MILLING AND BAKING TEST RESULTS FOR EASTERN SOFT WINTER WHEATS HARVESTED IN 2006

SUPPORTED BY:

THE QUALITY EVALUATION COMMITTEE OF THE SOFT WHEAT COUNCIL

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Table of Contents

Soft Wheat Quality Council

Mission, Policy, and Operating Procedure

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. The Soft Wheat Quality Council (SWQC) will provide an organization structure to evaluate the quality of soft wheat experimental lines and cultivars 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).

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 cultivars.
- Promote the enhancement of soft wheat quality in new cultivars.
- 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 cultivars 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 cultivar 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

Agri-Pro – June Hancock: plant breeder and contributor.
Beretta is an awnless soft red winter wheat. It has very good disease resistance and test weight. Beretta is a good choice for early planting with a medium maturity date. It is adapted to all soil types with very good winter survival.

Magnolia is a new wheat for 2007. It is awned with very good test weight and standability. It is broadly adapted throughout the Southeast with a normal planting date and medium-early maturity. Winter survival is good. Magnolia shows very good stripe rust resistance.

D02-8486 is projected to be released for 2008. It is broadly adapted throughout the Southeast and has a normal-to-late planting date with very early maturity. D02-8486 is awnless with good test weight. It shows excellent stripe rust resistance as well as very good leaf rust resistance.

University of Georgia – Jerry Johnson: plant breeder and contributor.
AGS 2000 is a high yielding, high test weight soft red winter wheat variety in the medium maturity group. It originated from a cross made in 1989 at the University of Georgia in Griffin GA. Its pedigree includes Pioneer 2555, Florida 302, and PF84301, which is an experimental line from Passo Fundo, Brazil. AGS 2000 is medium maturing, awned, white chaffed, medium tall, with good straw strength. It has a heavy wax on the plants at heading which gives it a distinctive grayish blue-green plant color. It is moderately resistant to currently predominant races of powdery mildew, moderately resistant to leaf rust and resistant to the predominant biotypes of Hessian Fly in the Southeast. AGS 2000 is broadly adapted variety (from Georgia to Arkansas to Virginia).

University of Missouri – Anne McKindrey: plant breeder, David Tague: contributor.
MPG 7921 is a soft red winter wheat check cultivar, developed by the University of Missouri and marketed as a branded cultivar in the Missouri and delta regions of the soft red winter wheat area.

MO 011126 line is currently being purified and increased for potential release. We believe it will be reasonably broadly adapted. It is unclear how far north or south the variety is adapted, although it yielded very well over the area of the Eastern Cooperative nursery in 2006. It is in the Eastern and the Southern nurseries in 2007. MO 011126 historically has had excellent yield and test weight potential in Missouri trials with test weight approaching a half pound of Roane. Heading date is about equal to Bess. The variety has moderately high levels of resistance to stripe rust and BYDV. It also appears to be moderately drought resistant. MO 011126 lacks the levels of Fusarium head blight resistance of Ernie, Truman, and Bess.

Purdue – Herb Ohm: plant breeder and contributor.
Brief descriptions of Purdue lines entered in the 2006 WQC milling and baking analysis
Patterson is a long-term soft red winter wheat check cultivar for the Corn-belt states.

P981477A1. Very winter hardy, moderately resistant to Fusarium head blight (resistance from Fundulea 201R). Has resistance to leaf rust, stem rust, soilborne mosaic, powdery mildew, excellent yield potential, high test weight, early maturity, awnless. Decision on release will be made after harvest in 2007.

P011007A1-14. Moderate resistance to Fusarium head blight (resistance from Fundulea 201R, Goldfield, and possibly Roane and Xing 117). Excellent yield potential, good test weight, strong straw, two days earlier than Patterson, awnless. Has resistance to yellow dwarf virus, leaf rust, stem rust, powdery mildew, soilborne mosaic. Decision on release will be made after harvest in 2007.

Virginia Tech. – Carl Griffey plant breeder and contributor

USG3209. Soft red winter wheat variety adapted to the mid-Atlantic region.

VA 02W-555. A soft red winter wheat derived from a three-way cross involving USG3209. VA 02W-555 is currently proposed for release in Virginia as a named licensed cultivar under PVP protection.

Source of Test Data

Cathy Butti - Agri-Pro, Berthoud, Colorado

Jill BryanEhr - Horizon Milling Co., Minnetonka, MN

Diane Gannon - Kraft-Nabisco, Inc., Toledo, Ohio

Jan Levenhagen - The Mennel Milling Co., Fostoria, Ohio

Mary Guttieri - Ohio State University, Wooster, Ohio

Allen Westendorf - Siemer Milling Co., Teutopolis, Illinois

Laurie Murphy - Star of the West Milling Co., Frankenmuth, Michigan

Doug Engle - USDA-ARS Western Wheat Quality Laboratory, Pullman, Washington

Ron Martin, USDA-ARS Soft Wheat Quality Laboratory, Wooster, Ohio

Milling Analysis and Ash Curves – USDA-ARS Soft Wheat Quality Laboratory, Wooster OH

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. Ash curves for 12 soft wheat cultivars, 2006 QEC

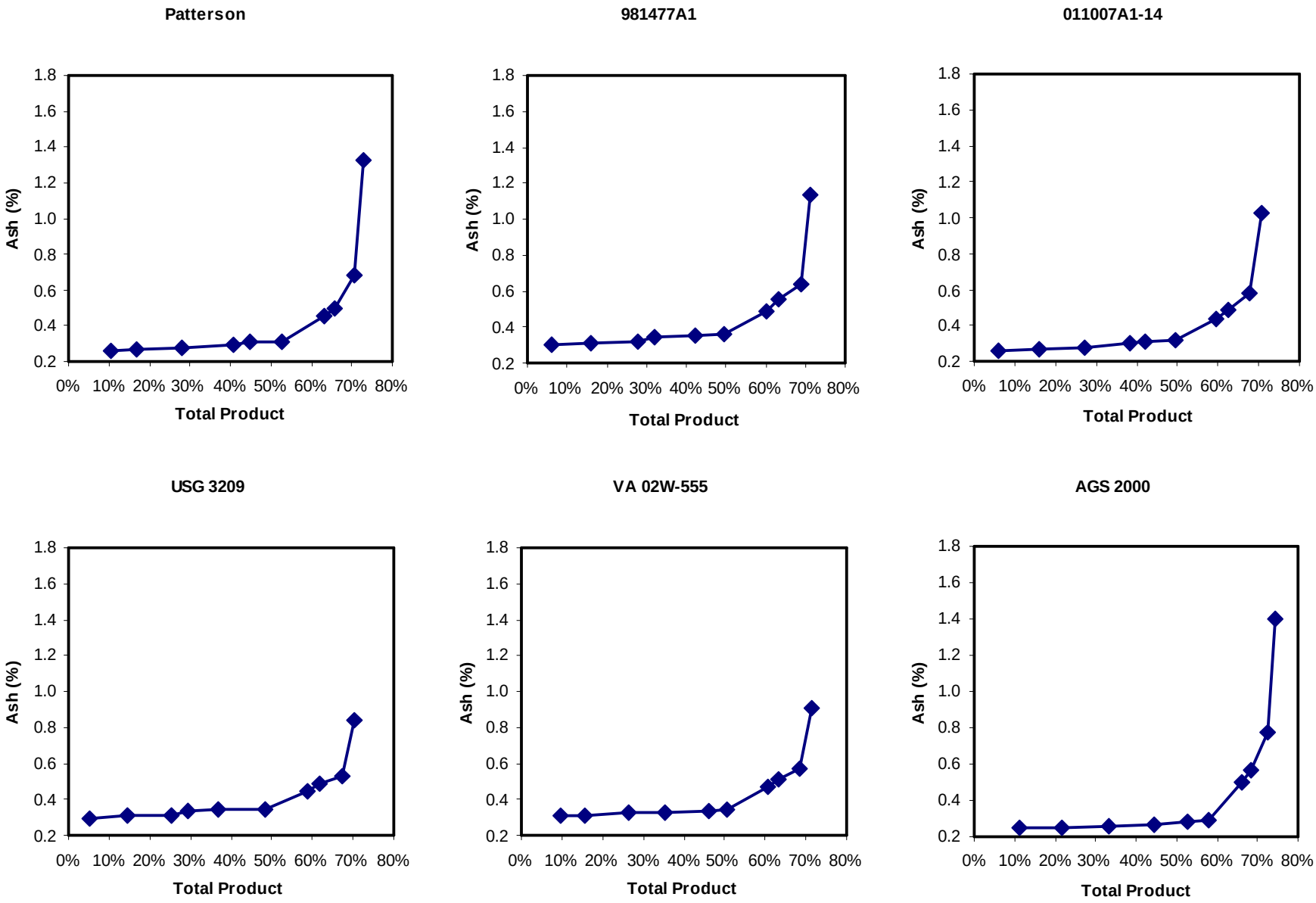


Figure 1. Ash curves for 12 soft wheat cultivars (continued), 2006 QEC

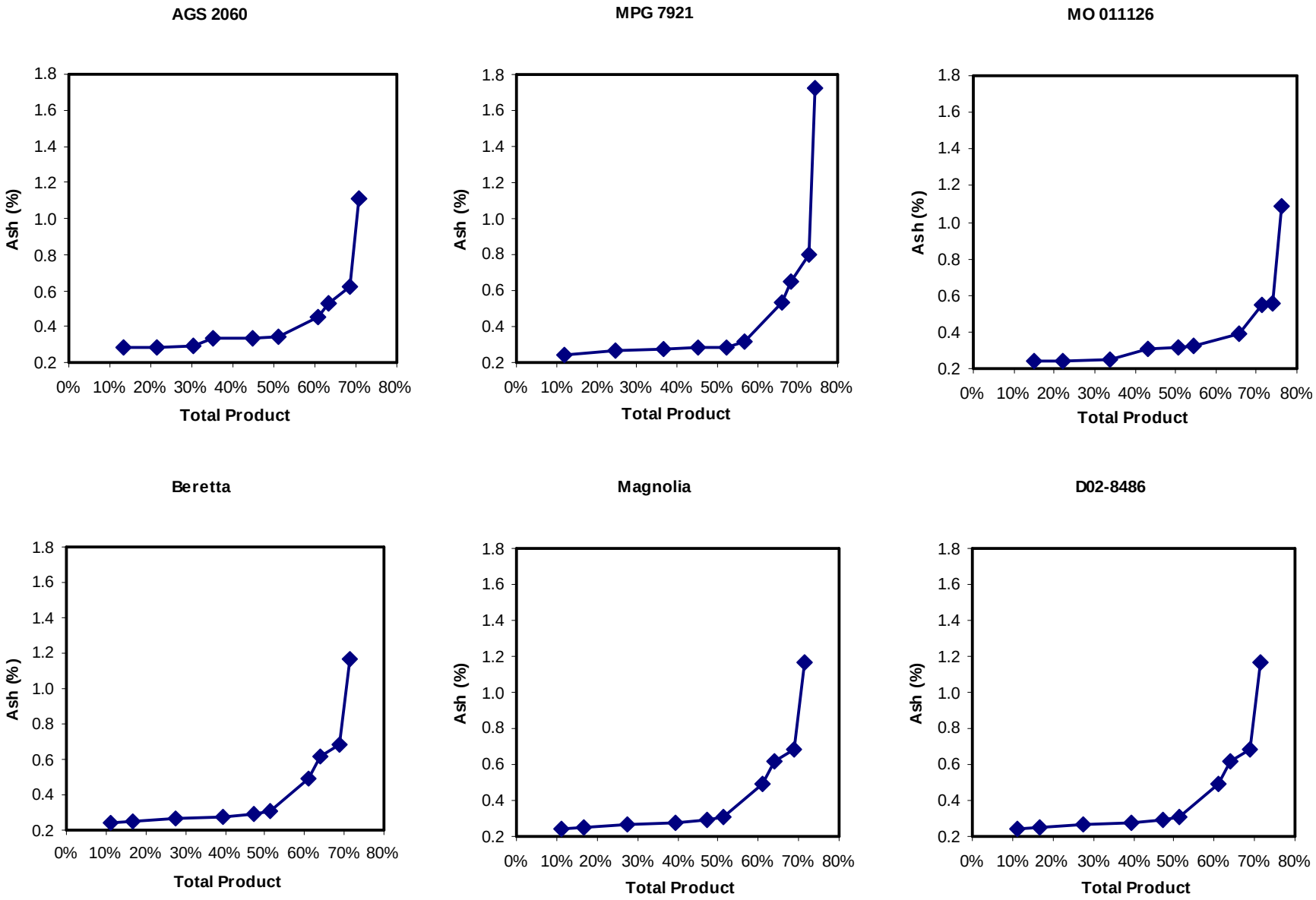


Table 1. Agri-Pro flour analytical values and cookie (10-52 method) data for 12 soft wheat cultivars, 2006 QEC.

Sample number	Cultivar	Moisture (%)	Protein (%)	Ash (%)	PPO (abs)	Cookies	
						Diameter (cm)	Top grain (1-9)
401	Patterson	13.5	8.80	0.358	0.67	19.2	7
402	981477A1	13.7	9.90	0.406	0.71	18.0	4
403	011007A1-14	13.7	8.50	0.354	0.76	18.8	6
404	USG 3209	13.6	7.40	0.384	0.85	18.2	5
405	VA02W-555	13.7	7.20	0.388	0.85	18.8	5
406	AGS 2000	13.5	9.60	0.376	1.05	18.4	3
407	AGS 2060	13.6	11.40	0.339	0.84	17.7	1
408	MPG 7921	13.6	8.30	0.387	0.98	19.0	8
409	MO 011126	13.8	9.75	0.341	1.06	18.0	4
410	Beretta	13.8	9.60	0.382	0.81	18.0	3
411	Magnolia	13.5	11.05	0.350	0.81	17.7	2
412	D02-8486	13.5	11.05	0.424	0.80	17.8	4

Table 2. Agri-Pro solvent retention capacity and color data for 12 soft wheat cultivars, 2006 QEC.

Sample number	Cultivar	Solvent Retention Capacity				Color			
		Sucrose (%)	Sodium carbonate (%)	Lactic acid (%)	Water (%)	Agtron	L	a	b
401	Patterson	91.75	66.28	114.83	50.69	69.7	86.46	-1.37	14.59
402	981477A1	94.70	66.85	105.26	54.84	64.7	86.11	-1.43	16.30
403	011007A1-14	88.87	66.76	97.55	51.42	68.0	86.33	-1.85	18.16
404	USG 3209	116.50	78.36	101.53	57.37	67.2	86.07	-1.88	17.37
405	VA02W-555	108.44	74.29	96.32	53.91	73.1	86.70	-2.11	18.12
406	AGS 2000	93.78	67.64	104.55	48.79	56.3	85.44	-0.98	15.25
407	AGS 2060	111.39	73.02	145.97	53.81	64.8	86.23	-0.92	13.79
408	MPG 7921	88.55	66.63	104.75	51.32	68.7	86.48	-1.46	15.57
409	MO 011126	92.98	66.76	113.73	52.07	67.1	86.37	-0.99	14.24
410	Beretta	101.01	68.62	115.25	52.68	58.6	85.31	-1.39	17.64
411	Magnolia	103.86	66.40	131.92	52.92	62.9	86.00	-0.92	15.29
412	D02-8486	93.32	68.40	91.20	55.57	62.3	86.01	-0.68	13.60

Table 3. Agri-Pro mixograph data for 12 soft wheat cultivars, 2006 QEC.

Sample number	Cultivar	Absorption (%)	Peak time (min)	Peak height (cm)	Tolerance	Tolerance rating
401	Patterson	54.5	2.75	4.60	664	7
402	981477A1	55.5	2.00	5.00	769	8
403	011007A1-14	53.2	2.00	4.80	620	8
404	USG 3209	53.0	1.25	4.80	1069	7
405	VA02W-555	52.0	1.75	4.80	906	7
406	AGS 2000	52.0	2.50	5.00	764	7.5
407	AGS 2060	57.5	2.50	5.20	731	8
408	MPG 7921	52.0	2.50	4.85	693	8
409	MO 011126	54.0	2.00	5.40	693	8
410	Beretta	54.0	2.50	4.80	621	9
411	Magnolia	58.7	2.00	5.30	445	9
412	D02-8486	58.0	1.50	5.30	470	9

Table 4. Agri-Pro cookie dough and end product ratings and comments for 12 soft wheat cultivars, 2006 QEC.

Sample number	Cultivar	Dough or batter rating	Comments on likes and dislikes	End-product performance rating	Comments on likes and dislikes
401	Patterson (ck)	7	Nice Dough	7	Nice Top Grain Good spread
402	981477A1	7	Nice Dough	4	Small with not very much Top grain
403	011007A1-14	7	Nice Dough	6	Okay but not as nice as Ck
404	USG 3209 (ck)	7	Nice Dough	5	Not very good Top grain
405	VA02W-555	7	Nice Dough	5	Same Top grain as Ck. With Better spread
406	AGS 2000 (ck)	7	Nice Dough	3	Not very good Top Grain
407	AGS 2060	7	Nice Dough	1	No Top grain at all. Did Not have good spread
408	MPG 7921 (ck)	7	Nice Dough	8	Very Nice Top Grain Good spread
409	MO 011126	7	Nice Dough	4	Not Very Good Top grain
410	Beretta (ck)	7	Nice Dough	3	Not very Good Top grain
411	Magnolia	7	Nice Dough	2	Almost No Top Grain Not good Spread
412	D02-8486	7	Nice Dough	4	Not very good Top grain. Better then the Checks

Table 5. Agri-Pro overall acceptability for cookies rating and comments for 12 soft wheat cultivars, 2006 QEC.

Sample number	Cultivar	Overall Acceptability Rating	Comments on likes and dislikes	Mitigating physical/chemical properties & comments
401	Patterson (ck)	7	best of group	
402	981477A1	6	poorer color, small cookie, no TG	
403	011007A1-14	3	yellow color, good SRC data	
404	USG 3209 (ck)	5	too low prot	
405	VA02W-555	5	too low protein, great color	
406	AGS 2000 (ck)	3	poor color	
407	AGS 2060	1	unusual SRC	
408	MPG 7921 (ck)	8	nice cookie	
409	MO 011126	3	smaller cookie, no TG	
410	Beretta (ck)	3	good protein, typical SRW mixo, poor cookies	
411	Magnolia	3	good protein, typical SRW mixo, poor cookies	
412	D02-8486	3	good protein, typical SRW mixo, poor cookies	

Table 6. Horizon Milling solvent retention capacity and cookie data (10-50D method) for 12 soft wheat cultivars, 2006 QEC.

Sample Number	Cultivar	Solvent Retention Capacity				Cookies (10-50D)				
		Sucrose (%)	Sodium carbonate (%)	Lactic acid (%)	Water (%)	W/T Ratio	Spread factor	Average diameter (mm)	Crust (1-5)	Score
401	Patterson	94.5	71.1	121.9	49.0	8.24	80.4	80.2	4.5	77
402	981477A1	96.5	72.0	121.7	50.0	7.57	73.9	78.7	4.5	56
403	011007A1-14	93.0	71.5	106.8	50.7	8.03	78.4	79.5	4.0	77
404	USG 3209	114.4	84.3	109.5	57.4	7.80	76.1	77.2	4.0	69
405	VA02W-555	105.7	80.6	101.1	53.5	7.66	74.8	78.4	3.5	60
406	AGS 2000	93.6	69.7	116.1	48.6	7.77	75.9	79.5	4.0	64
407	AGS 2060	106.6	74.3	152.4	51.9	8.03	78.4	78.2	4.5	64
408	MPG 7921	87.3	68.7	112.3	49.9	7.98	77.9	79.0	3.0	81
409	MO 011126	95.1	69.7	124.4	52.4	7.34	71.7	77.6	4.5	52
410	Beretta	101.4	73.0	128.4	55.3	7.60	74.1	77.1	4.5	54
411	Magnolia	108.9	71.3	135.9	52.4	7.43	72.5	77.2	4.5	54
412	D02-8486	95.0	71.3	100.8	45.4	6.67	65.1	75.9	4.5	37

Table 7. Horizon Milling cookie data (10-53 method) for 12 soft wheat cultivars, 2006 QEC.

Sample number	Cultivar	W/T Ratio	Spread factor	Average diameter (mm)	Crust (1-5)	Hardness (g)	Fracturability (mm)	Score
401	Patterson	8.73	83.6	105.8	5.0	3546	0.594	77
402	981477A1	7.79	74.6	103.4	5.0	4170	0.643	52
403	011007A1-14	8.47	81.2	105.5	5.0	3117	0.599	75
404	USG 3209	7.52	72.1	101.1	5.0	3875	0.611	48
405	VA02W-555	7.73	74.0	102.6	5.0	3862	0.611	54
406	AGS 2000	7.71	74.8	104.1	5.0	3965	0.548	54
407	AGS 2060	8.58	83.2	104.6	5.0	4098	0.545	77
408	MPG 7921	8.34	79.9	105.2	5.0	2815	0.557	69
409	MO 011126	8.06	77.3	103.1	5.0	3416	0.577	62
410	Beretta	7.52	72.9	102.8	5.0	3711	0.652	62
411	Magnolia	7.70	74.7	101.4	5.0	4426	0.559	54
412	D02-8486	6.89	66.0	100.4	5.0	4274	0.619	37

Table 8. Horizon Milling cookie dough and end product ratings and comments for 12 soft wheat cultivars, 2006 QEC.

Sample number	Cultivar	Dough or batter rating	Comments on likes and dislikes	End-product performance rating	Comments on likes and dislikes
401	Patterson (ck)	8	slightly firm, slightly dry	8	good SF and crust
402	981477A1	8	slightly firm, slightly dry	4	lower SF but crust comparable to check
403	011007A1-14	8	slightly firm, slightly dry	8	good SF; crust slightly less than check
404	USG 3209 (ck)	8	slightly firm, slightly dry	7	average SF for group
405	VA02W-555	6	slightly firm, dry	4	slightly lower SF and lower crust than check
406	AGS 2000 (ck)	6	slightly firm and dry	6	average SF for group
407	AGS 2060	6	slightly firm and dry	7	good SF and crust; slightly better than check
408	MPG 7921 (ck)	8	slightly soft, slightly tacky	7	good SF but lowest crust score
409	MO 011126	8	slightly soft, slightly tacky	4	low SF but good crust
410	Beretta (ck)	7	slightly soft, slightly dry	4	slightly poor SF but good crust
411	Magnolia	7	slightly soft, slightly dry	4	poor SF but good crust; comparable to check
412	D02-8486	7	slightly soft, slightly dry	2	very poor SF, poorest in group

Table 9. Horizon Milling overall acceptability for cookies rating and comments for 12 soft wheat cultivars, 2006 QEC.

Sample number	Cultivar	Overall acceptability rating	Comments on likes and dislikes	Mitigating physical/chemical properties & comments
401	Patterson (ck)	8	good overall dough and cookie traits	better SRC profile for cookies
402	981477A1	6	lower SF	slightly higher H_2O and sucrose SRC, higher protein, higher ash
403	011007A1-14	8	comparable to check	slightly higher H_2O, comparable protein and ash
404	USG 3209 (ck)	7.5	above average dough and SF	low protein, highest H_2O and sucrose values
405	VA02W-555	5	lower performing in dough and cookie	low protein, high ash, better SRC profile than check but more fitting for a cracker
406	AGS 2000 (ck)	6	average	better SRC profile for cookies
407	AGS 2060	6.5	slightly better than check	high protein, high H_2O and sucrose
408	MPG 7921 (ck)	7.5	good SF and dough, low crust	lowest sucrose value, good cookie profile SRC
409	MO 011126	6	low SF but good dough and crust	lowest ash
410	Beretta (ck)	5.5	slightly below average in group	high H_2O and sucrose
411	Magnolia	5.5	comparable to check	low ash & slightly higher protein; high H_2O and sucrose
412	D02-8486	4.5	worst overall performer	high ash and higher protein, SRC good cookie profile

Table 10. Kraft Foods flour analytical values for 12 soft wheat cultivars, 2006 QEC.

Sample number	Cultivar	Moisture (%)	Protein (%)	Ash (%)	pH	Falling number (sec)
401	Patterson	13.8	8.62	0.359	6.15	403
402	981477A1	13.9	9.64	0.420	6.08	375
403	011007A1-14	13.9	8.27	0.360	6.08	448
404	USG 3209	13.7	7.13	0.369	6.15	434
405	VA02W-555	13.9	7.03	0.400	6.18	425
406	AGS 2000	13.8	9.34	0.379	6.00	493
407	AGS 2060	13.7	11.25	0.389	6.08	406
408	MPG 7921	13.8	8.07	0.399	6.28	377
409	MO 011126	13.8	9.60	0.339	6.17	371
410	Beretta	13.9	9.41	0.390	6.12	391
411	Magnolia	13.6	10.84	0.358	6.16	374
412	D02-8486	13.7	10.84	0.429	6.20	381

Table 11. Kraft Foods Alveograph and Farinograph data for 12 soft wheat cultivars, 2006 QEC.

		Alveograph				Farinograph		
Sample number	Cultivar	P (mm)	L (mm)	W (10-4 joules)	W@L=100 (10-4 joules)	Absorption (%)	Stability (min)	Mixing tolerance index (BU)
401	Patterson	34	130	133	111	51.3	1.2	65
402	981477A1	34	138	131	107	52.4	4.7	47
403	011007A1-14	36	116	101	94	54.0	0.8	129
404	USG 3209	64	45	110	189	54.6	0.7	103
405	VA02W-555	51	70	106	130	54.0	0.8	89
406	AGS 2000	36	124	134	117	51.0	2.1	29
407	AGS 2060	34	163	172	119	53.0	4.0	34
408	MPG 7921	32	107	92	88	51.5	0.7	114
409	MO 011126	42	145	137	113	55.4	2.5	99
410	Beretta	47	129	149	129	53.8	1.1	65
411	Magnolia	47	170	171	128	56.2	2.9	58
412	D02-8486	40	138	118	102	57.7	1.6	128

Table 12. Kraft Foods solvent retention capacity data for 12 soft wheat cultivars, 2006 QEC.

Sample number	Cultivar	Solvent retention capacity test			
		Sucrose (%)	Sodium carbonate (%)	Lactic acid (%)	Water (%)
401	Patterson	95.6	69.6	117.1	48.8
402	981477A1	96.8	71.4	113.2	50.1
403	011007A1-14	95.1	71.5	94.0	50.6
404	USG 3209	114.6	82.4	101.4	56.2
405	VA02W-555	109.9	78.1	95.1	55.8
406	AGS 2000	99.4	69.2	109.3	49.0
407	AGS 2060	120.5	73.3	151.0	53.2
408	MPG 7921	91.4	69.2	112.3	50.7
409	MO 011126	99.4	72.7	112.6	51.9
410	Beretta	106.5	73.5	119.1	53.1
411	Magnolia	111.4	71.1	132.4	52.3
412	D02-8486	99.0	70.5	94.7	55.1

Table 13. Kraft Foods dough and end product ratings and comments for 12 soft wheat cultivars, 2006 QEC.

Sample number	Cultivar	Dough or batter rating	Comments on likes and dislikes	End-product performance rating	Comments on likes and dislikes
401	Patterson (ck)	8	nice dough characteristics	n/c	n/c
402	981477A1	3.5	slow and sticky	4	normal
403	011007A1-14	8	nice dough characteristics	n/c	n/c
404	USG 3209 (ck)	6	extruded smooth; easy clean	5	Small "L" ; Quick Bubbles
405	VA02W-555	7	good extrusion	4	Quick small bubbles
406	AGS 2000 (ck)	7	extruded "semi-slow"	8	nice dough consistancy
407	AGS 2060	7	extruded slow ; easy clean	9	Large "L" ; large bubble
408	MPG 7921 (ck)	4	sticky extrusion	4.5	normal
409	MO 011126	4	little sticky	6	Large "L" ; Nice
410	Beretta (ck)	7	extruded smooth, easy clean	8	Large bubbles
411	Magnolia	6	"Normal" to "Better"	6	Large "L" ; Small Bubble
412	D02-8486	4	easy clean, patties semi-sticky	5	Normal

Table 14. Kraft Foods overall acceptability rating and comments for 12 soft wheat cultivars, 2006 QEC.

Sample number	Cultivar	Overall acceptability rating	Comments on likes and dislikes	Mitigating physical/chemical properties & comments
401	Patterson (ck)	n/c	n/c	
402	981477A1	n/c	n/c	
403	011007A1-14	n/c	n/c	
404	USG 3209 (ck)	n/c	n/c	
405	VA02W-555	n/c	n/c	
406	AGS 2000 (ck)	n/c	n/c	
407	AGS 2060	7	did not break down rapidly	
408	MPG 7921 (ck)	n/c	sticky extrusion; breaks down quickly	
409	MO 011126	n/c	n/c	
410	Beretta (ck)	6	did not break down rapidly	
411	Magnolia	n/c	n/c	
412	D02-8486	n/c	n/c	

Table 15. Mennel Milling flour analytical values for 12 soft wheat cultivars, 2006 QEC.

Sample number	Cultivar	Moisture (%)	Protein (%)	Ash (%)	pH	Falling number (sec)	Amylograph (BU)	Brookfield viscosity (cps)	Damaged starch (%)
401	Patterson	13.74	8.78	0.358	5.99	344	640	64	2.82
402	981477A1	13.60	9.85	0.416	5.98	329	538	89	2.88
403	011007A1-14	13.44	8.42	0.353	6.08	338	466	47	3.34
404	USG 3209	13.60	7.29	0.353	6.06	372	537	100+	3.63
405	VA02W-555	13.94	7.26	0.359	6.07	353	491	73	3.84
406	AGS 2000	14.00	9.55	0.356	5.78	372	668	86	2.99
407	AGS 2060	13.68	11.34	0.365	5.73	383	716	100+	2.60
408	MPG 7921	13.93	8.22	0.383	6.15	325	419	40	3.53
409	MO 011126	13.36	9.76	0.353	5.95	335	442	68	3.43
410	Beretta	14.00	9.53	0.355	6.02	316	542	82	3.33
411	Magnolia	13.46	10.94	0.405	5.96	298	422	100+	3.18
412	D02-8486	13.57	11.05	0.427	6.00	335	191	54	4.44

Table 16. Mennel Milling solvent retention capacity and Farinograph values for 12 soft wheat cultivars, 2006 QEC.

Sample number	Cultivar	Solvent Retention Capacity				Farinograph				
		Sucrose (%)	Sodium carbonate (%)	Lactic acid (%)	Water (%)	Absorption (%)	Arrival time (min)	Peak time (min)	Stab-ility (min)	Mixing tolerance index (BU)
401	Patterson	98.5	70.5	125.1	50.4	50.8	0.5	1.1	4.0	77
402	981477A1	99.1	70.9	121.2	50.3	51.2	0.9	2.8	7.3	46
403	011007A1-14	94.9	71.6	107.5	52.4	51.6	0.5	1.3	3.5	83
404	USG 3209	117.0	85.4	110.6	58.5	53.4	0.6	1.3	3.4	62
405	VA02W-555	114.1	80.7	103.9	56.1	53.1	0.7	1.5	3.0	80
406	AGS 2000	104.9	71.1	119.3	51.2	50.5	0.4	1.3	5.2	66
407	AGS 2060	126.5	76.9	slid out	54.8	51.6	1.4	3.5	12.1	35
408	MPG 7921	94.1	69.1	116.0	53.0	50.6	0.4	1.2	2.3	87
409	MO 011126	99.8	71.3	124.4	53.3	53.7	0.7	2.0	4.0	76
410	Beretta	109.0	74.0	130.3	55.2	52.8	0.6	1.4	4.9	56
411	Magnolia	114.9	71.6	141.4	54.5	54.6	1.2	3.2	7.1	51
412	D02-8486	99.9	70.6	103.7	55.5	55.7	0.9	2.0	3.9	74

Table 17. Mennel Milling RVA data for 12 soft wheat cultivars, 2006 QEC.

Sample number	Cultivar	Peak (RVAu)	Trough (RVAu)	Breakdown (RVAu)	Final (RVAu)	Setback (RVAu)	Peak/Final
401	Patterson	368.63	237.96	130.67	414.13	176.17	0.890
402	981477A1	329.55	240.29	89.25	410.04	169.75	0.804
403	011007A1-14	340.55	235.71	104.83	396.46	160.75	0.859
404	USG 3209	374.29	285.50	88.79	484.96	199.46	0.772
405	VA02W-555	354.13	267.46	86.67	476.38	208.92	0.743
406	AGS 2000	408.92	263.29	145.63	424.88	161.58	0.962
407	AGS 2060	385.21	230.88	154.34	377.25	146.38	1.021
408	MPG 7921	337.34	195.04	142.30	345.33	150.29	0.977
409	MO 011126	349.05	219.46	129.59	366.80	147.34	0.952
410	Beretta	357.42	231.67	125.75	397.96	166.29	0.898
411	Magnolia	335.50	197.34	138.19	346.29	148.96	0.969
412	D02-8486	245.54	145.54	100.00	279.63	134.09	0.878

Table 18. Mennel Milling biscuit (10-31B method) and cookie (10-50D method) baking data for 12 soft wheat cultivars, 2006 QEC.

Sample number	Cultivar	Biscuits (10-31B)			Cookies (10-50D)			
		Weight (g)	Height (mm)	H/W	Width (mm)	Thickness (mm)	W/T	Spread Factor
401	Patterson	108.8	165.0	1.52	494	58.3	8.48	81.2
402	981477A1	118.4	178.5	1.51	480	64.3	7.46	71.6
403	011007A1-14	117.5	181.0	1.54	492	61.0	8.07	77.3
404	USG 3209	109.2	153.5	1.41	466	64.3	7.25	69.5
405	VA02W-555	110.4	162.0	1.47	481	65.3	7.36	70.6
406	AGS 2000	121.6	180.0	1.48	489	60.8	8.05	77.1
407	AGS 2060	126.0	203.5	1.62	484	57.8	8.38	80.3
408	MPG 7921	114.2	166.5	1.46	492	62.8	7.83	75.1
409	MO 011126	129.6	186.5	1.44	477	65.8	7.25	69.5
410	Beretta	116.6	180.0	1.54	477	64.5	7.40	70.9
411	Magnolia	119.5	170.5	1.43	472	62.2	7.59	72.7
412	D02-8486	120.6	183.0	1.52	463	70.5	6.57	62.9

Table 19. Mennel Milling biscuit batter and end product ratings and comments for 12 soft wheat cultivars, 2006 QEC.

Sample number	Cultivar	Dough or batter rating	Comments on likes and dislikes	End-product performance rating	Comments on likes and dislikes
401	Patterson (ck)	8		5	
402	981477A1	8		7	
403	011007A1-14	7		7	
404	USG 3209 (ck)	8		4	
405	VA02W-555	8		5	
406	AGS 2000 (ck)	6		7	
407	AGS 2060	4		9	
408	MPG 7921 (ck)	8		6	
409	MO 011126	5		7	
410	Beretta (ck)	8		7	
411	Magnolia	4		6	
412	D02-8486	5		7	

Table 20. Mennel Milling overall acceptability for biscuits rating and comments for 12 soft wheat cultivars, 2006 QEC.

Sample number	Cultivar	Overall acceptability rating	Comments on likes and dislikes	Mitigating physical/chemical properties & comments
401	Patterson (ck)	5		
402	981477A1	7		
403	011007A1-14	7		
404	USG 3209 (ck)	6		
405	VA02W-555	5		
406	AGS 2000 (ck)	7		
407	AGS 2060	7		
408	MPG 7921 (ck)	7		
409	MO 011126	6		
410	Beretta (ck)	8		
411	Magnolia	6		
412	D02-8486	6		

Table 21. Mennel Milling cookie dough and end product ratings and comments for 12 soft wheat cultivars, 2006 QEC.

Sample number	Cultivar	Dough or batter rating	Comments on likes and dislikes	End-product performance rating	Comments on likes and dislikes
401	Patterson (ck)	8	Slightly Sticky	8	Largest SF
402	981477A1	8	Slightly Stiff	7	Sl. Small SF
403	011007A1-14	8	Slightly Sticky	8	
404	USG 3209 (ck)	6	Stiff / Dry Dough	6	Sl. Dark; Small SF
405	VA02W-555	7	Stiff Dough	7	Sl. Dark; Small SF
406	AGS 2000 (ck)	8	Slightly Dry	8	
407	AGS 2060	8	Slightly Dry	8	Lightest Color
408	MPG 7921 (ck)	8		7	Sl. Small SF
409	MO 011126	8		6	Small SF
410	Beretta (ck)	8	Slightly Dry	7	Sl. Dark; Small SF
411	Magnolia	8	Slightly Dry	7	Sl. Small SF
412	D02-8486	7	Stiff Dough	6	Smallest SF

Table 22. Mennel Milling overall acceptability for cookies rating and comments for 12 soft wheat cultivars, 2006 QEC.

Sample number	Cultivar	Overall acceptability rating	Comments on likes and dislikes	Mitigating physical/chemical properties & comments
401	Patterson (ck)	8		SF = 81.2
402	981477A1	7		SF = 71.6
403	011007A1-14	8		SF = 77.3
404	USG 3209 (ck)	6		SF = 69.5
405	VA02W-555	7		SF = 70.6
406	AGS 2000 (ck)	8		SF = 77.1
407	AGS 2060	8		SF = 80.3
408	MPG 7921 (ck)	7		SF = 75.1
409	MO 011126	6		SF = 69.5
410	Beretta (ck)	7		SF = 70.9
411	Magnolia	7		SF = 72.9
412	D02-8486	6		SF = 62.9

Table 23. Mennel Milling product suitability for 12 soft wheat cultivars, 2006 QEC.

Cultivar		Soups and batters	Cookies and pastry	Crackers	Cakes	Biscuits	Blending or export	Hard pretzel
401	Patterson (ck)	Average	Above Average	Above Average	Below Average	Below Average	Below Average	Average
402	981477A1	Above Average	Average	Above Average	Below Average	Average	Average	Below Average
403	011007A1-14	Slightly Below Average	Average	Average	Average	Average	Below Average	Average
404	USG 3209 (ck)	Above Average	Below Average	Below Average	Average	Below Average	Below Average	Average
405	VA02W-555	Average	Average	Below Average	Average	Below Average	Below Average	Average
406	AGS 2000 (ck)	Above Average	Average	Above Average	Below Average	Average	Below Average	Average
407	AGS 2060	Above Average	Average	Average	Below Average	Above Average	Above Average	Below Average
408	MPG 7921 (ck)	Slightly Below Average	Average	Average	Average	Average	Below Average	Above Average
409	MO 011126	Average	Below Average	Above Average	Below Average	Below Average	Below Average	Average
410	Beretta (ck)	Above Average	Average	Above Average	Below Average	Average	Below Average	Average
411	Magnolia	Average	Average	Above Average	Below Average	Below Average	Above Average	Below Average
412	D02-8486	Below Average	Below Average	Below Average	Below Average	Average	Average	Average

Genotyping for Quality Traits by Ohio State University
and the Soft Wheat Quality Laboratory
Report prepared by M.J. Guttieri

All entries produced PCR amplification products with either the Ax1 or Ax2 primer pair (3); no null genotypes were observed in this set. MPG7921 produced amplification products with both primer pairs, suggesting a possible mixture of both genotypes in the seed source.

Only D02-8486 produced amplification products with the primers specific for the By8 gene (2). MPG7921, AGS2060, Magnolia, Beretta, AGS2000, MO 01126, and 011007A1-14 produced a 707 bp product with a By-specific primer set, indicating they are non-By9 genotypes, and VA02W555, USG3209, 981477A1, and Patterson produced a 662 bp product with a By-specific primer set, indicating that they are By9 genotypes. Only MO 01126 had the anticipated 45 bp insertion upstream of Bx7 associated with Bx7oe (6).

Amplification with primers specific for GluD1 Dx5 (3) produced a product with DNA from MPG7921, AGS2060, USG3209, 981477A1, Patterson, Magnolia, Beretta, and AGS2000, indicating that these are “5+10” genotypes or are mixtures with “5+10” genotypes.

Patterson and USG3209 amplified with primers for the LMW glutenin Glu-A3g allele (7). Beretta and MPG7921 amplified with primers for the Glu-A3d allele. MPG7921 also produced a unique second amplification product of equal intensity and slightly lower molecular weight than the anticipated 488 bp product.

Beretta, Magnolia, and 981477A1 were the only genotypes with the GliD1.2 allele (5). All others had the GliD1.1 allele.

VA02W-555, USG3209, 981477A1, and AGS2000 appear to carry the 1B/1R translocation as they produce an amplification product with primers specific for an ω-secalin (1) and do not produce an amplification product with primers for the 1BS LMW Glu (with the exception of 981477A1, which produces some of the 632 bp amplification product for the LMW Glu, suggesting a possible mixture in the seed source).

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).

References

1. de Froidmont, D. 1998. A Co-dominant Marker for the 1BL/1RS Wheat-rye Translocation via Multiplex PCR. J. Cereal Sci. 27:229-232.

2. Lei, Z.S., K.R. Gale, Z.H. He, C. Gianibelli, O. Larroque, X.C. Xia, B.J. Butow, and W. Ma. 2006. Y-type gene specific markers for enhanced discrimination of high-molecular weight glutenin alleles at the Glu-B1 locus in hexaploid wheat. J. Cereal Sci. 43:94-101.

3. Ma, M., W. Zhang, and K.R. Gale. 2003. Multiplex-PCR of high molecular weight glutenin alleles in wheat. Euphytica. 134:51-60.

4. Nakamura, T., P. Vrinten, M. Saito, and M. Konda. 2002. Rapid classification of partial waxy wheats using PCR-based markers. Genome 45:1150-1156.

5. Radovanovic, N. and S. Cloutier. 2003. Gene-assisted selection for high molecular weight glutenin subunits in wheat doubled haploid breeding programs. Molecular Brdg. 12:51-59.

6. Zhang, W., M.C. Gianibelli, W. Ma, L. Rampling, and K.R. Gale. 2003. Identification of SNPs and development of allele-specific PCR markers for γ-gliadin alleles in Triticum aestivum. Theor. Appl. Genet. 107:130-138.

7. Zhang, W., M.C. Gianibelli, W. Ma, L. Rampling, and K.R. Gale. 2004. Characterisation and marker development for low molecular weight glutenin genes from Glu-A3 alleles of bread wheat (Triticum aestivum L.). Theor. Appl. Genet. 108:1409-1419.

Table 24 Ohio State University genotyping report for 12 soft wheat cultivars, 2006 QEC.

	GluA1[3]		*GluB1*				*GluD1*[3]	*LMW GluA3*[7]					*Waxy*[4]	
Cultivar	*Ax 1*	*Ax 2**	*GluB1_ Bx7oe*[5]	*GluB1_ By8*[2]	*GluB1_ non By9*[2]	*GluB1_ By9*[2]	*GluD1_ Dx5*	*LMW_ GluA3_ c*	*LMW_ GluA3_ d*	*LMW_ GluA3_ g*	*GliD1*[6]	*1B/1R*[1]	*GBSS _A*	*GBSS_ B*
Patterson	+	trc	-	-	-	+	+	-	-	+	*GliD1.1*	-	wt	wt
981477A1		+	-	-	-	+	+	+	-	-	*GliD1.2*	+ (possible mix)	wt	wt
011007A1-14	trc	+	-	-	+	-	-	+	-	-	*GliD1.1*	-	wt	wt
USG 3209	+	-	-	-	-	+	+	-	-	+	*GliD1.1*	+	wt	wt
VA02W-555	-	+	-	-	-	+	-	+	-	-	*GliD1.1*	+	wt	wt
AGS 2000	-	+	-	-	+	-	+	+	-	-	*GliD1.1*	+	wt	wt
AGS 2060	-	+	-	-	+	-	+	+	-	-	*GliD1.1*	-	wt	wt
MPG 7921	+	+	-	-	+	-	+	-	++	-	*GliD1.1*	-	wt	wt
MO 011126	+	-	+	-	+	-	-	+	-	-	*GliD1.1*	-	wt	wt
Beretta	-	+	-	-	+	-	+	-	+	-	*GliD1.2*	-	wt	wt
Magnolia	-	+	-	-	+	-	+	+	-	-	*GliD1.2*	-	wt	wt
D02-8486	-	+	-	+	-	-	-	+	-	-	*GliD1.1*	-	wt	wt

Table 24. Siemer Milling flour analytical values for 12 soft wheat cultivars, 2006 QEC.

Sample number	Cultivar	Moisture (%)	Protein (%)	Ash (%)	pH
401	Patterson	13.3	8.51	0.372	4.60
402	981477A1	13.5	9.47	0.418	4.53
403	011007A1-14	13.5	8.27	0.366	4.50
404	USG 3209	13.5	7.06	0.353	4.56
405	VA02W-555	13.6	6.95	0.372	4.58
406	AGS 2000	13.5	9.50	0.368	4.54
407	AGS 2060	13.5	11.68	0.373	4.52
408	MPG 7921	13.6	8.12	0.386	4.50
409	MO 011126	13.7	9.06	0.374	4.55
410	Beretta	13.7	9.58	0.411	4.55
411	Magnolia	13.4	10.81	0.367	4.57
412	D02-8486	13.6	10.96	0.443	4.53

Table 25. Siemer Milling cake baking data for 12 soft wheat cultivars, 2006 QEC.

Sample number	Cultivar	Volume (cc)	Size (10)	Thickness (10)	Grain (16)	Tenderness (14)	Softness (10)	Crumb color (10)	Flavor (10)
401	Patterson	1005	10	10	15	13	8	10	8
402	981477A1	1040	9	9	13	13	8	10	8
403	011007A1-14	1005	10	9	15	13	9	10	9
404	USG 3209	980	8	8	15	12	9	10	8
405	VA02W-555	1075	10	10	15	13	9	10	9
406	AGS 2000	1030	8	8	14	12	8	10	8
407	AGS 2060	945	7	7	14	9	7	9	7
408	MPG 7921	1000	9	9	14	11	8	9	7
409	MO 011126	940	8	8	12	11	7	10	7
410	Beretta	1055	7	7	12	12	8	10	8
411	Magnolia	1030	7	7	12	12	8	10	8
412	D02-8486	1005	7	7	13	12	8	10	8

Table 26. Siemer Milling cake batter and end product ratings and comments for 12 soft wheat cultivars, 2006 QEC.

Sample number	Cultivar	Dough or batter rating	Comments on likes and dislikes	End-product performance rating	Comments on likes and dislikes
401	Patterson (ck)	8	Good batter	6	Average volume
402	981477A1	7	Good batter	7	Good volume
403	011007A1-14	8	Good batter	6	Average volume
404	USG 3209 (ck)	7	Good batter	6	Average volume
405	VA02W-555	8	Good batter	8	Very good volume
406	AGS 2000 (ck)	7	Good batter	7	Good volume
407	AGS 2060	5	Batter slightly thick	5	Poor volume
408	MPG 7921 (ck)	6	Batter slightly thick	6	Average volume
409	MO 011126	5	Batter slightly thick	5	Poor volume
410	Beretta (ck)	5	Batter slightly thick	8	Very good volume
411	Magnolia	5	Batter slightly thick	7	Good volume
412	D02-8486	6	Batter slightly thick	6	Average volume

Table 27. Siemer Milling overall acceptability for cakes rating and comments for 12 soft wheat cultivars, 2006 QEC.

Sample Number	Cultivar	Overall acceptability rating	Comments on likes and dislikes	Mitigating physical/chemical properties & comments
401	Patterson (ck)	7	Good grain	Tweak the formula to increase volume.
402	981477A1	7	Good grain	OK, would not change anything.
403	011007A1-14	7	Very good grain	Tweak the formula to increase volume.
404	USG 3209 (ck)	6	Good grain	Tweak the formula for better volume.
405	VA02W-555	8	Very good grain	Very good cake, no changes required.
406	AGS 2000 (ck)	7	Good grain, little tunneling	Good cake; can use formula as is.
407	AGS 2060	5	Tunneling	Flour protein higher than we like for cakes.
408	MPG 7921 (ck)	6	Good grain	Make changes in the formula to increase volume.
409	MO 011126	5	Good grain	Would need to make major changes to formula
410	Beretta (ck)	7	Soft, tender	Tweaking the formula would eliminate tunneling
411	Magnolia	6	Somewhat dry	Flour protein higher than we like for cakes.
412	D02-8486	6	Slightly coarse grain	Flour protein higher than we like for cakes.

Table 28. Star of the West flour analytical values for 12 soft wheat cultivars, 2006 QEC.

Sample number	Cultivar	Moisture (%)	Protein (%)	Ash (%)	Falling number (sec)	Amylograph peak (BU)
401	Patterson	13.78	8.45	0.391	386	650
402	981477A1	13.55	9.64	0.436	361	520
403	011007A1-14	13.81	8.37	0.366	401	480
404	USG 3209	13.62	7.10	0.391	422	610
405	VA02W-555	13.81	6.92	0.381	383	510
406	AGS 2000	13.58	9.46	0.386	457	635
407	AGS 2060	13.81	11.29	0.408	413	750
408	MPG 7921	13.74	8.03	0.379	342	410
409	MO 011126	13.68	9.59	0.339	400	440
410	Beretta	13.79	9.38	0.375	362	645
411	Magnolia	13.55	10.78	0.366	370	430
412	D02-8486	13.82	10.91	0.458	369	200

Table 29. Star of the West solvent retention capacity and cookie data (10-50D method) for 12 soft wheat cultivars, 2006 QEC.

Sample number	Cultivar	Solvent Retention Capacity				Cookies		
		Sucrose (%)	Sodium carbonate (%)	Lactic acid (%)	Water (%)	Width (cm)	Thickness (cm)	Ratio
401	Patterson	95.9	69.0	115.5	49.5	49.6	5.90	8.41
402	981477A1	86.6	70.0	113.3	48.4	49.5	6.00	8.25
403	011007A1-14	94.2	71.7	100.1	51.7	49.4	5.95	8.30
404	USG 3209	114.7	84.2	103.9	58.2	49.0	6.00	8.17
405	VA02W-555	109.5	80.3	99.9	55.5	49.3	6.00	8.22
406	AGS 2000	98.5	72.8	110.1	50.6	49.9	6.05	8.25
407	AGS 2060	122.1	76.5	151.8	53.1	49.1	5.90	8.32
408	MPG 7921	82.5	67.3	109.5	51.6	48.2	5.85	8.24
409	MO 011126	92.9	70.2	116.3	51.6	48.2	6.05	7.96
410	Beretta	105.5	73.5	120.0	53.4	48.6	5.80	8.38
411	Magnolia	109.2	70.5	130.7	52.0	48.7	6.25	7.79
412	D02-8486	97.8	71.0	95.1	54.2	47.3	6.30	7.51

Table 30. Star of the West cookie dough and crumb color data for 12 soft wheat cultivars, 2006 QEC.

Sample number	Cultivar	Dough Color			Crumb Color		
		L	a	b	L	a	b
401	Patterson	75.57	-1.41	21.66	66.27	2.71	19.33
402	981477A1	75.25	-1.02	23.06	62.90	3.82	18.70
403	011007A1-14	76.89	-1.83	24.69	66.93	2.53	18.92
404	USG 3209	74.50	-1.01	25.52	66.32	2.29	19.98
405	VA02W-555	77.36	-1.36	26.18	66.77	2.04	19.94
406	AGS 2000	76.72	-0.11	21.64	66.81	2.53	17.92
407	AGS 2060	77.80	0.14	21.49	66.08	2.74	18.59
408	MPG 7921	76.76	0.60	22.51	65.05	3.19	18.78
409	MO 011126	78.99	0.36	20.88	68.36	2.02	17.92
410	Beretta	76.02	-0.22	22.98	65.74	2.88	19.45
411	Magnolia	76.27	-0.76	21.92	64.40	3.48	18.91
412	D02-8486	77.61	0.72	20.72	66.73	2.77	18.28

Table 31. Star of the West RVA data for 12 soft wheat cultivars, 2006 QEC.

Sample number	Cultivar	Peak (RVAu)	Trough 1 (RVAu)	Breakdown (RVAu)	Final viscosity (RVAu)	Setback (RVAu)	Peak time (min)
401	Patterson	236.25	134.33	101.92	264.92	130.58	5.67
402	981477A1	202.17	121.92	80.25	246.83	124.92	5.67
403	011007A1-14	224.42	128.08	96.33	251.25	123.17	5.53
404	USG 3209	229.33	151.83	77.50	315.67	163.83	5.47
405	VA02W-555	204.92	148.00	56.92	306.75	158.75	5.53
406	AGS 2000	259.42	136.25	123.17	259.83	123.58	5.60
407	AGS 2060	253.08	120.17	132.92	218.17	98.00	5.60
408	MPG 7921	222.25	115.50	106.75	231.08	115.58	5.53
409	MO 011126	235.17	121.50	113.67	235.00	113.50	5.47
410	Beretta	209.92	124.75	85.17	242.00	117.25	5.80
411	Magnolia	206.00	109.50	96.50	215.00	105.50	5.53
412	D02-8486	168.17	85.42	82.75	185.83	100.42	5.33

Table 32. Star of the West Farinograph data for 12 soft wheat cultivars, 2006 QEC.

Sample number	Cultivar	Absorption (%)	Development time (min)	Stability (min)	Mixing tolerance index	Time to breakdown (min)
401	Patterson	50.5	1.4	5.1	45	2.7
402	981477A1	51.5	1.8	7.5	28	7.2
403	011007A1-14	53.1	1.4	2.9	72	2.0
404	USG 3209	53.8	1.2	1.6	62	2.1
405	VA02W-555	53.0	1.4	1.9	67	2.0
406	AGS 2000	50.0	1.2	4.5	48	2.2
407	AGS 2060	52.6	4.0	9.8	28	9.3
408	MPG 7921	50.6	1.2	1.4	80	1.8
409	MO 011126	54.6	2.7	4.2	72	4.5
410	Beretta	53.3	1.4	4.4	56	4.9
411	Magnolia	55.3	3.7	4.8	62	5.4
412	D02-8486	57.4	2.0	3.0	98	3.5

Table 33. Star of the West cookie dough and end product ratings and comments for 12 soft wheat cultivars, 2006 QEC.

Sample number	Cultivar	Dough or batter rating	Comments on likes and dislikes	End-product performance rating	Comments on likes and dislikes
401	Patterson (ck)	8	Good dough consistency. Dough somewhat dark in	8	Very good top grain and spread.
402	981477A1	5	Slightly sticky compared to Patterson. Dark dough	7	Very good top grain and spread.
403	011007A1-14	7	Slightly softer then Patterson. Dough dark	8	Very good top grain and spread.
404	USG 3209 (ck)	4	Dough is dry and stiff during mixing. Dough	7	Very good top grain. Slightly tight spread
405	VA02W-555	7	Make up absorbs flour quickly, dough soft at final	7	Very good top grain. Thin edges
406	AGS 2000 (ck)	5	Dough is somewhat sticky and soft.	5	Good spread. Below average top grain.
407	AGS 2060	4	Stiff dough.	4	Spread comparable to AGS 2060. Marginal top grain.
408	MPG 7921 (ck)	8	Good dough consistency. Dough is lighter in color.	5	Below average top grain. Good spread.
409	MO 011126	5	Good consistency, somewhat soft. Dough is	3	Minimal cookie spread. Marginal shape. Poor top
410	Beretta (ck)	8	Good dough consistency Somewhat soft during	4	Good Spread. Below average top grain
411	Magnolia	4	Stiff dough compared to Beretta.	6	Better top grain then Beretta. Slight darker color then
412	D02-8486	5	Soft dough during make-up, not sticky.	2	Poor top grain, very smooth, tough apperance. Poor

Table 34. Star of the West overall acceptability rating and comments for 12 soft wheat cultivars, 2006 QEC.

Sample number	Cultivar	Overall acceptability rating	Comments on likes and dislikes	Mitigating physical/chemical properties & comments
401	Patterson (ck)	8		Third darkest yellow colored dough out of all sample sets.
402	981477A1	7		Second darkest yellow colored dough out of all the sample sets.
403	011007A1-14	8		
404	USG 3209 (ck)	6		Low protein.
405	VA02W-555	6		Very close match to USG 3209. Protein is low. Dark yellow colored
406	AGS 2000 (ck)	5		
407	AGS 2060	4		
408	MPG 7921 (ck)	5		Second brightest dough out of all sample sets.
409	MO 011126	4		Brightest dough out of all the samples sets and lightest cookie
410	Beretta (ck)	6		
411	Magnolia	5		
412	D02-8486	2		

Figure 2. Star of the West RVA graphs for Patterson, 981477A1, and 011007A1-14, 2006 QEC.

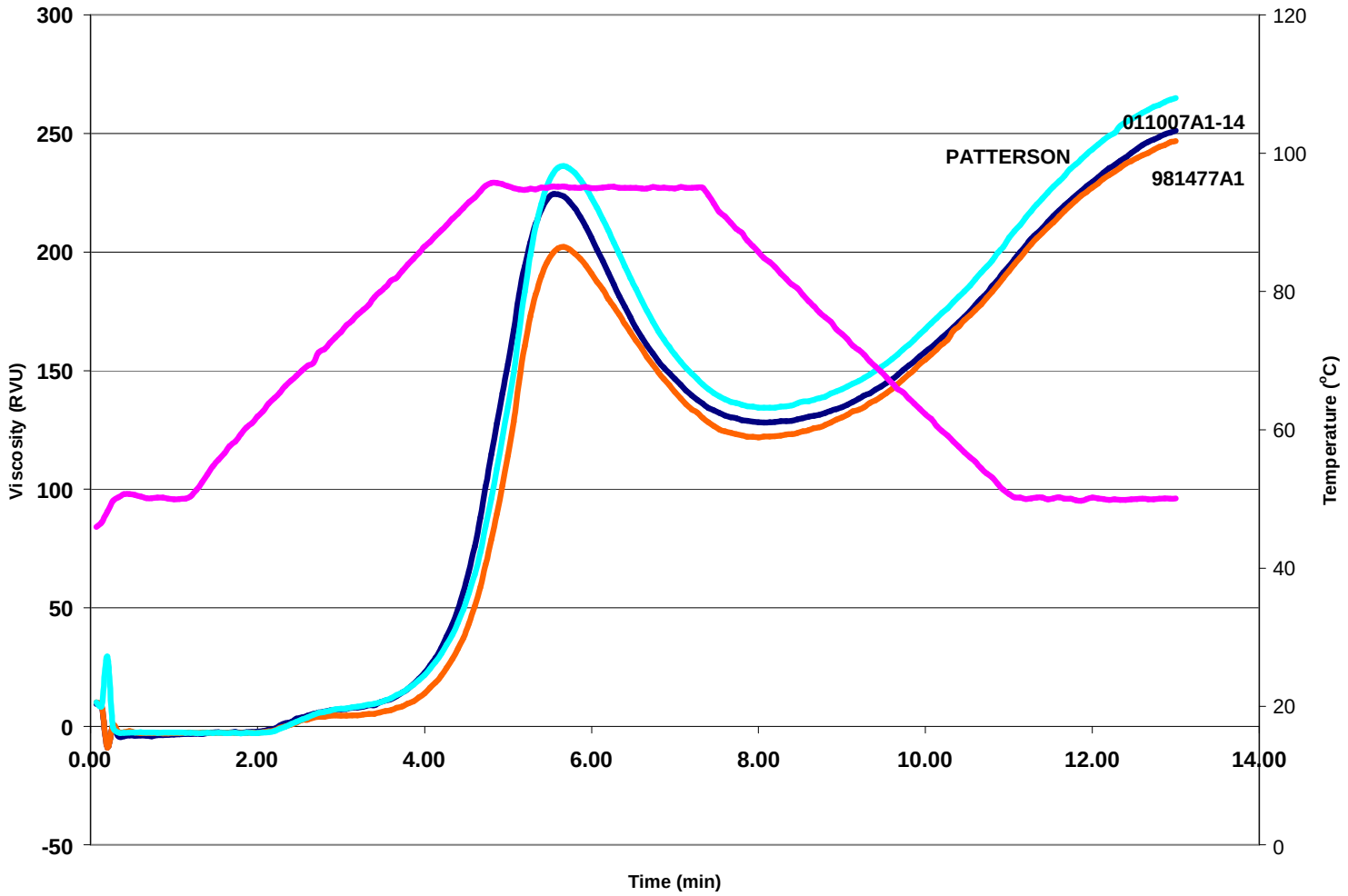


Figure 3. Star of the West RVA graphs for USG 3209 and VA02W-555, 2006 QEC.

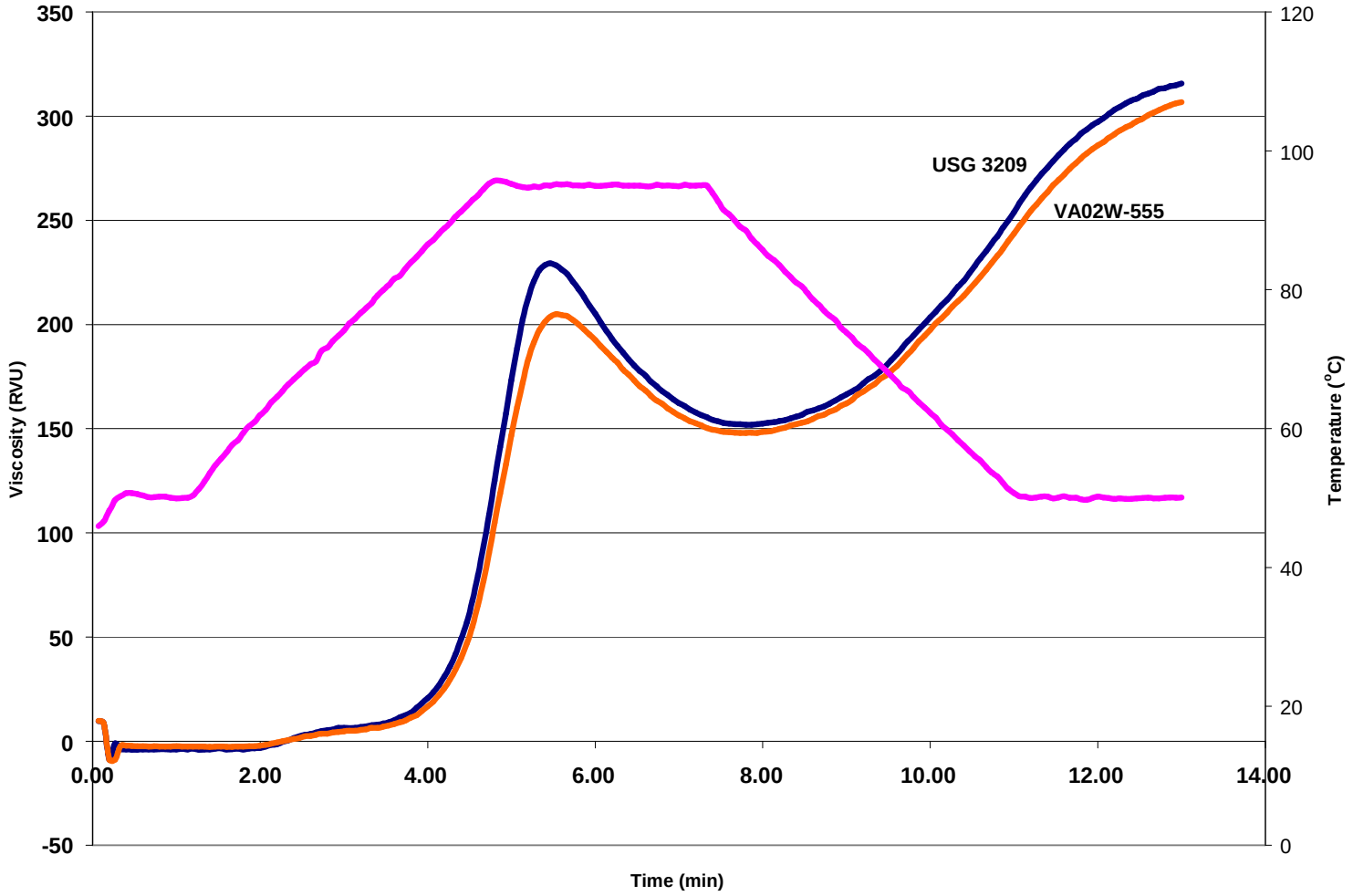


Figure 4. Star of the West RVA graphs for AGS 2000 and AGS 2060, 2006 QEC.

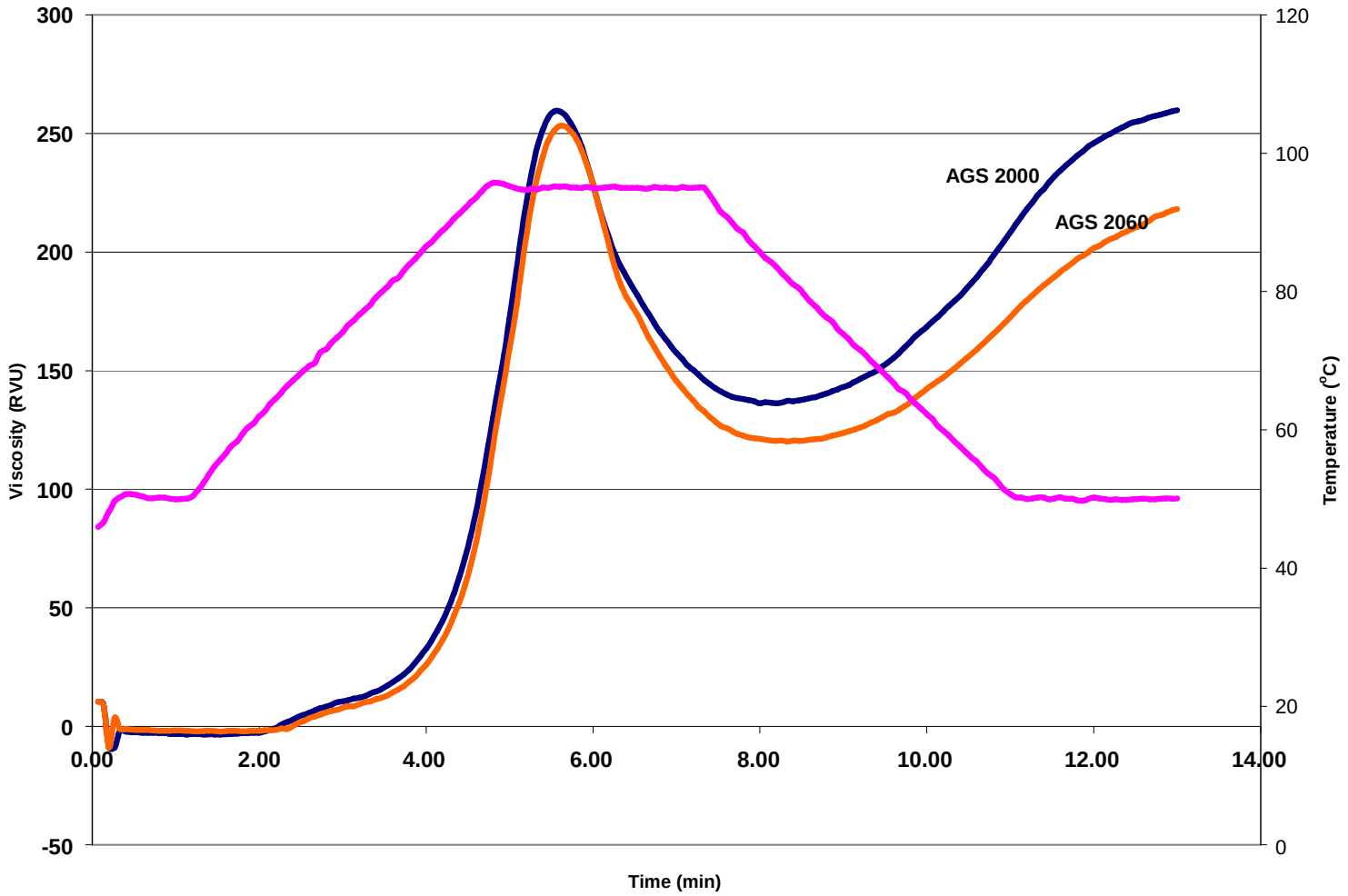


Figure 5. Star of the West RVA graphs for MPG 7291 and MO 011126, 2006 QEC.

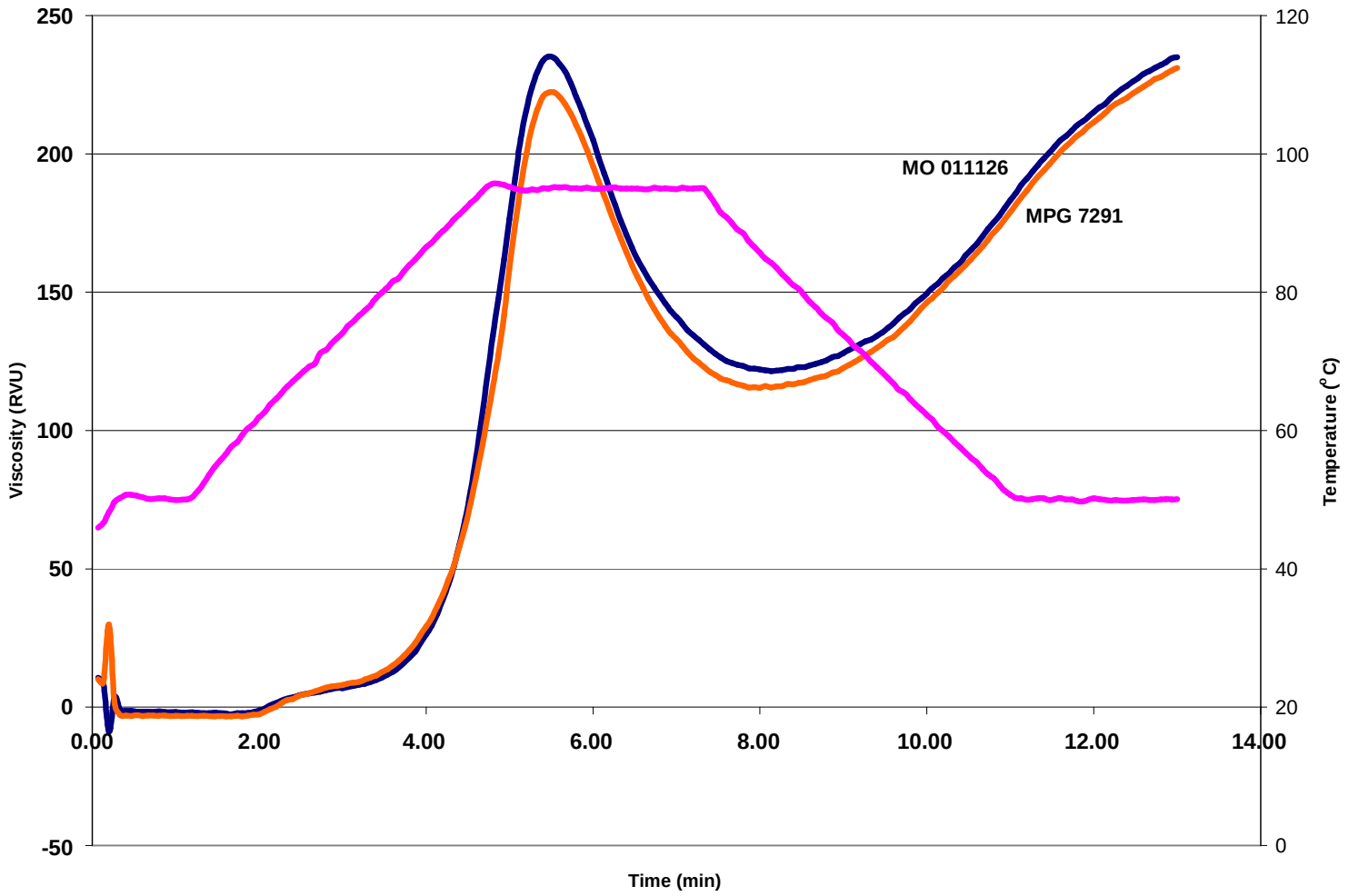


Figure 6. Star of the West RVA graphs for Beretta, Magnolia, and D02-8486, 2006 QEC.

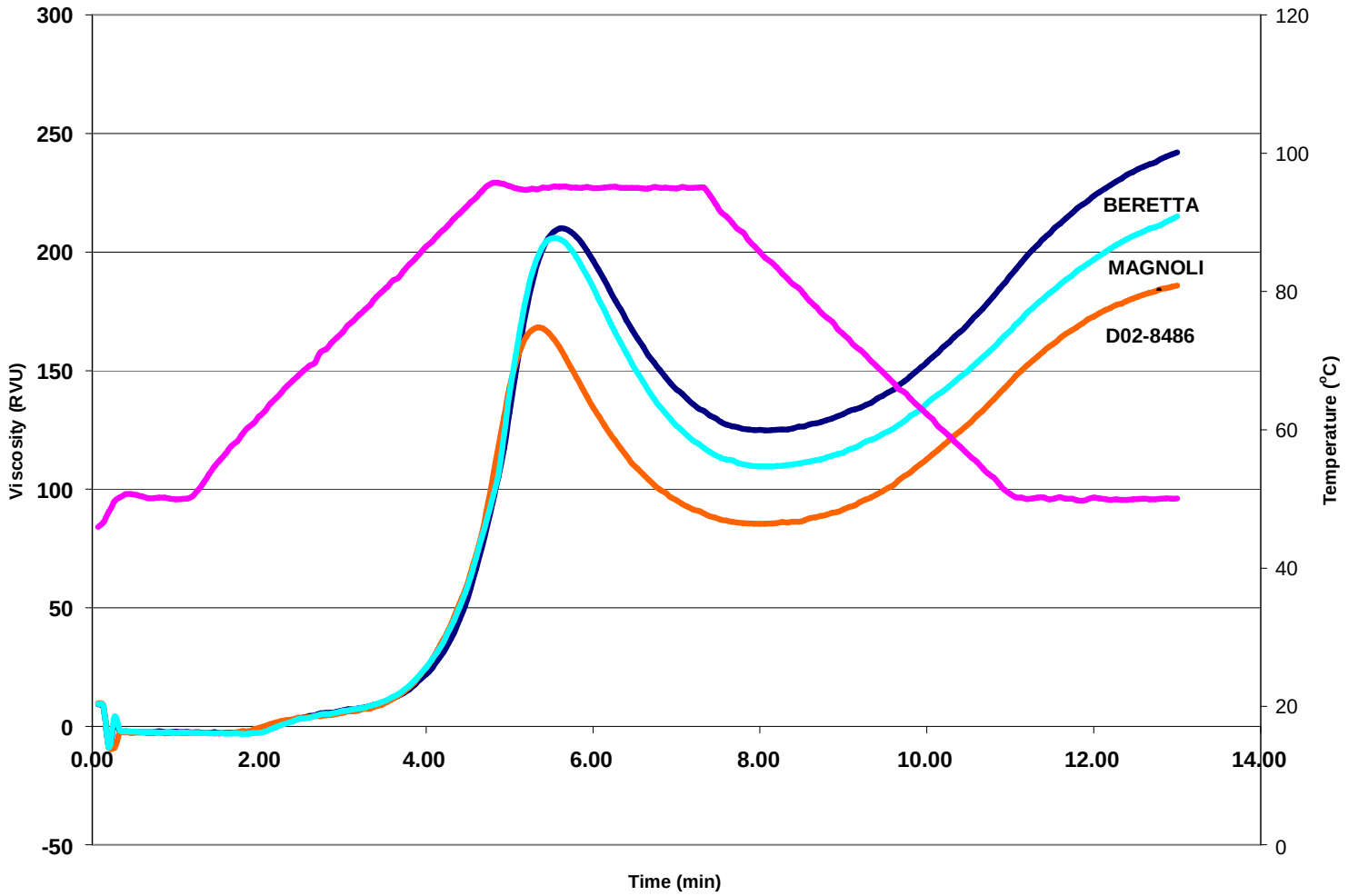


Table 35. USDA-ARS WWQL flour analytical values for 12 soft wheat cultivars, 2006 QEC.

Sample number	Cultivar	Protein (%)	Ash (%)	RVA (stirring no.)	Viscosity (sec)	Swelling volume (mL/g)
401	Patterson	9.3	0.35	158	113	21.9
402	981477A1	10.5	0.39	134	152	20.8
403	011007A1-14	9.0	0.35	135	82	21.7
404	USG 3209	8.0	0.37	140	70	21.6
405	VA02W-555	7.8	0.38	126	54	22.0
406	AGS 2000	9.9	0.38	189	120	23.0
407	AGS 2060	12.1	0.38	192	256	21.9
408	MPG 7921	8.9	0.39	135	67	22.2
409	MO 011126	10.3	0.37	137	147	22.5
410	Beretta	10.2	0.34	142	140	20.2
411	Magnolia	11.7	0.34	134	227	20.2
412	D02-8486	11.5	0.42	87	134	20.1

Table 36. USDA-ARS WWQL solvent retention capacity and mixograph data for 12 soft wheat cultivars, 2006 QEC.

Sample number	Cultivar	Solvent Retention Capacity				Mixograph	
		Sucrose (%)	Sodium carbonate (%)	Lactic acid (%)	Water (%)	Absorption (%)	Type
401	Patterson	98.8	70.8	118.6	50.2	54.8	6M
402	981477A1	100.6	71.5	113.6	51.2	56.5	4M
403	011007A1-14	96.5	71.0	104.8	51.6	55.4	5M
404	USG 3209	118.9	81.7	105.1	57.7	54.3	3L
405	VA02W-555	112.4	78.7	101.2	54.9	54.5	4L
406	AGS 2000	102.3	71.4	111.6	50.6	53.9	6M
407	AGS 2060	116.1	75.1	159.1	54.4	56.8	5M
408	MPG 7921	93.6	68.3	107.4	51.4	53.3	6M
409	MO 011126	99.8	68.1	119.0	53.6	55.4	5M
410	Beretta	108.7	72.6	123.0	54.4	54.9	5M
411	Magnolia	116.0	70.9	137.8	55.2	57.7	4M
412	D02-8486	101.1	70.6	99.8	56.0	57.4	4M

Table 37. USDA-ARS WWQL cookie (10-52 method) and Japanese sponge cake data for 12 soft wheat cultivars, 2006 QEC.

Sample number	Cultivar	Cookies		Sponge Cake	
		Diameter (cm)	Top Grain Score	Volume (cc)	Crumb Grade Score
401	Patterson	9.21	7	1315	21
402	981477A1	8.99	6	1280	20
403	011007A1-14	9.24	7	1285	20
404	USG 3209	8.95	4	1300	20
405	VA02W-555	9.18	6	1335	20
406	AGS 2000	9.21	6	1315	20
407	AGS 2060	8.68	2	1225	21
408	MPG 7921	9.27	8	1265	20
409	MO 011126	9.10	6	1240	18
410	Beretta	8.91	5	1240	19
411	Magnolia	8.86	5	1240	18
412	D02-8486	8.71	5	1200	18

Table 38. USDA-ARS WWQL alkaline noodle color data for 12 soft wheat cultivars, 2006 QEC.

Sample number	Cultivar	Immediately after sheeting			24 hours after sheeting		
		L	a	b	L	a	b
401	Patterson	87.7	-1.9	15.8	77.8	-1.1	22.2
402	981477A1	86.8	-1.9	17.5	76.5	-0.6	22.8
403	011007A1-14	89.0	-2.4	16.8	82.5	-1.9	21.3
404	USG 3209	88.4	-2.7	18.3	83.1	-2.6	23.2
405	VA02W-555	91.4	-3.0	16.3	88.1	-3.1	19.9
406	AGS 2000	86.3	-1.6	16.8	78.0	-0.7	22.0
407	AGS 2060	86.3	-1.5	16.6	77.6	-0.7	22.7
408	MPG 7921	89.4	-2.3	15.3	83.8	-2.0	18.5
409	MO 011126	89.1	-2.0	14.7	83.3	-1.6	18.0
410	Beretta	83.0	-1.4	22.2	66.1	0.4	24.7
411	Magnolia	85.0	-1.3	18.5	70.7	-0.1	23.6
412	D02-8486	85.1	-1.1	17.0	70.9	0.3	22.0

Table 39. USDA-ARS WWQL cookie dough and end product ratings and comments for 12 soft wheat cultivars, 2006 QEC.

Sample number	Cultivar	Dough or batter rating	Comments on likes and dislikes	End-product performance rating	Comments on likes and dislikes
401	Patterson (ck)	8		6	
402	981477A1	9		5	
403	011007A1-14	8		6	
404	USG 3209 (ck)	9	soft easy to handle	5	
405	VA02W-555	7	slightly stiff	6	
406	AGS 2000 (ck)	7	slightly stiff	6	
407	AGS 2060	8	a little softer	3	poor spread & top grain
408	MPG 7921 (ck)	7	slightly sticky	6	
409	MO 011126	7	slightly sticky	6	
410	Beretta (ck)	8	a little softer	5	
411	Magnolia	8	softer easy to handle	5	good cookie for protein
412	D02-8486	7	slightly stiff	4	

Table 40. USDA-ARS WWQL overall acceptability for cookies rating and comments for 12 soft wheat cultivars, 2006 QEC.

Sample number	Cultivar	Overall acceptability rating	Comments on likes and dislikes	Mitigating Physical/Chemical Properties & Comments
401	Patterson (ck)	6		Strong protein type
402	981477A1	6		Strong protein type
403	011007A1-14	6		Good PPO color reaction
404	USG 3209 (ck)	5		Good PPO color reaction
405	VA02W-555	5		Good PPO color reaction
406	AGS 2000 (ck)	6		Strong protein type
407	AGS 2060	6	High protein sample	Strong protein type
408	MPG 7921 (ck)	6		Good PPO color reaction
409	MO 011126	6		Strong protein type/ Good PPO color reaction
410	Beretta (ck)	5		Strong protein type
411	Magnolia	6		Strong protein type
412	D02-8486	5		

Table 41. USDA-ARS WWQL sponge cake batter and end product ratings and comments for 12 soft wheat cultivars, 2006 QEC.

Sample number	Cultivar	Dough or batter rating	Comments on likes and dislikes	End-product performance rating	Comments on likes and dislikes
401	Patterson (ck)	6.5		8	good grain
402	981477A1	6		7	
403	011007A1-14	7		7	
404	USG 3209 (ck)	6		8	
405	VA02W-555	7		8	
406	AGS 2000 (ck)	7		8	
407	AGS 2060	7.5		6	good grain
408	MPG 7921 (ck)	6	somewhat runny	6	
409	MO 011126	6	somewhat runny	5	poor grain
410	Beretta (ck)	7		5	
411	Magnolia	5	thin, runny	5	poor grain
412	D02-8486	8	thick & puffy	4	poor grain

Table 42. USDA-ARS WWQL overall acceptability for sponge cake rating and comments for 12 soft wheat cultivars, 2006 QEC.

Sample number	Cultivar	Overall acceptability rating	Comments on likes and dislikes	Mitigating Physical/Chemical Properties & Comments
401	Patterson (ck)	8		
402	981477A1	7		
403	011007A1-14	8		
404	USG 3209 (ck)	8		
405	VA02W-555	8		
406	AGS 2000 (ck)	8		
407	AGS 2060	7	high flour protein	
408	MPG 7921 (ck)	6		
409	MO 011126	5		
410	Beretta (ck)	5		
411	Magnolia	5		
412	D02-8486	4		

Table 43. USDA-ARS SWQL wheat analytical and SKCS data for 12 soft wheat cultivars, 2006 QEC.

Sample number	Cultivar	Hexane density	Test weight (lb/bu)	1000 kernel weight (g)	SKCS		
					Hardness	Weight (mg)	Diameter (mm)
401	Patterson	1.3390	61.70	31.36	23.72	32.18	2.46
402	981477A1	1.3542	61.20	31.85	32.06	32.79	2.44
403	011007A1-14	1.3242	60.30	33.51	30.73	34.90	2.69
404	USG 3209	1.3465	61.70	41.89	27.97	42.05	2.64
405	VA02W-555	1.3254	61.00	42.52	18.70	42.93	2.64
406	AGS 2000	1.3603	62.20	42.51	8.20	42.62	2.72
407	AGS 2060	1.3606	62.15	30.21	21.67	32.65	2.40
408	MPG 7921	1.3549	61.75	38.57	24.02	38.45	2.56
409	MO 011126	1.3764	63.40	43.84	30.75	44.04	2.87
410	Beretta	1.3676	60.80	31.31	32.29	31.28	2.37
411	Magnolia	1.3533	61.15	36.39	28.96	37.47	2.56
412	D02-8486	1.3680	62.30	36.25	38.74	36.41	2.52

Table 44. USDA-ARS SWQL milling data for 12 soft wheat cultivars, 2006 QEC.

Sample number	Cultivar	Quad-Sr.	Quad-Jr.		Miag Multomat	
		Straight grade yield (%)	Softness equivalence (%)	Straight grade yield (%)	Break flour yield (%)	Straight grade yield (%)
401	Patterson	70.76	60.19	71.24	27.43	72.91
402	981477A1	70.08	57.55	69.56	24.75	71.41
403	011007A1-14	69.04	58.81	69.72	25.27	70.72
404	USG 3209	68.80	58.83	69.84	25.88	70.45
405	VA02W-555	69.62	58.79	70.51	26.70	71.37
406	AGS 2000	73.18	62.48	72.97	28.83	74.25
407	AGS 2060	68.79	53.76	68.20	23.42	70.77
408	MPG 7921	71.34	51.17	73.57	27.34	74.45
409	MO 011126	75.12	58.43	72.15	23.08	76.24
410	Beretta	70.52	57.02	69.12	26.97	71.37
411	Magnolia	70.12	56.87	70.41	24.88	72.37
412	D02-8486	71.56	52.74	69.92	22.80	72.98

Table 45. USDA-ARS SWQL flour analytical values for 12 soft wheat cultivars, 2006 QEC.

Cultivar		Moisture (%)	Protein (%)	Ash (%)	pH	Falling number (sec)	Alpha amylase (abs)	Damaged Starch (%)	Mixograph absorption (%)
401	Patterson	14.14	8.69	0.355	5.95	408	0.122	1.39	55.0
402	981477A1	14.34	9.69	0.409	5.83	403	0.126	2.01	56.0
403	011007A1-14	14.20	8.38	0.355	5.80	406	0.125	2.65	56.0
404	USG 3209	14.08	7.28	0.385	5.90	462	0.103	3.51	55.0
405	VA02W-555	14.24	7.26	0.400	5.89	419	0.105	4.12	54.0
406	AGS 2000	14.12	9.39	0.364	5.79	428	0.107	1.66	57.0
407	AGS 2060	14.09	11.30	0.376	5.81	477	0.103	0.51	59.0
408	MPG 7921	14.06	8.16	0.385	6.02	384	0.104	3.57	55.0
409	MO 011126	14.15	9.66	0.339	5.97	401	0.100	2.88	55.0
410	Beretta	14.27	9.51	0.376	6.06	418	0.098	2.17	57.0
411	Magnolia	13.98	10.90	0.334	5.77	369	0.107	1.91	60.0
412	D02-8486	14.13	10.95	0.412	5.87	403	0.144	5.13	60.0

Table 46. USDA-ARS SWQL solvent retention capacity and RVA values for 12 soft wheat cultivars, 2006 QEC.

Sample number	Cultivar	Solvent Retention Capacity				RVA			
		Sucrose (%)	Sodium carbonate (%)	Lactic acid (%)	Water (%)	Peak height (cps)	Breakdown (cps)	Setback (cps)	Final height (cps)
401	Patterson	90.8	73.3	109.5	50.6	3061	1161	1637	3537
402	981477A1	91.3	73.1	107.9	51.9	2645	874	1513	3284
403	011007A1-14	89.9	74.9	98.5	53.4	2865	1046	1496	3315
404	USG 3209	104.7	82.3	105.4	59.3	2949	761	1845	4033
405	VA02W-555	98.6	79.6	99.9	56.6	2652	582	1853	3923
406	AGS 2000	90.2	70.8	101.1	51.2	3402	1346	1464	3521
407	AGS 2060	106.6	73.8	148.0	54.2	3314	1503	1263	3075
408	MPG 7921	89.1	71.1	102.8	52.8	2826	1218	1398	3006
409	MO 011126	95.1	73.5	112.7	54.5	2932	1231	1364	3065
410	Beretta	98.6	74.2	112.6	55.3	2912	1103	1539	3348
411	Magnolia	101.6	73.2	128.6	54.7	2780	1213	1349	2916
412	D02-8486	94.2	72.8	91.8	56.4	2078	872	1146	2352

Table 47. USDA-ARS SWQL solvent retention capacity values of flours chlorinated by Siemer Milling for 12 soft wheat cultivars, 2006 QEC.

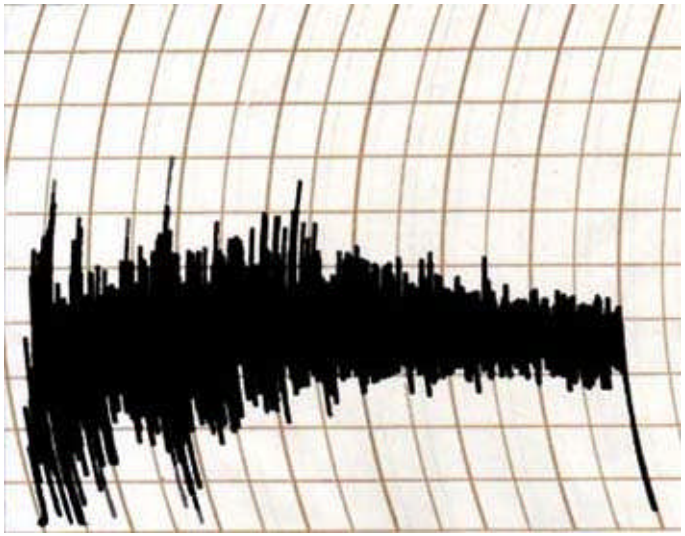
Sample number	Cultivar	pH	Solvent Retention Capacity			
			Sucrose (%)	Sodium carbonate (%)	Lactic acid (%)	Water (%)
401	Patterson	4.60	100.30	65.69	94.48	53.26
402	981477A1	4.53	101.60	66.30	90.11	52.93
403	011007A1-14	4.50	105.23	68.56	82.32	55.12
404	USG 3209	4.56	108.46	75.80	85.69	59.13
405	VA02W-555	4.58	103.42	72.37	80.80	58.01
406	AGS 2000	4.54	98.68	65.51	87.33	53.71
407	AGS 2060	4.52	140.59	66.24	128.11	60.44
408	MPG 7921	4.50	92.51	67.14	84.38	54.57
409	MO 011126	4.55	112.68	69.22	97.81	54.79
410	Beretta	4.55	104.49	70.06	97.61	56.26
411	Magnolia	4.57	130.12	68.91	112.64	57.92
412	D02-8486	4.53	97.98	71.82	89.38	53.86

Table 48. USDA-ARS SWQL cookie (10-53 method) data for 12 soft wheat cultivars, 2006 QEC.

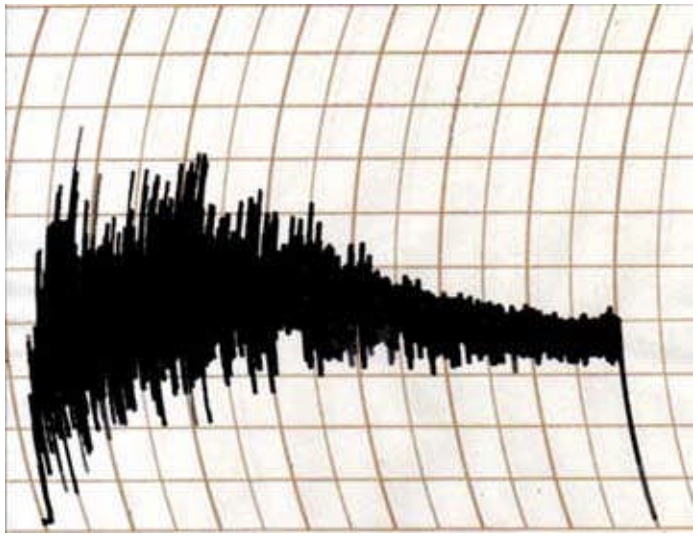
Sample number	Cultivar	Width (cm)	Height (cm)	Hardness (kg)
401	Patterson	15.46	21.63	5.116
402	981477A1	15.00	23.39	5.734
403	011007A1-14	15.36	21.96	4.464
404	USG 3209	14.60	23.20	6.043
405	VA02W-555	14.85	23.59	6.124
406	AGS 2000	15.36	21.34	5.348
407	AGS 2060	15.11	20.97	6.629
408	MPG 7921	15.27	22.03	4.636
409	MO 011126	15.02	22.03	5.057
410	Beretta	15.00	22.30	5.571
411	Magnolia	14.89	22.24	6.278
412	D02-8486	14.71	23.36	5.659

Figure 7. USDA-ARS SWQL Mixograms for 12 soft wheat cultivars, 2006 QEC.

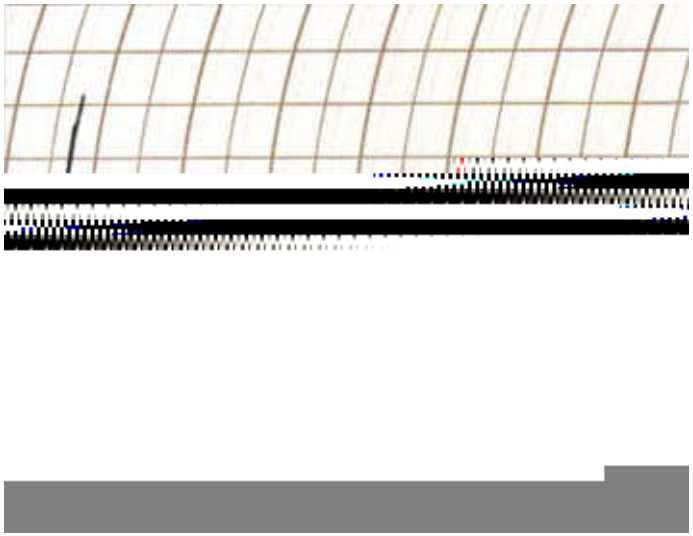
401 – Patterson



402 – 981477A1



403 – 011007A1-14



404 – USG 3209

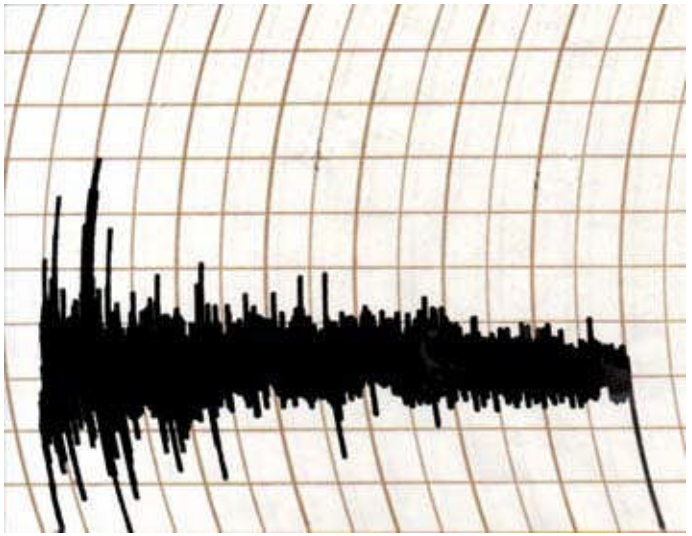
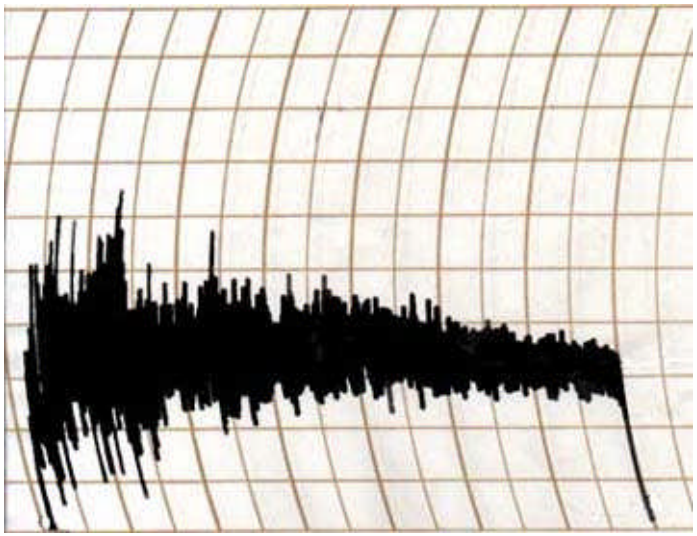
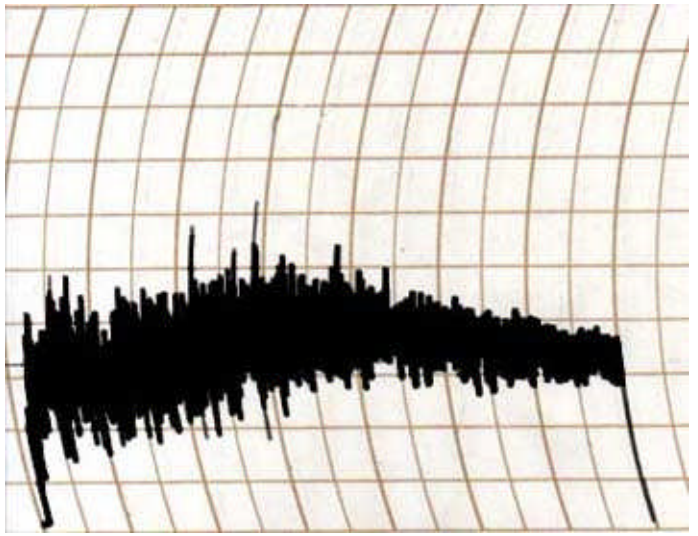


Figure 7. USDA-ARS SWQL Mixograms for 12 soft wheat cultivars (continued), 2006 QEC.

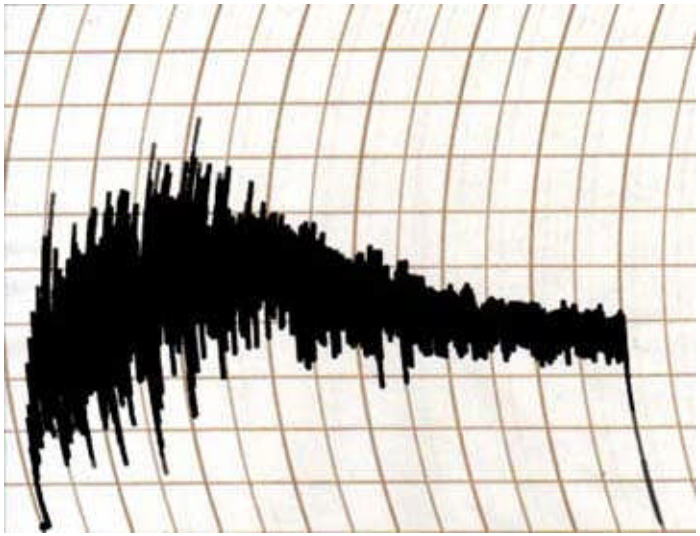
405 – VA02W-555



406 – AGS 2000



407 – AGS 2060



408 – MPG 7921

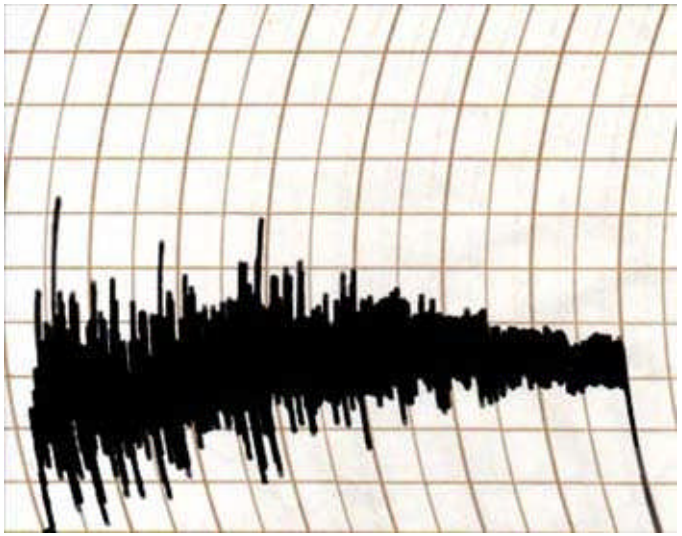
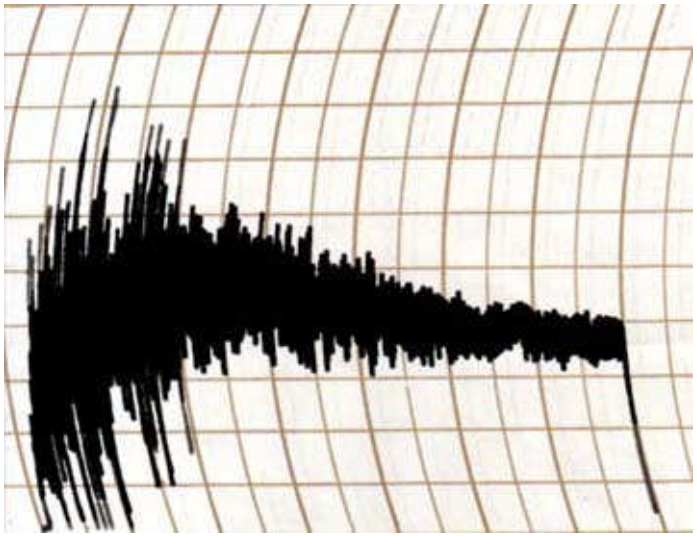
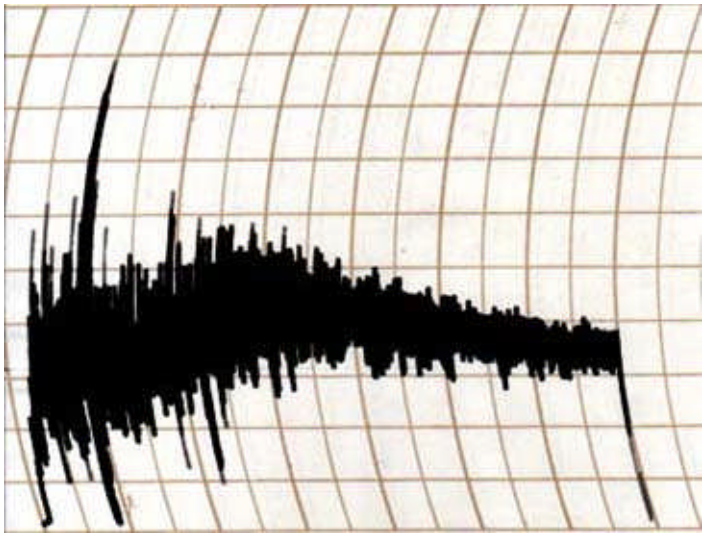


Figure 7. USDA-ARS SWQL Mixograms for 12 soft wheat cultivars (continued), 2006 QEC.

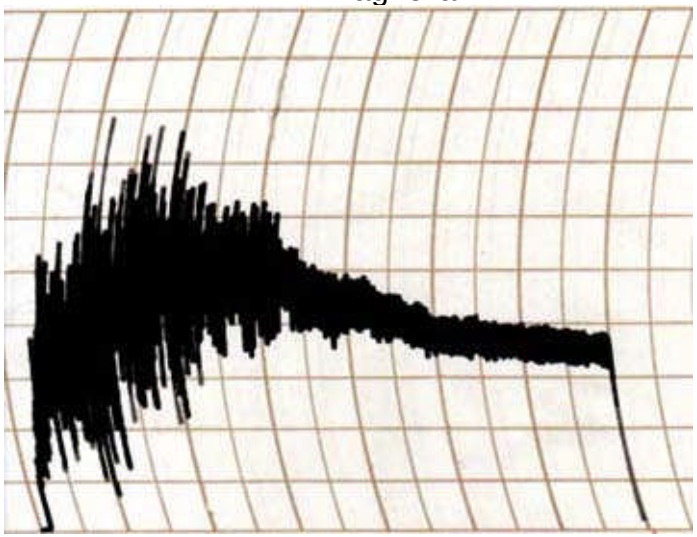
409 – MO 011126



410 – Beretta



411 – Magnolia



412 – D02-8486

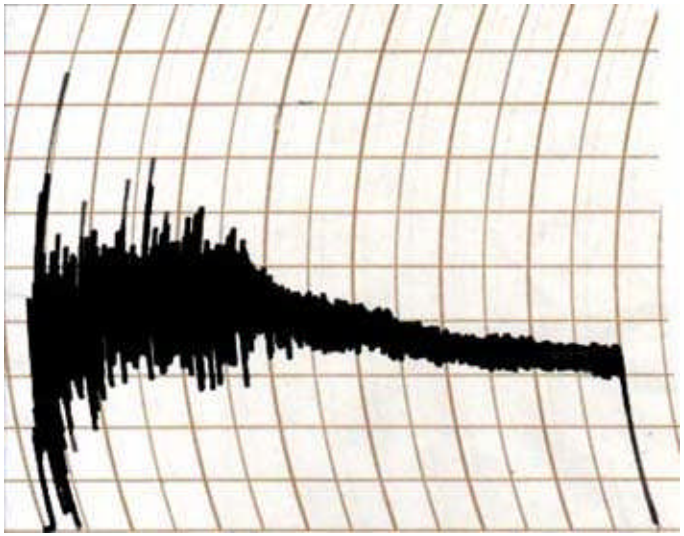


Table 49. USDA-ARS SWQL cookie dough and end product ratings and comments for 12 soft wheat cultivars, 2006 QEC.

Sample number	Cultivar	Dough or batter rating	Comments on likes and dislikes	End-product performance rating	Comments on likes and dislikes
401	Patterson (ck)	6		8	Best diameter
402	981477A1	6		4	
403	011007A1-14	6	Odd combination of solvent values	8	Tender cookie
404	USG 3209 (ck)	4	High water abs.	3	
405	VA02W-555	4		3	Hard cookie
406	AGS 2000 (ck)	8	Low sucrose, NaCO	8	
407	AGS 2060	4		6	Good stack ht
408	MPG 7921 (ck)	8	Low sucrose	6	
409	MO 011126	5		6	
410	Beretta (ck)	5		6	
411	Magnolia	5		4	
412	D02-8486	6		4	

Table 50. USDA-ARS SWQL overall acceptability for cookies rating and comments for 12 soft wheat cultivars, 2006 QEC.

Sample number	Cultivar	Overall acceptability rating	Comments on likes and dislikes	Mitigating Physical/Chemical Properties & Comments
401	Patterson (ck)	8		Good milling wheat
402	981477A1	7		Good ash curve but low total flour
403	011007A1-14	8		Good ash curve but low total flour
404	USG 3209 (ck)	4		Poor milling yields
405	VA02W-555	6		Improvement over check for milling
406	AGS 2000 (ck)	8		Very good milling wheat
407	AGS 2060	6	High protein sample	Poorer miller than check
408	MPG 7921 (ck)	7		Good milling wheat
409	MO 011126	6		Low break flour, high straight grade yield
410	Beretta (ck)	6		High break flour yield, moderate straight grade yield
411	Magnolia	5		Poorer ash curve than Beretta and break flour yield
412	D02-8486	5		Poorer ash curve than Beretta and break flour yield

Table 51. Summary of quality assessment scores[a] for dough quality, end-product performance and overall acceptability for 12 soft wheat cultivars, 2006 QEC.

		AgriPro			Horizon Milling			Kraft Foods			Mennel Milling					
		Cookies			Cookies						Biscuits			Cookies		
Sample number	Cultivar	Dough quality score	End product score	Overall score	Dough quality score	End product score	Overall score	Dough quality score	End product score	Overall score	Batter quality score	End product score	Overall score	Dough quality score	End product score	Overall score
401	Patterson	7	7	7	8	8	8	8	n/c	n/c	8	5	5	8	8	8
402	981477A1	7	4	6	8	4	6	3.5	4	n/c	8	7	7	8	7	7
403	011007A1-14	7	6	3	8	8	8	8	n/c	n/c	7	7	7	8	8	8
404	USG 3209	7	5	5	8	7	7.5	6	5	n/c	8	4	6	6	6	6
405	VA02W-555	7	5	5	6	4	5	7	4	n/c	8	5	5	7	7	7
406	AGS 2000	7	3	3	6	6	6	7	8	n/c	6	7	7	8	8	8
407	AGS 2060	7	1	1	6	7	6.5	7	9	7	4	9	7	8	8	8
408	MPG 7921	7	8	8	8	7	7.5	4	4.5	n/c	8	6	7	8	7	7
409	MO 011126	7	4	3	8	4	6	4	6	n/c	5	7	6	8	6	6
410	Beretta	7	3	3	7	4	5.5	7	8	6	8	7	8	8	7	7
411	Magnolia	7	2	3	7	4	5.5	6	6	n/c	4	6	6	8	7	7
412	D02-8486	7	4	3	7	2	4.5	4	5	n/c	5	7	6	7	6	6

[a]Samples assessed using a 9-point scale with 9=excellent, 5=average, and 1=very poor.

Table 52. Summary of quality assessment scores[a] for dough quality, end-product performance and overall acceptability for 12 soft wheat cultivars, 2006 QEC.

		Siemer Milling			Star of the West			USDA-ARS WWQL						USDA-ARS SWQL		
		Cakes			Cookies			Cookies			Sponge Cake			Cookies		
Sample number	Cultivar	Dough quality score	End product score	Overall score	Dough quality score	End product score	Overall score	Dough quality score	End product score	Overall score	Batter quality score	End product score	Overall score	Dough quality score	End product score	Overall score
401	Patterson	8	6	7	8	8	8	8	6	6	6.5	8	8	6	8	8
402	981477A1	7	7	7	5	7	7	9	5	6	6	7	7	6	4	7
403	011007A1-14	8	6	7	7	8	8	8	6	6	7	7	8	6	8	8
404	USG 3209	7	6	6	4	7	6	9	5	5	6	8	8	4	3	4
405	VA02W-555	8	8	8	7	7	6	7	6	5	7	8	8	4	3	6
406	AGS 2000	7	7	7	5	5	5	7	6	6	7	8	8	8	8	8
407	AGS 2060	5	5	5	4	4	4	8	3	6	7.5	6	7	4	6	6
408	MPG 7921	6	6	6	8	5	5	7	6	6	6	6	6	8	6	7
409	MO 011126	5	5	5	5	3	4	7	6	6	6	5	5	5	6	6
410	Beretta	5	8	7	8	4	6	8	5	5	7	5	5	5	6	6
411	Magnolia	5	7	6	4	6	5	8	5	6	5	5	5	5	4	5
412	D02-8486	6	6	6	5	2	2	7	4	5	8	4	4	6	4	5

[a]Samples assessed using a 9-point scale with 9=excellent, 5=average, and 1=very poor.

Table 53. Summary of quality assessment scores[a] for dough quality, end-product performance and overall acceptability for 12 soft wheat cultivars, 2006 QEC.

		Average		
Sample number	Cultivar	Dough or batter quality score	End product score	Overall score
401	Patterson	7.5	7.1	7.2
402	981477A1	6.1	5.8	6.7
403	011007A1-14	7.3	7.1	7.0
404	USG 3209	6.6	5.7	5.9
405	VA02W-555	6.8	5.9	6.1
406	AGS 2000	6.8	6.4	6.4
407	AGS 2060	5.9	5.4	5.6
408	MPG 7921	7.3	6.3	6.6
409	MO 011126	6.2	5.1	5.2
410	Beretta	7.0	5.4	5.8
411	Magnolia	5.9	5.1	5.4
412	D02-8486	6.4	4.3	4.6

[a]Samples assessed using a 9-point scale with 9=excellent, 5=average, and 1=very poor.
[b]Average does not include Kraft scores because not all samples were rated.

Appendix 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 α-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.