		Sponge cake	
		Water absorp. %	Type	Diameter cm	Top grain score	Volume ml	Texture score
Set 1	Pioneer 25R39 (XW 06M)	57.4	5M	8.7	7	1220	17
	PUR 02444 A1-23-9	57.0	4M	8.9	6	1285	19
	PUR 03112A1-7-3	57.0	2M	9.1	7	1263	17
	PUR 04287A1-10	54.8	3M	8.7	6	1260	19
	PUR 99600A2-4-32	54.3	3M	8.8	6	1200	20
	W 1377	55.5	4M	8.8	7	1275	18
	Hopewell (Check)	54.3	5M	9.2	8	1265	18
Set 2	USG 3209 (Check)	54.8	6L	9.0	7	1275	19
	SS 5205 (VA01W-205)	52.3	4L	9.7	9	1340	20
	Shirley (VA03W-409)	25.2	2L	9.3	8	1210	19
	Renwood 3434 (VA03W-434)	53.6	4M	9.1	8	1195	17
Set 3	Envoy (E1009)	53.1	6M	9.0	8	1230	19
	Coral (E2017)	53.8	4M	9.3	8	1245	18
	Ambassador (E0028)	52.7	2M	9.5	9	1290	21
	Red Amber (D8006R)	53.1	6M	9.3	6	1285	20
	D8006 W (Check)	52.2	4L	9.3	8	1355	21
Set 4	MO 11126	53.1	7M	9.5	8	1375	22
	BESS (Check)	53.3	4M	9.1	8	1320	22

Table 25. USDA-ARS Western Wheat Quality Laboratory alkali noodle color evaluation of 18 soft winter wheat cultivars for 2008 Wheat Quality Council.

	Variety	Alkali noodle color @ 0 Hour			Alkali noodle color @ 24 Hour			
		L*	a*	b*	L*	a*	b*	Change in L*
Set 1	Pioneer 25R39 (XW 06M)	85.3	-1.6	16.8	78	-0.3	20.6	7.3
	PUR 02444 A1-23-9	84.8	-1.9	19	76.4	-0.5	26.7	8.4
	PUR 03112A1-7-3	83.2	-1.8	18.5	70.9	0.1	24.5	12.3
	PUR 04287A1-10	84.2	-1.5	17.1	70.5	0.8	25.1	13.7
	PUR 99600A2-4-32	85.3	-1.6	16	71.4	0.5	24.3	13.9
	W 1377	83.9	-1.9	18.7	73.8	0.5	21.0	10.1
	Hopewell (Check)	83.2	-1.8	20.4	69.9	1.0	23.8	13.3
Set 2	USG 3209 (Check)	83.7	-2.7	22.3	75.5	-0.6	26.6	8.2
	SS 5205 (VA01W-205)	86.0	-2.0	16.1	79.8	-1.2	23.3	6.2
	Shirley (VA03W-409)	83.4	-2.4	21.5	73.8	-0.9	25.0	9.6
	Renwood 3434 (VA03W-434)	89.2	-0.8	12	75.8	-0.3	26.4	13.4
Set 3	Envoy (E1009)	88.5	-1.1	14.7	74.7	-0.8	21.0	13.8
	Coral (E2017)	85.5	-2.1	18.3	71.8	0.1	25.4	13.7
	Ambassador (E0028)	85.7	-3.3	24.8	77.6	-1.6	31.8	8.1
	Red Amber (D8006R)	85.3	-2.2	19.8	73.8	-0.5	29.9	11.5
	D8006 W (Check)	86.2	-2.7	20.9	75.8	-1.3	29.3	10.4
Set 4	MO 11126	86.7	-2.6	19.9	78.1	-1.6	24.8	8.6
	BESS (Check)	85.4	-2.4	20.5	72.0	-0.5	28.1	13.4

Table 26. USDA-ARS Soft Wheat Quality Laboratory comments for 18 soft wheat varieties, 2008 Wheat Quality Council.

Sample#	End-Product Performance		Overall Acceptability		Mitigating Physical/Chemical Properties & Comments
	Cookie score	Liked/Disliked Comments	Score	Liked/Disliked Comments	
Pioneer 25R39 aa(XW 06M)	3	Small/hard cookie	3		
Pur 02444A1-23-9	6	Softer texture	6	Relative high sucrose	
Pur 03112A1-7-3	5		6	Good SRC profile	
Pur 04287A1-10	3	Small Cookie	4		
Pur 99600A2-4-32	5		5		
W 1377	4		6	Good SRC effectiveness	
Hopewell (Ck)	5		5		
USG 3209 (Ck)	3		3		
SS 5205 (VA01W-205)	8	Best cookie in set	8	Good SRC effectiveness	
Shirley (VA03W-409)	6		6		
Renwood 34334 (VA03W-434)	3		3		

Table 26 (Cont.). Western Wheat Quality Laboratory comments for 18 soft wheat varieties, 2008 Wheat Quality Council.

Envoy (E1009)	5		5	
Coral (E2017)	6	Soft texture	5	
Ambassador (E0028)	8	Best cookie in set	8	Relatively weak gluten
Red Amber (D8006R)	7		7	
D8006W (Ck)	7		7	
MO 11126	9		9	
Bess (Ck)	7	Relatively hard for the diameter	6	

Table 27. USDA-ARS Soft Wheat Quality Laboratory grain evaluation of 18 soft winter wheat cultivars for 2008 Wheat Quality Council.

	Variety	Grain test wt lb/bu	SKCS Analysis				Falling no. sec	Alpha-amylase abs.	Miag milling	
			Grain hardness score	Grain wt. mg	Grain moist. %	Grain dia. mm			Straight grade %	Break flour %
Set 1	Pioneer 25R39 (XW 06M)	62.6	49.8	33.5	8.1	2.36	389	0.072	72.5	25.6
	PUR 02444 A1-23-9	59.0	29.7	32.5	8.5	2.35	382	0.073	70.7	28.4
	PUR 03112A1-7-3	59.5	48.0	27.1	8.9	2.31	390	0.104	74.2	26.2
	PUR 04287A1-10	61.7	45.1	31.6	8.5	2.59	366	0.122	74.1	24.3
	PUR 99600A2-4-32	60.6	41.7	28.8	8.5	2.27	414	0.069	72.2	28.6
	W 1377	64.9	41.7	33.9	8.6	2.44	385	0.108	71.5	25.5
	Hopewell (Check)	59.4	17.7	31.3	10.0	2.26	362	0.118	72.0	30.3
Set 2	USG 3209 (Check)	62.1	24.6	40.1	13.2	2.66	442	0.097	72.7	28.9
	SS 5205 (VA01W-205)	61.8	3.5	37.0	12.3	2.47	439	0.072	74.6	32.0
	Shirley (VA03W-409)	60.2	8.7	39.1	13.2	2.49	448	0.074	75.9	30.6
	Renwood 3434 (VA03W-434)	59.4	23.8	27.7	12.7	2.21	417	0.086	73.1	27.8
Set 3	Envoy (E1009)	62.5	21.5	43.1	12.2	3.05	388	0.089	75.5	24.8
	Coral (E2017)	62.9	16.2	42.1	13.7	2.59	354	0.110	77.1	30.0
	Ambassador (E0028)	62.9	16.1	41.3	13.5	2.60	378	0.074	77.4	27.5
	Red Amber (D8006R)	64.1	20.3	44.5	12.1	2.70	430	0.077	75.5	24.8
	D8006 W (Check)	64.5	19.9	40.5	12.4	2.65	371	0.104	76.1	29.7
Set 4	MO 11126	60.0	-5.5	39.6	12.5	2.58	421	0.046	75.9	35.6
	BESS (Check)	63.5	30.3	27.8	13.0	1.96	421	0.076	74.7	31.4

Table 28. USDA-ARS Soft Wheat Quality Laboratory flour evaluation of 18 soft winter wheat cultivars for 2008 Wheat Quality Council.

Variety	Flour protein %	Flour pH	Damage starch %	Flour moist. %	Rapid Visco-analysis profile							
					Peak cP	Trough cP	Break-down cP	Final cP	Set-back cP	Peak time min	Pasting temp. C	Peak/Final ratio
Pioneer 25R39	9.06	6.10	4.34	13.45	3217	1644	1573	3107	1463	5.87	66.15	1.04
PUR 02444 A1-23-9	9.47	6.28	2.74	13.60	3579	1829	1751	3296	1467	5.93	68.23	1.09
PUR 03112A1-7-3	10.25	6.13	2.74	13.48	3470	1810	1660	3295	1485	6.03	75.80	1.05
PUR 04287A1-10	9.82	6.15	3.46	13.42	2566	1277	1289	2582	1305	5.77	66.60	0.99
PUR 99600A2-4-32	9.34	5.99	3.40	13.78	3633	1921	1712	3486	1566	6.00	75.40	1.04
W 1377	9.20	6.24	4.27	13.78	2971	1535	1437	3019	1484	5.83	82.78	0.98
Hopewell (Check)	7.80	6.07	1.87	13.47	3149	1629	1520	3288	1659	5.73	67.78	0.96
USG 3209 (Check)	7.11	6.56	4.72	13.51	3405	2208	1197	4191	1983	5.93	74.20	0.81
SS 5205	7.51	6.39	2.31	13.54	3504	2211	1294	4183	1972	5.93	82.35	0.84
Shirley	8.40	6.41	3.76	13.74	2953	2093	860	4055	1962	5.93	83.90	0.73
Renwood 3434	9.04	6.27	3.27	13.58	2749	1706	1043	3439	1733	5.73	83.55	0.80
Envoy	8.70	6.26	3.08	13.09	3203	1822	1381	3412	1590	5.93	82.30	0.94
Coral	8.21	6.33	2.42	13.42	2245	1169	1076	2483	1314	5.67	83.48	0.90
Ambassador	8.02	6.31	3.47	13.53	3086	1809	1277	3490	1681	5.80	74.30	0.88
Red Amber	7.66	6.55	2.80	13.31	3252	1718	1534	3168	1450	6.00	84.68	1.03
D8006 W (Check)	7.54	6.36	3.42	13.14	3472	1795	1677	3386	1591	5.90	74.18	1.03
MO 11126	8.67	6.16	0.79	13.15	3819	2300	1520	3894	1594	6.10	83.05	0.98
Bess (Check)	9.19	6.38	1.28	12.87	3831	2096	1735	3572	1476	6.07	68.48	1.07

Table 29. USDA-ARS Soft Wheat Quality Laboratory solvent retention capacity and wire-cut cookie of 18 soft winter wheat cultivars for 2008 Wheat Quality Council.

Variety	Solvent Retention Capacity					Wire-cut cookie				
	Water %	Sodium carbon. %	Sucrose %	Lactic acid %	Effective- ness ratio	Diameter cm	Stack height cm	Punch force g	Punch distance mm	Area g/sec
Pioneer XW 06M	57.4	76.4	94.9	95.7	0.56	14.55	2.41	1177	1.65	6028
PUR 02444 A1-23-9	55.2	77.8	102.3	105.0	0.58	15.85	2.09	1054	3.53	4351
PUR 03112A1-7-3	53.2	72.4	89.2	78.0	0.48	15.54	2.20	1020	2.68	4290
PUR 04287A1-10	53.6	72.3	92.4	92.3	0.56	14.45	2.44	1099	3.12	5684
PUR 99600A2-4-32	56.5	78.2	101.3	100.9	0.56	15.39	2.17	1107	2.08	4157
W 1377	56.9	76.6	95.4	108.1	0.63	15.05	2.27	1057	2.08	4721
Hopewell (Check)	52.8	76.3	90.6	102.7	0.62	15.89	2.12	1038	2.28	4053
USG 3209 (Check)	59.0	80.0	101.5	84.5	0.47	15.10	2.32	1067	2.69	5338
VA01W-205	51.9	67.4	86.5	100.7	0.65	16.09	2.07	1014	3.63	3708
VA03W-409	56.3	75.3	92.5	74.5	0.44	15.15	2.37	1147	2.93	5495
VA03W-434	53.5	70.6	92.0	96.8	0.60	15.07	2.26	1180	3.70	5793
Envoy	55.8	71.8	91.3	106.0	0.65	15.15	2.23	990	1.72	4217
Coral	51.5	71.2	83.9	93.1	0.60	15.86	2.06	947	2.77	3680
Ambassador	51.9	71.2	81.4	81.2	0.53	16.23	1.99	933	2.61	3481
Red Amber	51.3	70.1	82.5	93.5	0.61	15.76	2.10	1009	2.56	3652
D8006 W (Check)	54.7	74.5	83.3	86.7	0.55	15.81	2.01	981	2.17	3564
MO 11126	50.3	66.8	85.6	104.5	0.69	16.61	1.87	989	2.33	3257
Bess (Check)	53.5	73.8	87.0	80.1	0.50	15.87	2.03	1162	3.23	4267

Table 30. Summary product evaluation scores for the 2008 Wheat Quality Council evaluation of 18 soft winter wheat cultivars.

Product evaluations	ADM cookie	Con- Agra	Horizon	Kellogg	Kraft	Mennel	Siemer	Star of the West	Wheat Market. Center	USDA Pullman  Cookies	USDA Pullman  Cakes	USDA Wooster	Ave
Variety													
Pioneer 25R39 (XW 06M)	6	3	4.0			4	7	5		4	4	3	
PUR 02444 A1-23-9	8	5	5.0			3	8	8		5	6	6	
PUR 03112A1-7-3	8	5	4.5			2	9	5		6	5	5	
PUR 04287A1-10	8	5	4.0			2	8	7		5	5	3	
PUR 99600A2-4-32	8	4	4.0			3	8	6		5	3	5	
W 1377	8	4	4.0			3	9	6		5	7	4	
Hopewell (Check)	7	6	6.0			3	8	8		7	6	5	
USG 3209 (Check)	8	4	3.0			5.5	7	4		6	7	3	
SS 5205 (VA01W- 205)	8	9	6.5			5	9	8		10	9	8	
Shirley (VA03W-409)	8	5	4.0			5.5	8	6		8	4	6	
Renwood 3434 (VA03W-434)	8	6	4.0			4.5	7	5		7	3	3	
Envoy (E1009)	8	5	4.0			4	7	6		6	4	5	
Coral (E2017)	8	7	6.5			4		7		8	5	6	
Ambassador (E0028)	8	7	6.5			4.5		8		8	8	8	
Red Amber (D8006R)	8	6	4.5			4		7		8	8	7	
D8006 W (Check)	8	6	6.0			4		8		8	9	7	
MO 11126	7	9	8.5			3.5		8		9	9	9	
BESS (Check)	7	5	6.0			1		7		6	8	7	



Table 31. Summary overall performance scores for the 2008 Wheat Quality Council evaluation of 18 soft winter wheat cultivars.

Overall Evaluations	ADM cookie	Con- Agra	Horizon	Kellogg	Kraft	Mennel	Siemer	Star of the West	Wheat Marketing Center	USDA Pullman	USDA Wooster	Ave.
Variety												
Pioneer 25R39 (XW 06M)	7	3	5.5			4.5	7	6		4	3	
PUR 02444 A1-23-9	8	5	5.5			3.5	8	7		5.5	6	
PUR 03112A1-7-3	8	5	5.0			2	9	5		6.5	6	
PUR 04287A1-10	8	5	5.5			2	7	6		6	4	
PUR 99600A2-4-32	8	4	5.5			2.5	8	6		4	5	
W 1377	8	4	5.0			3.5	9	6		6	6	
Hopewell (Check)	7	6	7.0			3	9	7		6.5	5	
USG 3209 (Check)	8	4	4.5			5	6	3		6	3	
SS 5205 (VA01W-205)	8	9	7.5			5.5	9	8		9	8	
Shirley (VA03W-409)	8	5	5.0			5	9	5		5.5	6	
Renwood 3434 (VA03W-434)	8	6	5.5			4.5	7	4		5	3	
Envoy (E1009)	8	5	5.0			3.5	7	6		5	5	
Coral (E2017)	8	7	7.5			4		7		6.5	5	
Ambassador (E0028)	8	7	7.0			4		8		7.5	8	
Red Amber (D8006R)	8	6	5.5			4		7		8	7	
D8006 W (Check)	8	6	6.5			3.5		8		8	7	
MO 11126	7	9	9.0			4		8		8.5	9	
BESS (Check)	7	5	7.0			1.5		5		7	6	

## **Appendix I. Genotyping for Quality Traits and Materials and Methods of the USDA ARS Soft Wheat Quality Laboratory**

### **Genotyping for Quality Traits by the Soft Wheat Quality Laboratory October, 2008. By Anne Sturbaum, USDA-ARS Wooster**

Amplification for high molecular weight glutenins at the GluA1 locus, using the Ax1 or Ax2\* primer pair, identified the Ax2\* genotype in Pioneer 25R39, Pur 02444A1-23-9 and Pur 99600A2-4-32. All other varieties had the Ax1 genotype. There were no nulls among these samples.

PCR product patterns specific to the GluB1 locus indicated the By8 allele only for Bess and the By9 allele for USG3209, D8006W, Pioneer 25R39, Pur-03112A1-7-3, Pur04287A1-10, Pur99600A2-4-32, VA01W-205 and VA03W-409, and Coral (E2017). The remaining lines, Pur-02444A1-23-9, W 1377, Hopewell, VA03W-434, Envoy (E1009), Abassador (E0028), Amber (D8006R) and D8006W (CK) produced patterns characteristic for one of the By8\*, By15 or By18 genotypes. Primers specific to the Bx7 over-expressing allele amplified the appropriate product, with a 45 bp insertion, for D8006(W), Pur 02444A1-23-9, Pur04287A1-10, Ambassador (E0028), Amber (D8006R) and MO11126. Amplification for Pur04287A1-10 yielded both the over-expressing and the wild-type allele implicating some mixed seed for this line (6).

Amplification with primers specific for GluD1, Dx5 (3), generated a product with DNA from Pur04287A1-10, Amber (D8006R), D8006(W) and USG 3209, corresponding to the "5+10" genotype. Both the Dx5 and Dx2 products amplified in DNA from Pur03112A1-7-3, identifying mixed seed or the presence of heterozygotes in this line.

Primer combinations to identify low molecular weight glutenins at the GluA3 locus identified Pur04287A1-10, W 1377 and USG3209 with the *Glu-A3g* allele, Pur02444A1-23-9 and Pur03112A1-7-3 with the *Glu-A3d* allele, VA03W-434 and VA01W-205 with the *Glu-A3b* allele and Bess with the *Glu-A3f* allele. All others produced amplification patterns implicating the *Glu-A3c* allele (7).

Gliadin allele-specific primers identified only Pur03112A1-7-3 with the *GliD1.2* allele. All other varieties had the *GliD1.1* allele (5).

The Rye 1B/1R translocation was identified in varieties Pur03112A1-7-3, Pur 04287A1-10, VA03W-409, VA03W-434 and USG3209, as they produced an amplification product with primers specific for rye  $\omega$ -secalin. Although the 1BS LMW Glu (indicative of the presence of the short arm of the 1B chromosome) amplified as well in Pur03112A1-7-3, Pur 04287A1-10 and VA03W-434, the 1B translocation was confirmed for these varieties using an alternate primer set (Scm9) that differentiates the 1B and 1A translocations (1,8).

All genotypes in this set produced the anticipated banding patterns for normal amylose genotypes (non-waxy) at both the A and B GBSS loci (4).

Alleles of the *Vp1B* gene (Viviparous-1), as assayed using Vp1B3 primers, are associated with tolerance to preharvest sprouting. Pioneer25R39, Envoy (E1009), Amber (D8006R) and D8006(W) produced a product indicating tolerance to PHS, USG3209 amplified both a tolerant and susceptible type. All other varieties amplified the larger product, indicating probable susceptibility to PHS at this locus. The effect of this locus is likely less than the effect of red seed coat color. None of the cultivars were found to have the most resistant allele that has been identified in some Chinese wheat cultivars.

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## QEC Genotyping

<b>Cultivar</b>	<i>Bx7Oe</i> <sup>5</sup>	<i>GluA1</i> <sup>3</sup>	<i>GluB1</i> <sup>2</sup>	<i>GluD1</i> <sup>3</sup>	<i>LMW gltns</i> <sup>7</sup>	<i>Gliadins</i> <sup>6</sup>	<i>Vp1</i> <sup>9</sup>	<i>RyeTL</i> <sup>8</sup>	<i>Waxy</i> <sup>4</sup>
<b>Ambassador (E0028)</b>	<i>OE</i>	<i>Ax1</i>	<i>By other than By8 or By 9</i>	<i>Dx2</i>	<i>GluA3c</i>	<i>GliD1</i>	<i>Susceptible</i>	<i>0</i>	<i>WT</i>
<b>Red Amber (D8006R)</b>	<i>OE</i>	<i>Ax1</i>	<i>By other than By8 or By 9</i>	<i>Dx5</i>	<i>GluA3c</i>	<i>GliD1</i>	<i>Tolerant</i>	<i>0</i>	<i>WT</i>
<b>Bess</b>	<i>WT</i>	<i>Ax1</i>	<i>By8</i>	<i>Dx2</i>	<i>GluA3f</i>	<i>GliD1</i>	<i>Susceptible</i>	<i>0</i>	<i>WT</i>
<b>Coral (E2017)</b>	<i>WT</i>	<i>Ax1</i>	<i>By9</i>	<i>Dx2</i>	<i>GluA3c</i>	<i>GliD1</i>	<i>Susceptible</i>	<i>0</i>	<i>WT</i>
<b>D8006W (CK)</b>	<i>OE</i>	<i>Ax1</i>	<i>By other than By8 or By 9</i>	<i>Dx5</i>	<i>GluA3c</i>	<i>GliD1</i>	<i>Tolerant</i>	<i>0</i>	<i>WT</i>
<b>Envoy (E1009)</b>	<i>WT</i>	<i>Ax1</i>	<i>By other than By8 or By 9</i>	<i>Dx2</i>	<i>GluA3c</i>	<i>GliD1</i>	<i>Tolerant</i>	<i>0</i>	<i>WT</i>
<b>Hopewell(CK)</b>	<i>WT</i>	<i>Ax1</i>	<i>By other than By8 or By 9</i>	<i>Dx2</i>	<i>GluA3c</i>	<i>GliD1</i>	<i>Susceptible</i>	<i>0</i>	<i>WT</i>
<b>MO 11126</b>	<i>OE</i>	<i>Ax1</i>	<i>By other than By8 or By 9</i>	<i>Dx2</i>	<i>GluA3c</i>	<i>GliD1</i>	<i>Susceptible</i>	<i>0</i>	<i>WT</i>
<b>Pioneer 25R39</b>	<i>WT</i>	<i>Ax2*</i>	<i>By9</i>	<i>Dx2</i>	<i>GluA3c</i>	<i>GliD1</i>	<i>Tolerant</i>	<i>0</i>	<i>WT</i>
<b>Pur 02444A1-23-9</b>	<i>OE</i>	<i>Ax2*</i>	<i>By other than By8 or By 9</i>	<i>Dx2</i>	<i>GluA3d</i>	<i>GliD1</i>	<i>Susceptible</i>	<i>0</i>	<i>WT</i>
<b>Pur 04287A1-10</b>	<i>OE</i>	<i>Ax1</i>	<i>By9</i>	<i>Dx5</i>	<i>GluA3g</i>	<i>GliD1</i>	<i>Susceptible</i>	<i>1B/1R</i>	<i>WT</i>
<b>Pur 99600A2-4-32</b>	<i>WT</i>	<i>Ax2*</i>	<i>By9</i>	<i>Dx2</i>	<i>GluA3c</i>	<i>GliD1</i>	<i>Susceptible</i>	<i>0</i>	<i>WT</i>
<b>Pur03112A1-7-3</b>	<i>WT</i>	<i>Ax1</i>	<i>By9</i>	<i>Dx2/Dx5</i>	<i>GluA3d</i>	<i>GliD2</i>	<i>Susceptible</i>	<i>1B/1R</i>	<i>WT</i>
<b>USG 3209(CK)</b>	<i>WT</i>	<i>Ax1</i>	<i>By9</i>	<i>Dx5</i>	<i>GluA3g</i>	<i>GliD1</i>	<i>Tol/Sus</i>	<i>1B/1R</i>	<i>WT</i>
<b>VA01W-205</b>	<i>WT</i>	<i>Ax1</i>	<i>By9</i>	<i>Dx2</i>	<i>GluA3b</i>	<i>GliD1</i>	<i>Susceptible</i>	<i>0</i>	<i>WT</i>
<b>VA03W-409</b>	<i>WT</i>	<i>Ax1</i>	<i>By9</i>	<i>Dx2</i>	<i>GluA3c</i>	<i>GliD1</i>	<i>Susceptible</i>	<i>1B/1R</i>	<i>WT</i>
<b>VA03W-434</b>	<i>WT</i>	<i>Ax1</i>	<i>By other than By8 or By 9</i>	<i>Dx2</i>	<i>GluA3b</i>	<i>GliD1</i>	<i>Susceptible</i>	<i>1B/1R</i>	<i>WT</i>
<b>W 1377</b>	<i>WT</i>	<i>Ax1</i>	<i>By other than By8 or By 9</i>	<i>Dx2</i>	<i>GluA3g</i>	<i>GliD1</i>	<i>Susceptible</i>	<i>0</i>	<i>WT</i>

## Materials and Methods of the USDA-ARS Soft Wheat Quality Laboratory

### Kernel and Whole Wheat Tests

**Test Weight:** (AACC Method 55-10) Weight per Winchester bushel of cleaned wheat subsequent to the removal of dockage using a Carter-Day dockage tester. Units are recorded as pounds/bushel (lb/bu) and kilograms/hectoliter (kg/hl).

**1000 Kernel Weight:** Units are recorded as grams/ 1000 kernels of cleaned wheat.

**Single Kernel Characterization System (SKCS):** (AACC Method 55-31) SKCS distribution showing % soft (A), semi-soft (B), semi-hard (C), and hard (D); SKCS hardness index; SKCS moisture content; CKCS kernel size; and SKCS kernel weight; along with standard deviations.

**Whole Wheat Moisture:** (AACC Method 44-15A) Air-oven method.

**Whole Wheat Crude Protein:** nitrogen combustion analysis using Elementar Nitrogen Analyzer. Units are recorded in % protein converted from nitrogen x 5.7 and expressed on 14% moisture basis.

**Whole wheat Falling Numbers:** (AACC Method 56-81B) Units are expressed in seconds using the Perten Falling Numbers instrument.

### Milling Tests

**Miag Multomat Mill:** The Miag Multomat Mill is a pneumatic conveyance system consisting of eight pair of 254 mm diameter x 102 mm wide rolls, and ten sifting passages. Three pairs are corrugated employed as break rolls and five pair are smooth rolls utilized in the reduction process. Each sifting passage contains six separate sieves. The two top sieves for each of the break bolls are intended to be used as scalp screens for the bran. The third break sieving unit of the Soft Wheat Quality Laboratory (SWQL) Miag Multomat Mill was modified so that the top four sieves are employed to scalp bran. That modification increased the final bran sieving surface by 100% and essentially eliminated any loss of flour. Thus, the mill very closely approximates full scale commercial milling.

**Experimental Milling Procedure:** All SRW varieties are tempered to a 14.0% moisture level. Generally tempered wheat is held for at least 24 hours in order for the moisture to equilibrate throughout the grain. Wheat is introduced into the first break rolls at a rate of 54.4 Kg/hour (90 #/hour). Straight grade flour is a blend of the three break flour streams including the grader flour and the five reduction streams including the duster flour. The straight grade flour mean volume diameter

will be about 50 microns with an ash content usually between .42% and .52%. Flour generated by the (SWQL) Miag Multomat Mill very nearly represents that of commercially produced straight grade flour. Bran, head shorts, tail shorts and red dog are by-products which are not included with the flour. Flour yields will vary between 70% and 78% which is variety dependent due to milling quality differences and/or grain condition. Sprouted and/or shriveled kernels will negatively impact flour production. Recovery of all mill products will usually be about 99%. Least significant differences for straight grade flour yield and break flour yield are 0.75% and 0.82%, respectively.

### **Flour Tests**

**Flour Moisture:** (AACC Method 44-15A) Units are expressed as % of flour.

**Flour Crude Protein:** Estimated from Near Infra-Red (NIR) using a Unity NIR Analyzers. Values were calibrated with an Elementar brand nitrogen combustion analyzer. Protein was estimated by multiplying nitrogen percentage by a standard conversion factor (5.7) and expressed on a 14% moisture basis.

**Flour Ash:** (AACC Method 08-01) Basic method, expressed on 14% moisture basis.

**Flour Falling Numbers:** (AACC Method 56-81B) Units are expressed in seconds using the Perten Falling Numbers instrument.

**Flour Alpha Amylase activity:** (AACC Method 22-06) Units are expressed in  $\alpha$ -amylase activity as SKB units/gram (@ 25°C).

**Flour Lactic Acid, Sucrose, Water, and Sodium Carbonate Retention Capacities (SRC):** (AACC Method 56-11) Units are expressed as %.

Water absorption is correlated to and intended to predict Farinograph water absorption. Sucrose SRC is a measure of pentosan content, which can strongly affect water absorption in baked products. Soft wheat flours for cookies typically have a target of 95% or less when used by the US baking industry for biscuits and crackers. Sodium carbonate SRC increases as starch damage due to milling increases. Normal values for good milling soft varieties are 68% or less. Lactic acid measures gluten strength with “weak” soft varieties having values below 85% and strong gluten soft varieties having values, typically, above 105% or 110%.

**Flour Damaged Starch:** Chopin SDMatic starch damage instrument using the supplied AACC calibration.

**Dough Tests**

**Flour Viscosity Measurements (Rapid Visco-Analyzer (RVA) Method):** Viscosity units are in centipoise units, peak time in minutes, pasting temperature in degrees centigrade. The hot pasting viscosity/time analysis of starch and flour was accomplished using a Rapid Visco Analyzer (RVA), Model RVA-4 (Foss North America, Inc., Eden Prairie, MN). The "standard 1" heating profile of that instrument's software (Thermocline for Windows, version 2.0, Newport Scientific Pty. Ltd., Warriewood, NSW, Australia) was employed to produce pasting curves based on 4 g (14% moisture basis) flour and 25 ml deionized water. Maximum heating temperature was 95°C and minimum cooled temperature was 50 °C. Peak pasting viscosity, peak time, minimum (trough) viscosity during cooling, breakdown viscosity (difference between peak and minimum viscosities), final viscosity at the conclusion of cooling, and setback (difference between final and minimum viscosities) were determined for each sample.

**Experimental Baked Product Tests**

**Sugar Snap Cookie:** (AACC Method 10-52, micro method) Two-cookie expressed in cm, cookie top grain expressed in arbitrary units from unacceptable to outstanding, from 1 to 9, respectively.

**Wire Cut Cookie:** (AACC Method 10-53, Macro Method) When using this method, the texture (hardness) of the cookies are able to be determined.