Milling and Baking Test Results for Eastern Soft Wheats
Harvested in 2025



Soft Wheat Quality Council of the Wheat Quality Council

March 24, 2026

Our Mission is to advocate the development of new wheat varieties that improve the value of wheat to all parties in the U.S. supply chain.

Our Goal is to improve the value of all U.S. wheat classes for producers, millers, and processors of wheat.

Membership in the Wheat Quality Council is a wise investment if wheat or flour quality has any influence on your business.

Uniform grow-outs are an extremely important part of the Wheat Quality Council efforts to improve wheat and flour quality.

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Acknowledgments

We thank the Wheat Quality Council for providing this forum to improve the quality of wheat. Thank you to the Soft Wheat Quality Laboratory staff and the collaborators in industry for their professional analysis and suggestions. Also, we are thankful for the cooperation from all the wheat breeding programs involved with this year's project. Great communication and cooperation among the breeding programs, growers, state foundation seeds programs, wheat seed companies and wheat quality laboratories in milling and baking companies make this project a continued success.

This program was carried out in cooperation with and funded by the Wheat Quality Council.

Collaborators for 2025 Crop Year

ADM Milling	Leslie Baine, Jessica Lehman
Ardent Mills	Caroline Smith, Amanda Smith, Miriam Dubin Hannah Howells
Great Plains Analytical Lab	Lacey Schmidt, Rich Kendrick
Kellanova	Michaelia Papranec, YuLai Jin
Mennel Milling Company	Cyprian Syeunda, Jim Beauregard
Mondeléz International	David Stevenson, Juan Calle-Bellido, Gerardo Gracia-Gonzalez
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Wheat Marketing Center	Autumn Sicard, Jayne Bock
USDA-ARS Western Wheat Quality Laboratory	Alecia Kiszonas
USDA-ARS Soft Wheat Quality Laboratory	Amy Bugaj, Tom Donelson, Taehyun Ji

Soft Wheat Quality Council

Mission, Policy, and Operating Procedure

The Soft Wheat Quality Council (SWQC) will provide an organizational structure to evaluate the quality of soft wheat experimental lines and varieties grown in the Eastern 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.

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 soft wheat industries seek in new varieties.
- Promote the enhancement of soft wheat quality in new varieties.
- Emphasize the importance of communication across all sectors and 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 USDA-ARS 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 his/her 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 consisting 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 Lead Scientist 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 varieties submitted by soft wheat breeders.
- 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 experimental test lines and a check variety each year for evaluation. (maximum 10 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.

WQC 2025 Crop Year Entries and Contributing Breeding Programs

Group	Entry Name	Location	Breeder/Contact	Institution/Company	Class
1	Beck 716	Ohio	Trek Murray	Beck's Hybrids	SRW
1	Beck 720	Ohio			SRW
1	Beck 722	Ohio			SRW
1	Beck 724	Ohio			SRW
1	Beck 725	Ohio			SRW
1	Beck 728	Ohio			SRW
1	Beck 732	Ohio			SRW
2	IL16LCSDH-09-T-2664-28	Ohio	Jessica Rutkoski	U. of Illinois	SRW
2	IL16-8048	Ohio			SRW
3	MI20R0210	Ohio	Eric Olson	Michigan State U.	SRW
	Branson*	Ohio			SRW
	Hilliard*	Ohio			SRW
4	OK20056CF-10C24	Oklahoma	Brett Carver	Oklahoma State U.	SRW
4	OK21424F	Oklahoma			SRW
5	18VTK10-23	Virginia	Nicholas Santantonio	Virginia Tech	SRW
5	DH19SRW07-321	Virginia			SRW
5	VA23W-532	Virginia			SRW
5	Shirley*	Virginia			SRW

*Check varieties.

Description of Entries

Beck 716
Management Tips:

- Excellent winterhardiness
- Handles a wide array of soil types
- Excellent for double crop opportunities

Strengths:

- BECK 716 brand packs a tremendous amount of yield into an early wheat with an excellent disease package. Use this attractive big headed product across soil types and reap the rewards.

General Characteristics

Exp #	5216
Relative Maturity	+0
Awns	Awns (Bearded)
Seed Size	12500
Fungicide Response	Med.
15" Row Adaptability	8
Test Weight	7
Double Crop	9

Plant Traits

Plant Height	Medium
Plant Color	Med. Green
Standability	7
Tillering	8
Winter Hardiness	9
Fall Growth	7
Plant Uniformity	8
Straw Yield	7

Plant Health

Septoria Leaf Blotch	8
Septoria Glume Blotch	7
Powdery Mildew	7
Leaf Rust	6
Stripe Rust	8
Wheat Scab	9
BYDV	7
SBWMV	6

Rating: 9 = Best

New **720** BRAND

SOFT RED WINTER WHEAT

Early

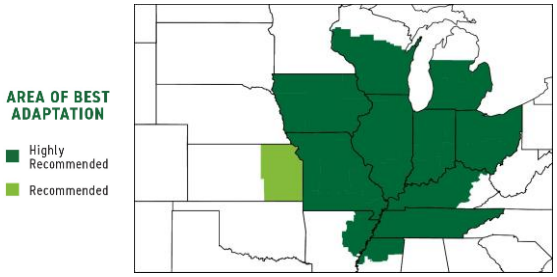
STRENGTHS

BECK 720 takes versatility to a whole new level across Beck's entire marketing area. This variety delivers high disease resistance from start to finish for all productivity levels. Trust this variety to deliver a yield punch and high grain quality for any acre or management style.

MANAGEMENT TIPS

- Excellent for wet-natured soils
- Tremendous fall establishment
- Stout agronomic disease package

GENERAL CHARACTERISTICS	
Exp #	**5001**
15" Row Adaptability	**9**
Relative Maturity (to Clark)	**+1**
Seed Size	**11,900**
Fungicide Response	**Med.**
Test Weight	**8**
Awns	**Awns (Bearded)**
Double Crop	**8**

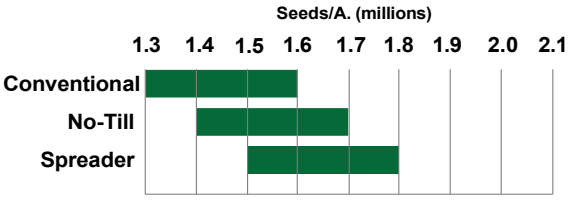


POSITIONING AND ADAPTABILITY - BY SOIL			
Irrigated			
High			
Medium			
Low			
Poorly Drained			
	Excellent	Good	Not Recommended

SOIL PRODUCTIVITY

PLANT TRAITS	
Standability	**7**
Tillering	**9**
Plant Height	**Med. Tall**
Winterhardiness	**9**
Fall Growth	**9**
Plant Uniformity	**8**
Plant Color	**Med. Green**
Straw Yield	**8**

RECOMMENDED SEEDING POPULATION



***For late seeding (Oct 15), increase rates by 15%**

PLANT HEALTH TRAITS	
Stripe Rust	**7**
Septoria Leaf Blotch	**7**
Septoria Glume Blotch	**8**
Powdery Mildew	**9**
Leaf Rust	**6**
Head Scab	**9**
BYDV	**8**
SBWMV	**9**

Rating: 9 = Best

YIELD COMPARISONS

Years	Plots	Brand	Bu./A	Test Wt.
2	32	BECK 720	93.3	58.3
		BECK 726	90.4	56.1
2	32	BECK 720	94.9	58.3
		BECK 727	91.1	58.0
1	12	BECK 720	92.3	58.3
		Pioneer P25R50	88.2	56.4

Beck 722

722 BRAND

SOFT RED WINTER WHEAT

Early

STRENGTHS

This awnless variety offers high straw tonnage and great yield potential for multiple revenue streams. This variety has excellent head scab tolerance and high test weight as an ease-of-use type of product.

MANAGEMENT TIPS

- Consider a growth regulator in +100 Bu./A environments
- Excellent straw option with a smooth head type
- Low management type with strong head scab tolerance

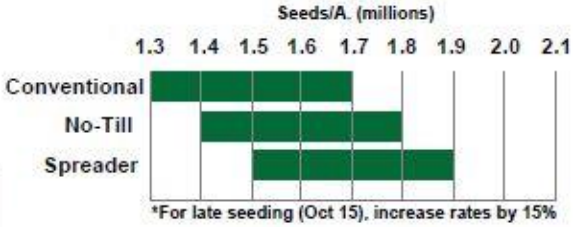
GENERAL CHARACTERISTICS	
Exp #	5901
15" Row Adaptability	7
Rel. Maturity (to Clark)	+1
Seed Size	13,000
Fungicide Resp.	Low
Test Weight	9
Awns	No Awns
Double Crop	8

POSITIONING AND ADAPTABILITY - BY SOIL			
Irrigated		■	
High		■	
Medium	■		
Low	■		
Poorly Drained	■		
	Excellent	Good	Not Recommended

SOIL PRODUCTIVITY

PLANT TRAITS	
Standability	7
Tillering	7
Plant Height	Med. Tall
Winterhardiness	8
Fall Growth	8
Plant Uniformity	8
Plant Color	Med. Green
Straw Yield	9

RECOMMENDED SEEDING POPULATION



*For late seeding (Oct 15), increase rates by 15%

PLANT HEALTH TRAITS	
Stripe Rust	8
Septoria Leaf Blotch	7
Septoria Glume Blotch	8
Powdery Mildew	7
Leaf Rust	7
Head Scab	9
BYDV	8
SBWMV	6

Rating: 9 = Best

YIELD COMPARISONS

Years	Plots	Brand	Bu./A	Test Wt.
3	56	BECK 722	89.7	58.8
		BECK 721	87.1	57.7
2	40	BECK 722	90.6	58.0
		BECK 120	86.8	55.5
1	24	BECK 722	91.2	58.5
		BECK 730	87.9	57.0

Beck 724

724 BRAND

SOFT RED WINTER WHEAT

Medium-Early

STRENGTHS

This new variety offers a competitive edge across acres and thrives in the heat of the southern portion of our marketing area. This versatility leader delivers the triple threat of standability, head scab tolerance, and top tier test weight.

MANAGEMENT TIPS

- Industry-leading test weight
- Incredible consistency across acres
- 15 inch row adaptability

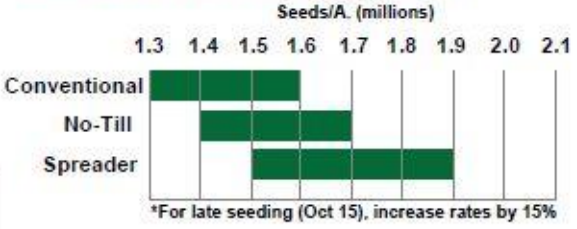
GENERAL CHARACTERISTICS	
Exp #	5817
15" Row Adaptability	9
Rel. Maturity (to Clark)	+2
Seed Size	13,000
Fungicide Resp.	Med.
Test Weight	9
Awns	Awns (Bearded)
Double Crop	7

POSITIONING AND ADAPTABILITY - BY SOIL	Excellent	Good	Not Recommended
Irrigated	■		
High	■		
Medium	■		
Low	■		
Poorly Drained	■		

SOIL PRODUCTIVITY

PLANT TRAITS	
Standability	8
Tillering	9
Plant Height	Med. Tall
Winterhardiness	7
Fall Growth	8
Plant Uniformity	8
Plant Color	Med. Green
Straw Yield	9

RECOMMENDED SEEDING POPULATION



*For late seeding (Oct 15), increase rates by 15%

PLANT HEALTH TRAITS	
Stripe Rust	8
Septoria Leaf Blotch	8
Septoria Glume Blotch	8
Powdery Mildew	7
Leaf Rust	6
Head Scab	9
BYDV	8
SBWMV	8

Rating: 9 = Best

YIELD COMPARISONS

Years	Plots	Brand	Bu./A	Test Wt.
3	57	BECK 724	89.8	59.4
		BECK 721	87.8	57.9
2	56	BECK 724	89.7	57.7
		BECK 726	87.3	55.7
1	6	BECK 724	81.9	55.1
		Pioneer P26R36	78.5	54.9

Beck 725

NEW **725** BRAND

SOFT RED WINTER WHEAT

Medium

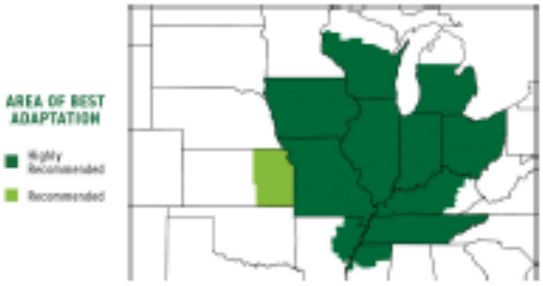
STRENGTHS

BECK 725 has an incredible yield punch tailored to higher management growers. This new outstanding variety brings enough heat to deliver potential new farm averages.

MANAGEMENT TIPS

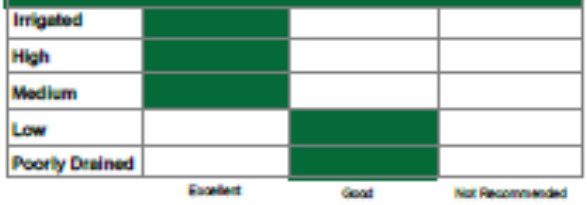
- Prefers additional nitrogen
- Excellent response to a foliar fungicide application
- Wide footprint across Beck's entire marketing area

GENERAL CHARACTERISTICS	
Exp #	5101
15" Row Adaptability	7
Relative Maturity (to Clark)	+3
Seed Size	12,500
Fungicide Response	High
Test Weight	7
Awns	Awns (Bearded)
Double Crop	7



PLANT TRAITS	
Standability	8
Tillering	7
Plant Height	Medium
Winterhardiness	8
Fall Growth	7
Plant Uniformity	7
Plant Color	Med. Green
Straw Yield	7

POSITIONING AND ADAPTABILITY - BY SOIL

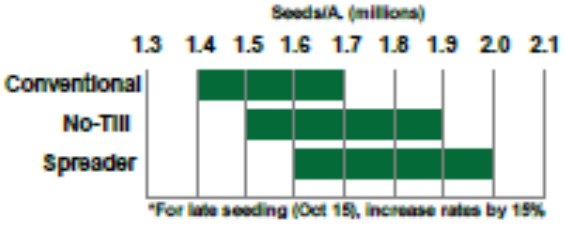


SOIL PRODUCTIVITY

PLANT HEALTH TRAITS	
Stripe Rust	5
Septoria Leaf Blotch	7
Septoria Glume Blotch	9
Powdery Mildew	7
Leaf Rust	5
Head Scab	9
BYDV	7
SBWMV	8

Rating: 9 = Best

RECOMMENDED SEEDING POPULATION



*For late seeding (Oct 15), increase rates by 15%

YIELD COMPARISONS

Years	Plots	Brand	Bu./A.	Test Wt.
2	34	BECK 725	101.5	58.2
		BECK 120	96.0	58.4
1	12	BECK 725	95.0	57.8
		AgriMAXX 505	93.7	60.0
1	12	BECK 725	95.0	57.8
		Pioneer P25R36	91.2	58.3

Beck 728

Management Tips:

- Utilize a fungicide for Leaf and Stripe rust
- Excellent staygreen
- FHB1 for Head Scab and clean for BYDV

Strengths:

- BECK 728 brand has oak tree-like standability with built-in tolerance to Head Scab and Barley Yellow Dwarf virus. This product will be ready to cut and still have a touch of "staygreen" - a sure farmer favorite for wheat producers.

General Characteristics

Exp #	5125
Relative Maturity	+3
Awns	No Awns
Seed Size	13000
Fungicide Response	Med. High
15" Row Adaptability	9
Test Weight	6
Double Crop	7

Plant Traits

Plant Height	Med. Short
Plant Color	Dark Green
Standability	9
Tillering	9
Winter Hardiness	8
Fall Growth	7
Plant Uniformity	9
Straw Yield	8

Plant Health

Septoria Leaf Blotch	7
Septoria Glume Blotch	8
Powdery Mildew	9
Leaf Rust	6
Stripe Rust	6
Wheat Scab	8
BYDV	9
SBWMV	7

Rating: 9 = Best

Beck 732

732 BRAND

SOFT RED WINTER WHEAT

Medium-Late

STRENGTHS

This new agronomic all-star has it all. BECK 732 blends reliable yields in all productivity levels and management styles in our marketing area. This variety's winter hardiness combined with an extremely desirable disease package is ready for all adverse growing conditions.

MANAGEMENT TIPS

- Excellent foliar disease package
- Season-long standability
- Consistent performer in all acres

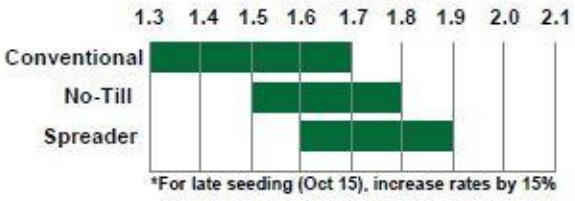
GENERAL CHARACTERISTICS	
Exp #	5902
15" Row Adaptability	9
Rel. Maturity (to Clark)	+4
Seed Size	13,000
Fungicide Resp.	Low
Test Weight	8
Awns	Awns (Bearded)
Double Crop	6

POSITIONING AND ADAPTABILITY - BY SOIL			
Irrigated			
High			
Medium			
Low			
Poorly Drained			
	Excellent	Good	Not Recommended

SOIL PRODUCTIVITY

PLANT TRAITS	
Standability	8
Tillering	8
Plant Height	Medium
Winterhardiness	9
Fall Growth	8
Plant Uniformity	8
Plant Color	Dark Green
Straw Yield	7

RECOMMENDED SEEDING POPULATION



*For late seeding (Oct 15), increase rates by 15%

PLANT HEALTH TRAITS	
Stripe Rust	8
Septoria Leaf Blotch	7
Septoria Glume Blotch	7
Powdery Mildew	7
Leaf Rust	8
Head Scab	9
BYDV	8
SBWMV	8

Rating: 9 = Best

YIELD COMPARISONS

Years	Plots	Brand	Bu./A	Test Wt.
2	20	BECK 732	91.5	57.4
		BECK 730	89.1	57.1
1	6	BECK 732	80.1	55.1
		Pioneer P25R50	78.2	55.8
1	6	BECK 732	83.3	53.2
		Pioneer P26R59	80.3	53.0

IL16LCSDH-09-T-2664-28

IL16LCSDH-09-T-2664-28 is a high-yielding, medium-early soft red winter wheat cultivar (Triticum aestivum L.) with excellent test weight and resistance to Fusarium head blight (caused primarily by Fusarium graminearum). IL16LCSDH-09-T-2664-28 was released by the Illinois Agricultural Experiment Station in 2024 for brand labeling based on its overall performance over 4 years of testing. Based on 42 randomized trials conducted from 2022- 2024, the yield of IL16LCSDH-09-T-2664-28 was 2 bushels per acre (bu/A) greater than IL07-19334 and one 1 bu/A greater than Pioneer Brand 25R74. The test weight of IL16LCSDH-09-T-2664-28 1lb heavier than that of IL07-19334 and 4lbs heavier than that of Pioneer Brand 25R74. IL16LCSDH-09-T-2664-28 matures about 1 day earlier than Pioneer Brand 25R74 and three days earlier than IL07-19334. IL16LCSDH-09-T-2664-28 is about 2 inches shorter than IL07-19334.

IL16-8048

IL16-8048 is a high-yielding, medium-early soft red winter wheat cultivar (Triticum aestivum L.) with excellent test weight and resistance to Fusarium head blight (caused primarily by Fusarium graminearum). IL16-8048 was released by the Illinois Agricultural Experiment Station in 2020 for brand labeling based on its overall performance over 4 years of testing. Based on 17 randomized trials conducted from 2020 to 2022, the yield of IL16-8048 has been about 1 bushel per acre (bu/A) greater than IL07-19334, 1 bu/A less than Pioneer Brand 25R74, and 14 bu/A greater than Kaskaskia. The test weight of IL16-8048 in these trials was equal to IL07-19334 and Kaskaskia and 2 lbs/bu greater than Pioneer Brand 25R74. Across 5 randomized trials in Illinois over 3 years, IL16-8048 headed 1 to 2 days earlier than IL07-19334, 2 to 3 days earlier than Kaskaskia, and 0 to 1 day earlier than Pioneer Brand 25R74. In these 5 trials, the height of IL16-8048 was 1 inch (in) taller than IL07-19334, 5 in shorter than Kaskaskia, and 3 to 4 in taller than Pioneer Brand 25R74. Over three years of Fusarium head blight nursery data, IL16-8048 has 40% less kernel damage and Deoxynivalenol accumulation than IL07-19334, and 60-70% less kernel damage and Deoxynivalenol accumulation than Pioneer Brand 25R74 and Kaskaskia. IL16-8048 is at least moderately resistant to soil-borne mosaic virus, leaf rust (caused by Puccinia triticina), Septoria leaf blotch (caused by Septoria tritici), stripe rust (caused by Puccinia striiformis), and powdery mildew (caused by Blumeria graminis f. sp. tritici). IL16-8048 has good milling and baking quality. Up to 1% of other types are allowed in IL16-8048 PVP for IL16-8048 will not be applied for.

MI20R0210

'MI20R0210' is a soft red winter wheat derived from the cross P25R47/Hilliard/MI14R213. MI20R0210 demonstrates high yield potential and stability with broad adaptation across the Eastern US, Ontario and Quebec. A combination of modified bulk breeding at the F2 generation and greenhouse advance of the F3 and F4 generations in the Minibulk system were used to derive the single F5 plant resulting in MI20R0210. MI20R0210 carries the Rht-D1b dwarfing gene allele and Ppd-A1a photoperiod sensitivity. The line has an upright flag leaf angle and wide tiller angle.

MI20R0210 was tested in replication for five years from 2021 to 2025 across Michigan and the Eastern US at 90 locations. The line has been evaluated in the Michigan commercial yield trial in 2022, 2023, 2024 and 2025 and confers a yield advantage over current wheat varieties. Test

weight is 2 lbs. greater that SY100 and one lb. less than Pioneer 25R40. Height is similar to both SY100 and Pioneer 25R40. MI20R0210 demonstrates tolerance to lodging under high yield conditions.

MI20R0210 is resistant to a range of stripe rust races with low infection type and severity to races in the Eastern US, Washington state and Kenya. Field resistance is demonstrated to leaf rust races common to the northern soft wheat region. Both visual response to Fusarium head blight and DON mycotoxin accumulation are intermediate and similar to SY100. MI20R0210 demonstrates strong resistance to Septoria and Stagonospora foliar canopy pathogens and an intermediate response to Bacterial Leaf Streak.

Flour yield for MI20R0210 is 1 to 2% greater than average. Lactic acid SRC as well as kernel and flour protein are average to slightly below average. MI20R0210 demonstrates above average cookie baking performance.

Branson

Branson is a soft red winter wheat bred and developed by AgriPro Wheat. Branson is a medium height semi dwarf variety with good straw strength. Branson is moderately resistant to Septoria Leaf Blotch and Stripe rust and Powdery Mildew. Intermediate resistance to Soil borne Mosaic virus and Leaf rust. Primary adaptation is the wheat growing regions of Missouri, Illinois, Indiana, Michigan, and Ohio. Juvenile growth habit is semi erect. Plant color at boot stage is dark green. Flag leaf at boot stage is erect and twisted. Waxy bloom is present on the head, stem and flag leaf sheath. Anther color is yellow. Head shape is strap, mid-dense and awnletted. Glumes are glabrous, narrow in width and long in length with oblique shoulders and obtuse beaks. Seed shape is ovate. Brush hairs are mid-long in length and occupy a large area of the seed tip. Seed crease depth is shallow and width is narrow. Seed cheeks are rounded. Branson has been uniform and stable since 2003. Less than 0.8% of the plants were rouged from the Breeders Seed increase in 2004. Approximately 90% of the rouged variant plants were taller height wheat plants (8 to 15 cm) and 10% were awned plants. AgriPro Wheat maintains seed stock and certified classes of Foundation, Registered and Certified. Certified seed stocks of Branson will be available in the fall of 2005. Certified acreage is not to be published by AOSCA and certifying agencies. Plant Variety Protection is anticipated and Branson may only be sold as a class of certified seed.

Hilliard

Soft red winter (SRW) wheat cultivar Hilliard (VA11W-108) was derived from the cross Pioneer Brand ‘25R47’ (PI 631473) / ‘Jamestown’ (PI 653731). Hilliard was derived as a bulk of an F5:6 headrow selected in 2010 and has been evaluated over five years (2013 – 2017) in Virginia’s State Variety Trials and throughout the soft red winter (SRW) wheat region in the 2014, 2016, and 2017 USDA-ARS Uniform Southern and Uniform Eastern Soft Red Winter Wheat Nurseries.

Hilliard is a broadly adapted, high yielding, mid-season, medium height, awned, semi-dwarf (gene Rht2) SRW wheat. In the southern SRW wheat region, head emergence of Hilliard (121d) has been similar to that of ‘USG 3555’ and 3 days later than Jamestown. In the eastern SRW wheat region, head emergence of Hilliard (136 d) was 1 day later than ‘Branson’ and 1.5 d

earlier than 'Shirley'. Average mature plant height of Hilliard throughout the SRW wheat region has varied from 34 to 38 inches. In the 2014 Uniform Southern and Uniform Eastern nurseries, plant height of Hilliard (34 inches) was 2 inches shorter than checks 'AGS 2000' and MO_080104 and 2.5 to 3.5 inches taller than Shirley. Straw strength (0=erect to 9=completely lodged) of Hilliard (0.2 – 2.3) is very good and similar to that of Shirley (0.6 – 2.5). In the Uniform Eastern Nursery, winter hardiness (0 = no injury to 9 = severe injury) of Hilliard (2.2) was similar to that of the checks (1.8 – 2.9), while in the Uniform Southern Nursery, its winter injury (4.0) was less than that of the checks (5.4 – 6.5).

Hilliard was evaluated at 21 sites in the 2014 USDA-ARS Uniform Southern SRW Wheat Nursery and ranked second among 33 entries for grain yield (84 bu/ac). Average test weight of Hilliard (55.8 lb/bu) was similar to the overall trial mean and significantly ($P < 0.05$) higher than that of USG 3555 (54.4 lb/bu). Hilliard also was evaluated at 21 locations in the 2014 USDA-ARS Uniform Eastern SRW Wheat Nursery, and ranked first in grain yield within the eastern wheat region (87.6 lb/bu) and second over all test sites (86.9 lb/bu). Average test weight of Hilliard (56.9 lb/bu) was similar to the overall trial mean, and significantly ($P < 0.05$) higher than those of Branson (55.8 lb/bu) and Shirley (54.7 lb/bu).

Grain samples of Hilliard produced in five crop environments (2012 – 2014) were evaluated for end use quality by the USDA-ARS Soft Wheat Quality Lab. Hilliard has exhibited milling and baking qualities that are intermediate between those of Jamestown and USG 3555. Jamestown has better milling quality attributes than Hilliard or USG 3555, while both Jamestown and Hilliard have superior baking quality compared to USG 3555. While flour of Hilliard has the lowest grain protein content, it has slightly stronger gluten strength than Jamestown or USG 3555.

Hilliard is a widely adapted, mid-season wheat variety with good winter hardiness. It has high grain yield potential, good straw strength, and has performed well over most of the eastern SRW wheat production areas. With the exception of stem rust, Hilliard has expressed moderate to high levels of resistance to diseases prevalent in the SRW wheat region. These include powdery mildew, leaf rust, stripe rust, leaf and glume blotch, bacterial leaf streak, Soil Borne Mosaic Virus, Barley and Cereal Yellow Dwarf Viruses, Fusarium head blight, and Hessian fly.

OK20056CF-10C24

This HRW-backcross derivative (2*Strad CL+/ARS090199-4H) resulted from a stripe-rust introgression program executed by USDA-ARS and Washington State University. The HRW recipient, Strad CL+, originated from Oklahoma State University (OSU) and the donor originated from USDA-ARS (Pullman, WA). OK20056CF-10C24 is a very soft, high-test weight, high-protein (12+, wheat) SRW experimental with moderate gluten strength (Dx5+Dy10). Starch damage has not been assessed. RVA analysis revealed a slightly elevated pasting temperature. Grain yield of OK20056CF-10C24 was at the top of the class for the past five years across Oklahoma. It exhibits strong adult-plant stripe rust resistance, all-season leaf rust resistance, intermediate reaction to head scab, strong acid-soil tolerance, and field resistance to Hessian fly (Texas biotype). Release is being considered for fall 2026.

OK21424F
Another product of a long-standing collaboration with Corteva, OK21424F is a SRW progeny from a single cross of SRW x HRW wheat (25R56/OK12621). Like OK20056CF-10C24, this line also is very soft and has high test weight and moderately high-protein (12 wheat), but intermediate gluten strength (still Dx5+Dy10). It carries soft alleles at Pina-D1, Pinb-D1, Pinb-B2. OK21424F is targeted for the primary SRW region in Oklahoma but is adapted statewide. It exhibits strong resistance to stripe rust and powdery mildew (both in the adult plant), barley yellow dwarf, and leaf rust (all-season). Release is being considered for fall 2026.

18VTK10-23

DH19SRW07-321

VA23W-532

Shirley
'Shirley' (Reg. No. CV-1039, PI 656753), soft red winter (SRW) wheat (*Triticum aestivum L.*), developed and tested as VA03W-409 by the Virginia Agricultural Experiment Station, was released in March 2008. Shirley was derived from the three-way cross VA94-52-25/'Coker 9835'//VA96-54-234. Shirley is widely adapted and provides producers and end users with a full-season, short-stature, semidwarf (*Rht1*) cultivar that has very high yield potential and good milling and pastry baking qualities. Shirley also is notably resistant to leaf rust (Puccinia triticina Eriks.), stem rust (*Puccinia graminis* Pers.:Pers. f. sp. tritici Eriks. & E. Henn.), and powdery mildew [Blumeria graminis (DC.) E.O. Speer].

In Virginia Shirley had the highest 3-yr (2006–2008) average grain yield (6316 kg ha–1) among cultivars evaluated in the state variety trial. In USDA–ARS Uniform Eastern SRW Wheat Nursery Trials conducted at 29 locations in 2006 and at 22 locations in 2007, Shirley ranked first in grain yield in both years with mean yields of 6155 and 5456 kg ha–1, respectively. Shirley has soft grain texture, low endosperm separation indices (score = 8.9), high break flour (323–328 g kg–1), and high straight grade (777–779 g kg–1) flour yields on an Allis mill. Flour protein concentration (7.62–8.65 g 100 g–1) and gluten strength (84.6–93.6 g 100 g–1) of Shirley are lower than average. These quality attributes combined with low fl our sucrose solvent retention capacity (87.6– 90.8 g 100 g–1) contribute to Shirley's good pastry baking quality (cookie spread diameters of 17.15–18.65 cm).

Milling and Baking Results Reported by Collaborators and SWQL

Mill Stream Distribution by SWQL

Table 1. Miag Multomat mill stream yields (%) of the WQC 2025 crop year entries by SWQL

Mill Stream	Group 1							Checks for Groups 1-3	
	Beck 716	Beck 720	Beck 722	Beck 724	Beck	Beck 728	Beck 732	Branson*	Hilliard*
1st Break	9.6	8.9	7.4	7.4	9.5	6.6	9.3	8.0	9.4
2nd Break	9.9	9.1	8.4	9.2	8.7	8.3	10.4	8.5	8.4
Grader	6.7	5.9	6.3	5.7	5.6	7.2	6.7	5.5	5.3
3rd Break	9.4	8.7	7.8	9.8	8.5	8.2	9.5	8.4	8.4
Total Break	**35.6**	**32.7**	**30.0**	**32.1**	**32.3**	**30.3**	**35.9**	**30.4**	**31.4**
1st Reduction	8.3	8.9	7.9	7.3	9.6	6.7	8.4	8.2	10.2
2nd Reduction	7.9	8.8	10.5	8.0	10.2	8.2	8.1	8.7	9.0
3rd Reduction	6.2	6.3	7.5	7.2	6.4	7.5	6.0	7.1	6.6
Duster	6.2	6.5	7.3	5.8	7.2	6.7	6.5	6.4	7.2
4th Reduction	3.3	3.4	4.4	4.0	3.4	4.0	3.1	4.0	3.3
5th Reduction	1.8	1.9	2.2	2.5	1.8	2.2	1.6	2.4	2.2
Total Reduction	33.7	35.7	39.9	34.9	38.7	35.3	33.7	36.8	38.4
Straight Grade	**69.3**	**68.4**	**69.9**	**67.0**	**71.0**	**65.6**	**69.7**	**67.2**	**69.9**
Head Shorts	6.7	6.4	6.5	6.9	6.4	7.0	5.9	6.8	6.1
Red Dog	1.5	1.5	1.6	2.0	1.4	1.9	1.2	2.1	1.7
Tail Shorts	0.5	0.5	0.5	0.5	0.5	0.5	0.3	0.6	0.5
Bran	22.1	23.3	21.5	23.6	20.6	25.0	22.9	23.3	21.9
Total Byproduct	30.7	31.6	30.1	33.0	29.0	34.4	30.3	32.8	30.1

*Check varieties.

Table 1-continued

Mill Stream	Group 2		Group 3	Checks for Groups 1-3	
	IL16LCSDH-09-T-2664-28	IL16-8048	MI20R0210	Branson*	Hilliard*
1st Break	6.0	7.9	9.2	8.0	9.4
2nd Break	8.3	8.1	10.5	8.5	8.4
Grader	4.9	5.1	6.8	5.5	5.3
3rd Break	7.6	8.0	9.3	8.4	8.4
Total Break	**26.8**	**29.1**	**35.8**	**30.4**	**31.4**
1st Reduction	8.6	10.0	8.6	8.2	10.2
2nd Reduction	11.6	11.5	8.1	8.7	9.0
3rd Reduction	7.7	7.4	5.9	7.1	6.6
Duster	8.2	8.5	6.7	6.4	7.2
4th Reduction	4.6	4.1	3.2	4.0	3.3
5th Reduction	2.3	2.1	1.8	2.4	2.2
Total Reduction	43.2	43.6	34.2	36.8	38.4
Straight Grade	**69.9**	**72.7**	**70.0**	**67.2**	**69.9**
Head Shorts	6.8	5.5	6.0	6.8	6.1
Red Dog	1.6	1.3	1.6	2.1	1.7
Tail Shorts	0.6	0.4	0.5	0.6	0.5
Bran	21.1	20.1	21.9	23.3	21.9
Total Byproduct	30.1	27.3	30.0	32.8	30.1

*Check varieties.

Table 1-continued

Mill Stream	Group 4		Group 5			
	OK20056CF-10C24	OK21424F	18VTK10-23	DH19SRW07-321	VA23W-532	Shirley*
1st Break	8.2	7.1	9.7	6.5	6.6	7.6
2nd Break	6.8	7.5	7.9	6.8	6.8	7.7
Grader	4.0	4.4	4.2	3.9	4.1	4.3
3rd Break	8.4	6.8	8.4	7.6	8.0	8.3
Total Break	**27.5**	**25.8**	**30.3**	**24.8**	**25.5**	**27.9**
1st Reduction	11.0	10.5	12.2	10.4	9.9	10.6
2nd Reduction	10.5	11.9	9.7	12.0	11.2	11.3
3rd Reduction	7.6	7.8	6.9	8.4	8.5	8.3
Duster	7.9	9.2	7.3	7.7	7.3	7.7
4th Reduction	4.0	4.5	3.6	5.0	4.8	4.7
5th Reduction	2.8	2.7	2.6	3.3	3.2	3.3
Total Reduction	43.8	46.6	42.3	46.8	44.8	45.8
Straight Grade	**71.3**	**72.4**	**72.6**	**71.6**	**70.3**	**73.7**
Head Shorts	6.6	6.1	8.1	6.7	7.5	6.8
Red Dog	2.0	1.8	2.0	2.0	2.3	2.3
Tail Shorts	0.6	0.6	0.7	0.6	0.7	0.6
Bran	19.6	19.1	16.6	19.1	19.3	16.6
Total Byproduct	28.7	27.6	27.4	28.4	29.7	26.3

Wheat Grain and Flour Quality Characteristics

Table 2. Grain characteristics and SKCS parameters of the 2025 entries by USDA-ARS Soft Wheat Quality Laboratory

Group	Entry	Test Weight (lb/bu)	Grain Falling Number	Grain Protein (%, 12% mb)	SKCS Parameter		
					Kernel Hardness	Kernel Diameter (mm)	Kernel Weight (mg)
1	Beck 716	53.7	374	9.3	-0.5	2.5	27.6
1	Beck 720	56.4	420	9.9	7.4	2.6	30.7
1	Beck 722	57.2	399	10.1	9.2	2.4	27.0
1	Beck 724	57.1	437	10.8	9.6	2.5	29.4
1	Beck 725	56.5	355	9.4	11.4	2.5	30.5
1	Beck 728	51.2	383	10.6	10.4	2.4	22.7
1	Beck 732	54.2	387	9.3	5.9	2.3	25.5
2	IL16LCSDH-09-T-2664-28	60.7	414	11.0	19.7	2.3	24.6
2	IL16-8048	60.0	443	11.3	13.8	2.5	28.0
3	MI20R0210	53.3	406	9.9	1.0	2.4	26.6
1-3	Branson*	55.0	414	11.0	13.2	2.5	28.5
1-3	Hilliard*	58.3	387	10.3	12.6	2.6	31.3
4	OK20056CF-10C24	61.3	408	13.2	15.8	2.6	29.5
4	OK21424F	61.3	422	12.3	10.7	2.6	28.6
5	18VTK10-23	61.5	363	10.5	12.4	3.0	39.6
5	DH19SRW07-321	63.1	403	10.7	33.5	2.7	32.3
5	VA23W-532	61.6	423	10.0	27.0	2.8	37.3
5	Shirley*	60.7	426	9.5	13.9	2.8	38.3

*Check varieties.

Table 3. Miag and Quadrumat milling parameters of the 2025 entries by USDA-ARS Soft Wheat Quality Laboratory

Group	Entry	Miag Milling		Quadrumat Milling	
		Break Flour Yield (%)	Straight Grade Flour Yield (%)	Softness Equivalence (%)	Flour Yield (%)
1	Beck 716	35.6	69.3	73.2	69.8
1	Beck 720	32.7	68.4	70.0	68.9
1	Beck 722	30.0	69.9	67.1	68.8
1	Beck 724	32.1	67.0	67.8	66.3
1	Beck 725	32.3	71.0	69.5	71.1
1	Beck 728	30.3	65.6	69.0	64.6
1	Beck 732	35.9	69.7	72.9	70.1
2	IL16LCSDH-09-T-2664-28	26.8	69.9	63.2	68.2
2	IL16-8048	29.1	72.7	63.9	70.7
3	MI20R0210	35.8	70.0	72.0	71.1
1-3	Branson*	30.4	67.2	66.3	66.5
1-3	Hilliard*	31.4	69.9	66.7	69.7
4	OK20056CF-10C24	27.5	71.3	59.9	69.2
4	OK21424F	25.8	72.4	59.0	71.0
5	18VTK10-23	30.3	72.6	62.1	70.7
5	DH19SRW07-321	24.8	71.6	56.1	69.8
5	VA23W-532	25.5	70.3	57.1	68.1
5	Shirley*	27.9	73.7	58.9	71.3

*Check varieties.

Table 4. Flour quality parameters of the 2025 entries by USDA-ARS Soft Wheat Quality Laboratory

Group	Entry	Moisture (%)	Protein (%, 14% mb)	Flour Ash (%, 14% mb)	Starch Damage (%)
1	Beck 716	14.2	7.4	0.40	1.8
1	Beck 720	14.1	8.0	0.35	2.0
1	Beck 722	14.0	8.4	0.40	2.1
1	Beck 724	14.1	8.7	0.36	2.5
1	Beck 725	14.0	7.8	0.39	2.3
1	Beck 728	14.0	8.7	0.37	1.5
1	Beck 732	14.0	7.5	0.37	1.4
2	IL16LCSDH-09-T-2664-28	14.2	9.3	0.35	2.2
2	IL16-8048	14.0	9.3	0.35	2.3
3	MI20R0210	14.2	8.0	0.39	1.8
1-3	Branson*	14.1	8.9	0.36	2.3
1-3	Hilliard*	14.1	8.3	0.37	2.1
4	OK20056CF-10C24	14.2	11.0	0.38	2.5
4	OK21424F	14.2	10.0	0.34	2.3
5	18VTK10-23	14.2	8.6	0.34	2.8
5	DH19SRW07-321	13.6	8.9	0.39	3.5
5	VA23W-532	13.4	8.3	0.42	4.7
5	Shirley*	13.7	7.6	0.40	4.5

*Check varieties.

Summaries and Statistics of Combined Cooperator Test Parameters

Table 5. Mean SRC test parameters and overall flour quality scores (n=6)[a]

Group	Entry	Solvent Retention Capacity (%)			
		Water	Sodium Carbonate	Sucrose	Lactic Acid
1	Beck 716	51.9 ef	72.8 de	91.4 c	107.5 d
1	Beck 720	53.7 bcd	77.4 c	105.0 a	129.3 ab
1	Beck 722	51.0 f	72.2 de	95.5 bc	126.5 bc
1	Beck 724	56.2 a	79.8 b	105.2 a	139.3 a
1	Beck 725	51.9 ef	71.4 e	90.6 c	96.4 e
1	Beck 728	52.6 de	79.0 b	108.1 a	136.6 a
1	Beck 732	53.1 cde	73.0 d	93.0 c	118.7 c
1	Branson*	54.8 b	82.7 a	108.2 a	119.3 bc
1	Hilliard*	53.9 bc	78.5 bc	101.9 ab	123.0 bc
2	IL16LCSDH-09-T-2664-28	52.3 b	71.4 c	96.1 b	135.0 a
2	IL16-8048	51.5 b	69.0 d	97.5 b	138.6 a
2	Branson*	54.8 a	82.7 a	108.2 a	119.3 b
2	Hilliard*	53.9 a	78.5 b	101.9 ab	123.0 b
3	MI20R0210	50.9 b	75.2 c	94.0 c	94.3 b
3	Branson*	54.8 a	82.7 a	108.2 a	119.3 a
3	Hilliard*	53.9 a	78.5 b	101.9 b	123.0 a
4	OK20056CF-10C24	54.7 a	67.7 a	105.4 a	150.3 a
4	OK21424F	51.3 b	64.8 b	96.0 b	141.7 a
5	18VTK10-23	56.2 a	75.5 a	103.4 a	132.0 a
5	DH19SRW07-321	55.7 a	70.6 b	101.5 ab	133.0 a
5	VA23W-532	57.3 a	77.5 a	103.7 a	120.7 b
5	Shirley*	55.2 a	76.4 a	98.8 b	91.6 c

*Check varieties.

[a]Means with different letters within the same group are significantly different at $P<0.05$.

Table 6. Damaged starch content (n=2) and flour falling number (n=2)[a]

Group	Entry	Damaged Starch Content (%)	Falling Number
1	Beck 716	2.6 a	363 b
1	Beck 720	2.7 a	419 ab
1	Beck 722	2.9 a	420 ab
1	Beck 724	3.3 a	450 a
1	Beck 725	3.0 a	364 b
1	Beck 728	2.4 a	382 ab
1	Beck 732	2.3 a	387 ab
1	Branson*	3.0 a	419 ab
1	Hilliard*	2.7 a	383 ab
2	IL16LCSDH-09-T-2664-28	2.5 a	411 a
2	IL16-8048	3.0 a	396 a
2	Branson*	3.0 a	419 a
2	Hilliard*	2.7 a	383 a
3	MI20R0210	2.5 a	392 a
3	Branson*	3.0 a	419 a
3	Hilliard*	2.7 a	383 a
4	OK20056CF-10C24	3.0 a	476 a
4	OK21424F	3.1 a	407 a
5	18VTK10-23	3.4 a	368 a
5	DH19SRW07-321	4.3 a	404 a
5	VA23W-532	5.1 a	470 a
5	Shirley*	5.0 a	392 a

*Check varieties.

[a]Means with different letters within the same group are significantly different at $P<0.05$.

Table 7. Mean alveograph test parameters (n=2)[a]

Group	Entry	Alveograph			
		P	L	P/L Ratio	W
1	Beck 716	37.5 bc	89.0 ab	0.44 c	77.0 b
1	Beck 720	49.0 b	83.0 abc	0.60 bc	101. ab5
1	Beck 722	37.0 bc	100.0 ab	0.37 c	98.0 ab
1	Beck 724	65.5 a	57.5 cd	1.16 a	126.0 ab
1	Beck 725	29.5 c	85.5 abc	0.35 c	53.0 b
1	Beck 728	47.0 b	107.0 a	0.44 c	178.0 a
1	Beck 732	44.0 bc	47.0 d	0.95 ab	81.0 ab
1	Branson*	45.5 bc	98.5 ab	0.48 c	88.5 ab
1	Hilliard*	50.5 ab	75.0 bcd	0.69 bc	97.5 ab
2	IL16LCSDH-09-T-2664-28	40.0 a	110.5 a	0.37 a	119.0 a
2	IL16-8048	59.0 a	95.0 a	0.62 a	160.5 a
2	Branson*	45.5 a	98.5 a	0.48 a	88.5 a
2	Hilliard*	50.5 a	75.0 a	0.69 a	97.5 a
3	MI20R0210	27.5 b	86.0 a	0.35 a	44.5 a
3	Branson*	45.5 ab	98.5 b	0.48 b	88.5 a
3	Hilliard*	50.5 a	75.0 c	0.69 c	97.5 a
4	OK20056CF-10C24	107.0 a	50.0 b	2.17 a	244.0 a
4	OK21424F	48.0 b	118.5 a	0.41 b	140.5 b
5	18VTK10-23	90.5 a	55.5 a	1.63 ab	175.5 a
5	DH19SRW07-321	106.0 a	54.0 a	2.00 a	210.5 a
5	VA23W-532	72.5 ab	69.5 a	1.05 ab	145.5 a
5	Shirley*	52.0 b	53.0 a	1.01 b	75.0 a

*Check varieties.

[a]Means with different letters within the same group are significantly different at $P<0.05$.

Table 8. Farinograph test parameters (n=1)

Group	Entry	Farinograph			
		Water Absorption	Development Time	Stability	Mixing Tolerance
1	Beck 716	52.2	0.9	<1.0	180
1	Beck 720	52.6	1.0	1.6	100
1	Beck 722	51.5	1.2	1.5	140
1	Beck 724	54.0	1.2	1.6	130
1	Beck 725	50.5	0.8	<1.0	170
1	Beck 728	52.0	1.4	2.1	120
1	Beck 732	52.8	0.8	1.1	160
1	Branson*	54.7	1.5	1.6	120
1	Hilliard*	54.6	1.0	1.4	110
2	IL16LCSDH-09-T-2664-	52.0	1.6	2.8	120
2	IL16-8048	53.7	1.7	5.2	60
2	Branson*	54.7	1.5	1.6	120
2	Hilliard*	54.6	1.0	1.4	110
3	MI20R0210	51.7	0.9	1.0	160
3	Branson*	54.7	1.5	1.6	120
3	Hilliard*	54.6	1.0	1.4	110
4	OK20056CF-10C24	54.4	5.3	27.1	18
4	OK21424F	53.3	1.8	4.9	70
5	18VTK10-23	57.4	1.4	1.8	80
5	DH19SRW07-321	56.9	1.4	2.8	75
5	VA23W-532	56.4	1.6	3.1	100
5	Shirley*	55.1	1.6	2.0	120

*Check varieties.

Table 9. Mixograph test parameters (n=1)

Group	Entry	Mixograph	
		Absorption (%)	Peak Time (min)
1	Beck 716	53.0	0.9
1	Beck 720	52.0	1.2
1	Beck 722	53.0	1.3
1	Beck 724	53.0	1.3
1	Beck 725	52.5	0.9
1	Beck 728	52.0	1.2
1	Beck 732	53.0	1.1
1	Branson*	53.0	1.0
1	Hilliard*	53.5	1.0
2	IL16LCSDH-09-T-2664-28	54.0	6.4
2	IL16-8048	54.0	4.5
2	Branson*	53.0	1.0
2	Hilliard*	53.5	1.0
3	MI20R0210	52.0	1.0
3	Branson*	53.0	1.0
3	Hilliard*	53.5	1.0
4	OK20056CF-10C24	56.5	6.0
4	OK21424F	57.0	3.2
5	18VTK10-23	55.0	4.0
5	DH19SRW07-321	59.0	5.2
5	VA23W-532	56.0	2.8
5	Shirley*	54.0	1.2

*Check varieties.

Table 10. Mean Rapid Visco-Analyzer (RVA) test parameters (n=3)[a]

Group	Entry	Rapid Visco-Analyzer						
		Peak Time (min)	Peak (cP)	Trough (cP)	Break-down (cP)	Setback (cP)	Final (cP)	Pasting Temperature (°C)
1	Beck 716	6.1 a	3193 bc	1881 e	1312 a	1509 d	3390 ef	85.6 a
1	Beck 720	6.2 a	2998 d	2046 cd	952 c	1583	3633 d	86.4 a
1	Beck 722	6.2 a	3286 ab	2032 cd	1254 a	1603	3631 d	85.9 a
1	Beck 724	6.2 a	3115 cd	2194 a	925 c	1680 a	3869 a	85.6 a
1	Beck 725	6.2 a	3047 d	1874 e	1173 ab	1494 d	3368 f	86.0 a
1	Beck 728	6.2 a	3271 ab	2079 abc	1187 ab	1650 ab	3730 bc	84.7 ab
1	Beck 732	6.1 a	3338 a	2067 bc	1271 a	1647 ab	3714 cd	77.6 b
1	Branson*	6.2 a	3239 ab	2188 ab	1051 bc	1620	3809 ab	85.6 a
1	Hilliard*	6.1 a	3001 d	1939 de	1058 bc	1542 cd	3481 e	84.4 ab
2	IL16LCSDH-09-T-	6.2 a	3338 a	1953 bc	1381 a	1464 b	3417 b	85.9 a
2	IL16-8048	6.1 a	3137 bc	2112 ab	1025 b	1614 a	3726 a	84.8 ab
2	Branson*	6.2 a	3239 ab	2188 a	1051 b	1620 a	3809 a	85.6 a
2	Hilliard*	6.1 a	3001 c	1939 c	1058 b	1542 ab	3481 b	84.4 b
3	MI20R0210	6.2 a	3276 a	2132 ab	1148 a	1654 a	3786 a	83.5 a
3	Branson*	6.2 a	3239 a	2188 a	1051 a	1620 a	3809 a	85.6 a
3	Hilliard*	6.1 a	3001 b	1939 b	1058 a	1542 a	3481 b	84.4 a
4	OK20056CF-10C24	6.1 a	2644 b	1663 a	981 b	1470 a	3133 a	86.0 a
4	OK21424F	6.1 a	3111 a	1838 a	1277 a	1378 a	3211 a	85.1 a
5	18VTK10-23	6.0 a	2497 a	1476 b	1025 a	1281 b	2757 c	85.6 b
5	DH19SRW07-321	6.1 a	2736 a	1823 a	913 ab	1566 a	3388 ab	86.4 b
5	VA23W-532	6.1 a	2205 a	1760 a	445 b	1558 a	3318 b	88.1 a
5	Shirley*	6.1 a	2614 a	1859 a	751 ab	1681 a	3540 a	85.6 b

*Check varieties.

[a]Means with different letters within the same group are significantly different at $P<0.05$.

Table 11. Mean sugar-snap cookie test (AACCI Approved Methods 10-50D (n=5) & 10-52 (n=2)) parameters[a]

Group	Entry	Sugar-snap Cookie (10-50D)				Sugar-snap Cookie (10-52)	
		Width (mm)	Thickness (mm)	W/T Ratio (mm)	Spread Factor	Width (cm)	Top Grain Score
1	Beck 716	507.4 a	49.4	10.5 a	98.5 a	9.6 a	6.5 a
1	Beck 720	497.9 a	50.6	10.1 a	94.7 a	9.3 a	6.0 a
1	Beck 722	502.6 a	51.0	10.1 a	95.0 a	9.3 a	5.5 a
1	Beck 724	490.3 a	53.5	9.4 a	88.5 a	8.9 a	4.5 a
1	Beck 725	502.8 a	49.7	10.3 a	97.1 a	9.5 a	6.5 a
1	Beck 728	505.5 a	47.3	10.9 a	101.6 a	9.3 a	5.0 a
1	Beck 732	503.9 a	49.0	10.4 a	98.1 a	9.4 a	6.0 a
1	Branson*	492.9 a	53.4	9.4 a	88.7 a	8.9 a	4.5 a
1	Hilliard*	496.6 a	53.8	9.4 a	88.9 a	9.0 a	4.0 a
2	IL16LCSDH-09-T-2664-	494.0 a	52.6	9.6 a	89.9 a	8.9 a	4.0 a
2	IL16-8048	495.9 a	53.6	9.4 a	88.4 a	9.0 a	4.0 a
2	Branson*	492.9 a	53.4	9.4 a	88.7 a	8.9 a	4.5 a
2	Hilliard*	496.6 a	53.8	9.4 a	88.9 a	9.0 a	4.0 a
3	MI20R0210	512.2 a	49.7	10.6 a	99.4 a	9.4 a	6.0 a
3	Branson*	492.9 b	53.4	9.4 a	88.7 a	8.9 a	4.5 a
3	Hilliard*	496.6 ab	53.8	9.4 a	88.9 a	9.0 a	4.0 a
4	OK20056CF-10C24	460.2 b	65.5	7.1 a	67.3 b	8.3 a	3.0 a
4	OK21424F	483.6 a	54.2	9.1 a	85.5 a	8.9 a	5.0 a
5	18VTK10-23	472.3 a	63.0	7.7 a	72.9 a	8.7 a	5.0 a
5	DH19SRW07-321	462.7 a	62.8	7.6 a	71.0 a	8.6 a	4.5 a
5	VA23W-532	471.5 a	62.5	7.8 a	73.3 a	8.7 a	4.0 a
5	Shirley*	477.9 a	62.3	8.0 a	74.7 a	8.7 a	4.5 a

*Check varieties.

[a]Means with different letters within the same group are significantly different at $P<0.05$.

Table 12. Biscuit quality parameters (n=1)

Group	Entry	Biscuit		
		Width (mm)	Height (mm)	Weight (g)
1	Beck 716	54.1	37.4	25.2
1	Beck 720	54.2	37.5	25.7
1	Beck 722	53.4	38.2	25.2
1	Beck 724	51.6	36.1	25.7
1	Beck 725	54.3	34.1	24.7
1	Beck 728	-	-	-
1	Beck 732	52.8	33.0	24.1
1	Branson*	52.0	39.4	25.5
1	Hilliard*	52.8	37.0	25.2
2	IL16LCSDH-09-T-2664-	53.0	36.3	25.8
2	IL16-8048	50.2	39.1	28.4
2	Branson*	52.0	39.4	25.5
2	Hilliard*	52.8	37.0	25.2
3	MI20R0210	54.1	39.9	25.8
3	Branson*	52.0	39.4	25.5
3	Hilliard*	52.8	37.0	25.2
4	OK20056CF-10C24	50.8	34.8	23.4
4	OK21424F	52.9	35.1	25.1
5	18VTK10-23	51.2	35.3	26.6
5	DH19SRW07-321	50.8	36.0	27.3
5	VA23W-532	51.6	36.7	27.6
5	Shirley*	51.6	35.4	26.5

*Check varieties.

Table 13. Mean (n=2) sponge cake baking test parameters[a]

Group	Entry	Sponge Cake	
		Volume (mL)	Texture Score
1	Beck 716	1270 a	22 a
1	Beck 720	1212 ab	21 a
1	Beck 722	1251 ab	21 a
1	Beck 724	1167 b	21 a
1	Beck 725	1227 ab	23 a
1	Beck 728	1222 a	23 a
1	Beck 732	1228 b	21 a
1	Branson*	1228 ab	20 a
1	Hilliard*	1209 ab	21 a
2	IL16LCSDH-09-T-2664-28	1235 a	22 a
2	IL16-8048	1258 a	21 a
2	Branson*	1228 a	20 a
2	Hilliard*	1209 a	21 a
3	MI20R0210	1244 a	21 a
3	Branson*	1228 a	20 a
3	Hilliard*	1209 a	21 a
4	OK20056CF-10C24	1208 a	21 a
4	OK21424F	1217 a	21 a
5	18VTK10-23	1083 a	20 a
5	DH19SRW07-321	1112 a	20 a
5	VA23W-532	1160 a	20 a
5	Shirley*	1090 a	20 a

*Check varieties.

[a]Means with different letters within the same group are significantly different at $P<0.05$.

Table 14. Mean flour (n=7), cookie (n=6) and sponge cake (n=2) quality scores[a]

Group	Entry	Flour Score	Cookie Score	Sponge Cake Score
1	Beck 716	7.0 a	7.5 ab	7.3 a
1	Beck 720	7.6 a	7.0 ab	6.3 a
1	Beck 722	7.4 a	6.5 ab	7.0 a
1	Beck 724	6.9 a	6.0 ab	4.5 a
1	Beck 725	7.6 a	7.3 ab	6.0 a
1	Beck 728	7.0 a	6.0 ab	7.5 a
1	Beck 732	6.7 a	7.8 a	5.5 a
1	Branson*	6.6 a	5.7 b	5.0 a
1	Hilliard*	6.7 a	6.3 ab	5.0 a
2	IL16LCSDH-09-T-2664-28	7.6 a	5.8 a	6.5 a
2	IL16-8048	6.9 a	5.8 a	6.0 a
2	Branson*	6.6 a	5.7 a	5.0 a
2	Hilliard*	6.7 a	6.3 a	5.0 a
3	MI20R0210	7.4 a	7.5 a	6.0 a
3	Branson*	6.6 a	5.7 a	5.0 a
3	Hilliard*	6.7 a	6.3 a	5.0 a
4	OK20056CF-10C24	5.9 a	4.5 a	4.5 a
4	OK21424F	6.9 a	5.5 a	5.5 a
5	18VTK10-23	6.7 a	5.0 a	3.0 a
5	DH19SRW07-321	6.3 a	4.7 a	3.5 a
5	VA23W-532	6.1 a	5.3 a	3.5 a
5	Shirley*	6.6 a	5.2 a	1.0 a

*Check varieties.

[a]Means with different letters within the same group are significantly different at $P<0.05$.

Cooperator Data for Each Quality Test Parameter

Table 15. Water SRC (%) of 2025 WQC entries by cooperators

Group	Entry	Ardent	GPAL	Mennel	Kellanova	Star of West	SWQL	**Mean**	**STDEV**
1	Beck 716	51.3	52.9	51.5	50.8	52.4	52.4	51.9	0.79
1	Beck 720	54.7	54.6	53.4	51.6	54.0	54.0	53.7	1.14
1	Beck 722	51.9	51.8	50.3	49.3	51.0	51.6	51.0	1.02
1	Beck 724	56.7	56.2	56.9	54.1	56.8	56.4	56.2	1.05
1	Beck 725	52.4	51.3	51.7	50.1	52.2	53.5	51.9	1.15
1	Beck 728	53.3	52.9	53.0	50.4	53.6	52.1	52.5	1.19
1	Beck 732	53.9	52.7	53.3	52.1	52.0	54.8	53.1	1.10
2	IL16LCSDH-09-T-2664-28	51.8	52.4	51.4	52.5	53.8	51.6	52.2	0.89
2	IL16-8048	50.8	52.1	51.2	50.5	51.7	52.4	51.5	0.74
3	MI20R0210	51.5	50.1	50.7	49.1	51.1	52.6	50.8	1.23
1-3	Branson*	55.0	57.2	54.4	53.2	54.2	55.0	54.8	1.34
1-3	Hilliard*	53.7	54.8	53.1	52.2	54.5	55.1	53.9	1.10
4	OK20056CF-10C24	56.2	55.0	54.2	53.4	54.5	54.8	54.7	0.91
4	OK21424F	50.2	51.2	50.6	54.8	50.3	50.7	51.3	1.77
5	18VTK10-23	58.0	56.0	56.0	54.1	56.8	56.4	56.2	1.26
5	DH19SRW07-321	56.9	51.3	56.0	56.1	56.3	57.7	55.7	2.27
5	VA23W-532	58.8	53.5	57.6	56.3	58.4	59.0	57.3	2.09
5	Shirley*	55.6	50.5	56.5	54.4	56.6	57.7	55.2	2.55

*Check varieties.

Table 16. Sodium Carbonate SRC (%) of 2025 WQC entries by cooperators

Group	Entry	Ardent	GPAL	Mennel	Kellanova	Star of West	SWQL	**Mean**	**STDEV**
1	Beck 716	72.0	73.3	72.6	72.2	73.2	73.4	72.8	0.60
1	Beck 720	76.6	79.2	76.8	76.1	77.8	78.0	77.4	1.13
1	Beck 722	71.0	72.8	73.3	70.9	72.2	73.1	72.2	1.07
1	Beck 724	78.1	80.7	80.8	79.0	79.2	80.8	79.8	1.17
1	Beck 725	71.1	72.3	71.6	69.8	72.0	71.8	71.4	0.88
1	Beck 728	79.2	79.1	80.4	77.6	79.0	78.4	78.9	0.92
1	Beck 732	71.6	73.9	74.4	71.9	71.1	74.8	72.9	1.59
2	IL16LCSDH-09-T-2664-28	71.7	72.4	71.1	68.0	73.4	72.0	71.4	1.84
2	IL16-8048	67.4	70.8	68.8	67.0	68.4	71.4	69.0	1.77
3	MI20R0210	76.5	75.9	75.3	72.9	74.2	76.5	75.2	1.44
1-3	Branson*	83.1	84.7	83.2	79.8	82.9	82.5	82.7	1.61
1-3	Hilliard*	78.0	79.5	79.1	76.3	78.7	79.6	78.5	1.24
4	OK20056CF-10C24	68.3	67.3	68.3	66.1	66.9	69.3	67.7	1.16
4	OK21424F	63.8	67.3	64.5	62.8	63.7	66.6	64.8	1.78
5	18VTK10-23	75.6	75.9	75.8	73.7	75.7	76.1	75.5	0.90
5	DH19SRW07-321	70.6	66.8	71.8	69.4	71.5	73.4	70.6	2.27
5	VA23W-532	76.8	75.0	78.2	75.9	78.5	80.4	77.5	1.96
5	Shirley*	75.3	74.7	78.0	74.6	77.6	78.4	76.4	1.76

*Check varieties.

Table 17. Sucrose SRC (%) of 2025 WQC entries by cooperators

Group	Entry	Ardent	GPAL	Mennel	Kellanova	Star of West	SWQL	**Mean**	**STDEV**
1	Beck 716	91.0	99.7	91.4	85.9	92.8	87.4	91.4	4.85
1	Beck 720	104.8	114.3	107.2	96.2	107.9	99.6	105.0	6.44
1	Beck 722	95.0	104.2	95.2	89.5	96.4	92.7	95.5	4.92
1	Beck 724	104.1	118.2	105.9	98.3	105.0	99.9	105.2	7.01
1	Beck 725	89.5	100.1	91.0	84.9	91.6	86.3	90.6	5.36
1	Beck 728	103.3	118.0	111.0	99.1	112.5	104.8	108.1	6.94
1	Beck 732	90.9	101.0	93.3	86.5	97.8	88.6	93.0	5.54
2	IL16LCSDH-09-T-2664-28	96.9	104.7	96.1	91.4	92.2	95.1	96.1	4.77
2	IL16-8048	97.8	108.9	99.0	90.8	96.6	92.1	97.5	6.42
3	MI20R0210	94.4	96.0	98.5	86.2	98.6	90.3	94.0	4.91
1-3	Branson*	109.6	115.1	108.6	99.2	111.4	105.3	108.2	5.47
1-3	Hilliard*	102.7	102.2	105.6	94.8	107.3	98.5	101.9	4.57
4	OK20056CF-10C24	106.5	109.6	108.1	99.3	106.3	102.6	105.4	3.80
4	OK21424F	94.5	101.4	97.8	92.0	97.6	92.7	96.0	3.59
5	18VTK10-23	101.4	107.7	105.2	97.4	106.1	102.3	103.4	3.74
5	DH19SRW07-321	100.3	107.4	100.9	98.4	103.1	99.0	101.5	3.30
5	VA23W-532	100.8	106.8	105.2	101.2	106.6	101.6	103.7	2.82
5	Shirley*	98.0	104.1	99.1	95.4	99.5	96.4	98.8	3.04

*Check varieties.

Table 18. Lactic acid SRC (%) of 2025 WQC entries by cooperators

Group	Entry	Ardent	GPAL	Mennel	Kellanova	Star of West	SWQL	**Mean**	**STDEV**
1	Beck 716	102.2	115.9	105.7	114.1	110.1	97.1	107.5	7.22
1	Beck 720	124.3	140.9	128.0	134.0	130.1	118.6	129.3	7.72
1	Beck 722	120.3	133.6	127.1	131.0	129.9	117.1	126.5	6.48
1	Beck 724	135.4	144.7	142.8	143.6	144.8	124.4	139.3	8.07
1	Beck 725	91.9	101.5	96.5	100.3	99.0	89.3	96.4	4.87
1	Beck 728	136.1	138.2	138.2	139.5	143.2	124.6	136.6	6.35
1	Beck 732	110.3	118.4	116.4	115.3	148.0	103.9	118.7	15.27
2	IL16LCSDH-09-T-2664-28	132.3	145.6	142.1	145.4	119.5	125.0	135.0	11.14
2	IL16-8048	133.5	142.1	140.6	143.6	146.5	125.4	138.6	7.79
3	MI20R0210	86.2	101.0	91.9	101.4	92.2	93.3	94.3	5.87
1-3	Branson*	104.4	130.7	119.9	129.4	116.5	115.1	119.3	9.81
1-3	Hilliard*	112.9	129.5	120.9	132.4	127.1	115.2	123.0	7.92
4	OK20056CF-10C24	156.4	151.8	154.0	152.4	152.4	134.7	150.3	7.83
4	OK21424F	140.8	145.2	142.3	153.0	141.9	126.8	141.7	8.52
5	18VTK10-23	129.8	135.9	130.1	137.2	137.4	121.3	131.9	6.22
5	DH19SRW07-321	130.3	126.3	137.0	137.6	141.9	125.0	133.0	6.82
5	VA23W-532	120.6	124.0	118.3	126.6	122.1	112.8	120.7	4.81
5	Shirley*	91.8	91.7	90.2	95.7	92.2	87.7	91.5	2.64

*Check varieties.

Table 19. Sugar-snap cookie (10-50) diameter (mm) of 2025 WQC entries by cooperators

Group	Entry	ADM	Ardent	GPAL	Mennel	Star of West	**Mean**	**STDEV**
1	Beck 716	515	515	508	507	493	507	8.9
1	Beck 720	511	508	495	497	479	498	12.6
1	Beck 722	510	517	508	499	479	503	14.8
1	Beck 724	502	505	480	491	473	490	13.9
1	Beck 725	521	516	497	496	484	503	15.3
1	Beck 728	520	513		500	490	505	13.6
1	Beck 732	522	508	508	494	487	504	13.7
2	IL16LCSDH-09-T-2664-28	506	497	493	489	485	494	8.2
2	IL16-8048	513	500	492	500	474	496	14.3
3	MI20R0210	512	530	511	513	495	512	12.5
1-3	Branson*	509	496	485	501	474	493	13.7
1-3	Hilliard*	509	506	489	504	475	497	14.6
4	OK20056CF-10C24	471	463	457	463	448	460	8.5
4	OK21424F	495	491	478	481	473	484	9.2
5	18VTK10-23	489	478	470	478	447	472	15.7
5	DH19SRW07-321	474	475	457	471	438	463	15.8
5	VA23W-532	484	486	461	472	455	472	13.7
5	Shirley*	481	500	474	480	455	478	16.0

*Check varieties.

Table 20. Sugar-snap cookie (10-52) diameter (cm) of 2025 WQC entries by cooperators

Group	Entry	SWQL	WWQL	**Mean**	**STDEV**
1	Beck 716	9.8	9.3	9.6	0.33
1	Beck 720	9.5	9.1	9.3	0.29
1	Beck 722	9.5	9.0	9.2	0.34
1	Beck 724	9.2	8.6	8.9	0.43
1	Beck 725	9.7	9.2	9.5	0.39
1	Beck 728	9.5	9.0	9.2	0.39
1	Beck 732	9.7	9.1	9.4	0.43
2	IL16LCSDH-09-T-2664-28	9.0	8.7	8.8	0.27
2	IL16-8048	9.3	8.6	8.9	0.52
3	MI20R0210	9.6	9.2	9.4	0.29
1-3	Branson*	9.2	8.6	8.9	0.37
1-3	Hilliard*	9.4	8.6	9.0	0.52
4	OK20056CF-10C24	8.3	8.3	8.3	0.06
4	OK21424F	9.1	8.6	8.9	0.36
5	18VTK10-23	8.9	8.4	8.7	0.30
5	DH19SRW07-321	8.9	8.3	8.6	0.40
5	VA23W-532	9.0	8.4	8.7	0.38
5	Shirley*	8.9	8.4	8.7	0.35

*Check varieties.

Table 21. Sponge cake volume (mL) of 2025 WQC entries by cooperators

Group	Entry	WMC	WWQL	**Mean**	**STDEV**
1	Beck 716	1293	1246	1270	33.2
1	Beck 720	1213	1211	1212	1.4
1	Beck 722	1225	1276	1251	36.1
1	Beck 724	1189	1144	1167	31.8
1	Beck 725	1262	1192	1227	49.5
1	Beck 728	1203	1240	1222	26.2
1	Beck 732	1261	1195	1228	46.7
2	IL16LCSDH-09-T-2664-28	1202	1268	1235	46.7
2	IL16-8048	1260	1256	1258	2.8
3	MI20R0210	1272	1216	1244	39.6
1-3	Branson*	1211	1245	1228	24.0
1-3	Hilliard*	1254	1163	1209	64.3
4	OK20056CF-10C24	1224	1192	1208	22.6
4	OK21424F	1201	1232	1217	21.9
5	18VTK10-23	1124	1041	1083	58.7
5	DH19SRW07-321	1119	1104	1112	10.6
5	VA23W-532	1227	1093	1160	94.8
5	Shirley*	1092	1087	1090	3.5

*Check varieties.

Table 22. Flour quality scores of 2025 WQC entries by cooperators

Group	Entry	Ardent	GPAL	Kellanova	Mennel	Star of West	WMC	WWQL	**Mean**	**STDEV**
1	Beck 716	8	7	6	8	7	7	6	7.0	0.8
1	Beck 720	8	8	9	8	6	7	7	7.6	1.0
1	Beck 722	8	9	9	7	9	6	4	7.4	1.9
1	Beck 724	7	7	8	7	5	7	7	6.9	0.9
1	Beck 725	6	8	9	8	9	7	6	7.6	1.3
1	Beck 728	7	7	9	8	6	7	5	7.0	1.3
1	Beck 732	8	7	6	7	7	7	5	6.7	1.0
2	IL16LCSDH-09-T-2664-28	7	9	9	7	8	6	7	7.6	1.1
2	IL16-8048	7	6	7	7	8	6	7	6.9	0.7
3	MI20R0210	7	9	8	8	8	6	6	7.4	1.1
1-3	Branson*	8	7	7	7	5	6	6	6.6	1.0
1-3	Hilliard*	8	7	7	7	5	7	6	6.7	1.0
4	OK20056CF-10C24	5	5	8	8	7	5	3	5.9	1.9
4	OK21424F	6	6	9	8	6	6	7	6.9	1.2
5	18VTK10-23	8	5	7	7	7	7	6	6.7	1.0
5	DH19SRW07-321	7	5	7	7	7	6	5	6.3	1.0
5	VA23W-532	8	6	7	8	5	5	4	6.1	1.6
5	Shirley*	8	5	7	7	7	7	5	6.6	1.1

*Check varieties.

Table 23. Cookie quality scores of 2025 WQC entries by cooperators

Group	Entry	ADM	Ardent	GPAL	Mennel	Star of West	WWQL	**Mean**	**STDEV**
1	Beck 716	9	7	4	7	9	9	7.5	2.0
1	Beck 720	9	6	7	6	7	7	7.0	1.1
1	Beck 722	9	7	4	7	7	5	6.5	1.8
1	Beck 724	8	6	6	8	5	3	6.0	1.9
1	Beck 725	8	7	7	6	8	8	7.3	0.8
1	Beck 728	9	5		8	6	4	6.4	2.1
1	Beck 732	8	6	8	8	9	8	7.8	1.0
2	IL16LCSDH-09-T-2664-28	8	5	4	7	8	3	5.8	2.1
2	IL16-8048	8	7	4	7	7	2	5.8	2.3
3	MI20R0210	7	6	7	8	9	8	7.5	1.0
1-3	Branson*	8	6	5	7	5	3	5.7	1.8
1-3	Hilliard*	8	8	5	7	7	3	6.3	2.0
4	OK20056CF-10C24	7	4	4	6	4	2	4.5	1.8
4	OK21424F	8	6	3	7	7	2	5.5	2.4
5	18VTK10-23	8	7	4	6	4	1	5.0	2.5
5	DH19SRW07-321	8	6	4	6	3	1	4.7	2.5
5	VA23W-532	8	8	4	7	4	1	5.3	2.8
5	Shirley*	8	5	4	8	5	1	5.2	2.6

*Check varieties.

Table 24. Sponge cake quality scores of 2025 WQC entries by cooperators

Group	Entry	WMC	WWQL	Mean	STDEV
1	Beck 716	6.5	8	7.3	1.1
1	Beck 720	6.5	6	6.3	0.4
1	Beck 722	7	7	7.0	0.0
1	Beck 724	6	3	4.5	2.1
1	Beck 725	7	5	6.0	1.4
1	Beck 728	7	8	7.5	0.7
1	Beck 732	7	4	5.5	2.1
2	IL16LCSDH-09-T-2664-28	8	5	6.5	2.1
2	IL16-8048	7	5	6.0	1.4
3	MI20R0210	8	4	6.0	2.8
1-3	Branson*	6	4	5.0	1.4
1-3	Hilliard*	7	3	5.0	2.8
4	OK20056CF-10C24	5	4	4.5	0.7
4	OK21424F	6	5	5.5	0.7
5	18VTK10-23	5	1	3.0	2.8
5	DH19SRW07-321	5	2	3.5	2.1
5	VA23W-532	6	1	3.5	3.5
5	Shirley*	1	1	1.0	0.0

*Check varieties.

Table 25. Average wheat grain and flour quality characteristics of the 2025 crop Soft Wheat Quality Council entries between 2009 and 2024 crop years

Group	Entry	N	Test Weight (LB/BU)	Grain Protein (%)	Kernel Hard.	Flour Yield (%)	Softness Equiv. (%)	Flour Protein (%)	Water SRC (%)	Sodium Carb. SRC (%)	Sucrose SRC (%)	Lactic Acid SRC (%)	Cookie Diameter (cm)
1	Beck 716	0	-	-	-	-	-	-	-	-	-	-	-
1	Beck 720	3	58.5	10.3	12.8	67.8	61.4	8.5	55.1	77.2	101.0	119.5	18.1
1	Beck 722	4	60.4	10.1	17.6	69.4	56.0	8.6	52.3	71.0	90.2	111.1	18.5
1	Beck 724	4	60.0	10.1	11.9	66.3	60.7	8.4	56.6	78.4	97.9	129.2	18.2
1	Beck 725	2	60.4	8.2	20.7	69.2	59.9	6.8	55.8	73.7	87.0	99.2	18.7
1	Beck 728	0	-	-	-	-	-	-	-	-	-	-	-
1	Beck 732	4	57.8	9.3	11.7	69.3	63.7	7.8	54.4	72.8	88.1	111.7	18.8
2	IL16LCSDH-09-T-2664-28	3	63.9	9.0	29.2	66.9	54.0	-	-	-	-	-	-
2	IL16-8048	5	61.2	10.3	16.8	69.4	55.0	8.5	52.8	67.2	93.6	134.4	18.6
3	MI20R0210	8	59.4	9.4	7.6	69.4	60.7	7.5	54.2	71.3	89.4	93.5	19.4
1-3	Branson*	322	59.7	10.6	5.7	69.2	61.6	8.3	52.3	67.1	91.3	109.1	18.8
1-3	Hilliard*	186	59.9	10.3	14.0	67.1	59.7	8.1	55.3	73.2	98.5	118.2	18.5
4	OK20056CF-10C24	0	-	-	-	-	-	-	-	-	-	-	-
4	OK21424F	0	-	-	-	-	-	-	-	-	-	-	-
5	18VTK10-23	9	62.2	9.9	18.9	68.4	57.7	8.1	57.9	74.7	101.8	112.8	18.5
5	DH19SRW07-321	3	61.1	9.4	17.7	67.2	56.5	8.3	55.6	69.3	92.5	117.3	18.5
5	VA23W-532	0	-	-	-	-	-	-	-	-	-	-	-
5	Shirley*	253	58.9	10.3	7.7	69.0	56.8	7.9	54.4	70.8	91.0	90.7	18.9

*Check varieties.

Cooperator Data

ADM Milling Quality Evaluations

Table 26. Sugar-snap cookie baking test parameters by ADM Milling

Group	Entry	Cookie (10-50D)			
		Width (cm)	Thickness (cm)	W/T Ratio	Spread Factor
1	Beck 716	515	53	9.7	94.2
1	Beck 720	511	52	9.8	95.3
1	Beck 722	510	53	9.6	93.3
1	Beck 724	502	55	9.1	88.5
1	Beck 725	521	52	10.0	97.1
1	Beck 728	520	50	10.4	100.1
1	Beck 732	522	51	10.2	99.3
2	IL16LCSDH-09-T-2664-28	506	57	8.9	86.1
2	IL16-8048	513	55	9.3	90.5
3	MI20R0210	512	53	9.7	93.7
1-3	Branson*	509	55	9.3	89.8
1-3	Hilliard*	509	56	9.1	88.2
4	OK20056CF-10C24	471	72	6.5	63.4
4	OK21424F	495	55	9.0	87.3
5	18VTK10-23	489	70	7.0	67.8
5	DH19SRW07-321	474	68	7.0	67.6
5	VA23W-532	484	70	6.9	67.1
5	Shirley*	481	70	6.9	66.6

*Check varieties.

Table 27. Evaluation comments on flour quality and baked product performance by ADM Milling

		Analytical Flour Qualities				End Product Performance				
		Score: 1 Poor - 9 Excellent				Score: 1 Poor - 9 Excellent				Aditional Comments
Group	Entry	Likes	Dislikes	Basis	Score	Product	Likes	Dislikes	Score	Mitigating Physical/Chemical Properties
1	Beck 716	Lower protein, higher ash		Primary Analysis		Cookie	Good spread		9	Good dough/ no checking
1	Beck 720	Average protein and ash		Primary Analysis		Cookie	Good spread		9	Good dough/ no checking
1	Beck 722	Average protein, higher ash		Primary Analysis		Cookie	Good spread		9	Good dough/ no checking
1	Beck 724	Average protein and ash		Primary Analysis		Cookie	lowest spread for group		8	Slightly dry dough/ Slight checking
1	Beck 725	Lower protein, higher ash		Primary Analysis		Cookie	Good spread		8	Good dough/ Slight checking
1	Beck 728	Average protein and ash		Primary Analysis		Cookie	Good spread		9	Good dough/ no checking
1	Beck 732	Lower protein, average ash		Primary Analysis		Cookie	Good spread		8	Slightly dry dough/ no checking
2	IL16LCSDH-09-T-2664-28	Average protein and ash		Primary Analysis		Cookie	Good spread		8	Good dough/ no checking
2	IL16-8048	Average protein and ash		Primary Analysis		Cookie	Good spread		8	Good dough/ no checking
3	MI20R0210	Average protein, higher ash		Primary Analysis		Cookie	Good spread		7	softer dough than check samples/ checking
	Branson*	Average protein and ash		Primary Analysis		Cookie	Good spread		8	Slightly dry dough/ slight checking
	Hilliard*	Average protein and ash		Primary Analysis		Cookie	Good spread		8	Slightly dry dough/ no checking
4	OK20056CF-10C24	Higher protein, average ash		Primary Analysis		Cookie	lowest spread overall		7	Good dough/ no checking
4	OK21424F	Higher protein, lower ash		Primary Analysis		Cookie	Lower spread		8	Good dough/ no checking
5	18VTK10-23	Average protein and ash		Primary Analysis		Cookie	Lower spread		8	Good dough/ no checking
5	DH19SRW07-321	Average protein, higher ash		Primary Analysis		Cookie	Lower spread		8	Good dough/ Slight checking
5	VA23W-532	Average protein, higher ash		Primary Analysis		Cookie	Lower spread		8	Good dough/ Slight checking
5	Shirley*	Lower protein, higher ash		Primary Analysis		Cookie	Lower spread	All samp	8	Good dough/ no checking

*Check varieties.

Ardent Mills Quality Evaluations

Table 28. Solvent retention capacity and cookie baking test parameters by Ardent Mills

Group	Entry	Solvent Retention Capacity (%)				Cookies (10-50D)			
		Water	Sodium Carbonate	Sucrose	Lactic Acid	Width (mm)	Thickness (mm)	W/T Ratio	Spread Factor
1	Beck 716	51.3	72.0	91.0	102.2	514.6	37.5	13.7	116.1
1	Beck 720	54.7	76.6	104.8	124.3	507.8	37.4	13.6	114.7
1	Beck 722	51.9	71.0	95.0	120.3	517.4	36.7	14.1	119.2
1	Beck 724	56.7	78.1	104.1	135.4	505.4	39.0	13.0	109.6
1	Beck 725	52.4	71.1	89.5	91.9	515.9	37.8	13.6	115.3
1	Beck 728	53.3	79.2	103.3	136.1	513.0	37.0	13.9	117.2
1	Beck 732	53.9	71.6	90.9	110.3	508.5	39.2	13.0	109.7
2	IL16LCSDH-09-T-2664-28	51.8	71.7	96.9	132.3	497.4	40.6	12.3	103.6
2	IL16-8048	50.8	67.4	97.8	133.5	500.3	42.1	11.9	100.3
3	MI20R0210	51.5	76.5	94.4	86.2	530.2	35.9	14.8	124.8
1-3	Branson*	55.0	83.1	109.6	104.4	495.7	40.0	12.4	104.8
1-3	Hilliard*	53.7	78.0	102.7	112.9	506.4	40.1	12.6	106.7
4	OK20056CF-10C24	56.2	68.3	106.5	156.4	462.6	51.0	9.1	76.6
4	OK21424F	50.2	63.8	94.5	140.8	491.2	41.7	11.8	99.5
5	18VTK10-23	58.0	75.6	101.4	129.8	477.8	43.8	10.9	92.2
5	DH19SRW07-321	56.9	70.6	100.3	130.3	474.6	47.1	10.1	85.2
5	VA23W-532	58.8	76.8	100.8	120.6	486.1	44.1	11.0	93.1
5	Shirley*	55.6	75.3	98.0	91.8	499.5	42.9	11.6	98.4

*Check varieties.

Table 29. Evaluation comments on flour quality and baked product performance by Ardent Mills

		Analytical Flour Qualities				End Product Performance				
		Score: 1 Poor - 9 Excellent				Score: 1 Poor - 9 Excellent				Additional Comments
Group	Entry	Likes	Dislikes	Basis	Score	Product	Likes	Dislikes	Score	Mitigating Physical/Chemical Properties
1	Beck 716	comprable lactic to check, comperable MAP values to check		SRC, NIR MAP	8	Sugar Snap Cookie	bright dough, good cracking, high spread	sl crumbly dough	7	
1	Beck 720	high lactic, comperable MAP values to check		SRC, NIR MAP	8	Sugar Snap Cookie	high spread	sl yellow dough	6	
1	Beck 722	high lactic, comperable MAP values to check		SRC, NIR MAP	8	Sugar Snap Cookie	good surface cracking , high spread	sl yellow, sl crumbly	7	
1	Beck 724	comperable MAP values to check	high lactic	SRC, NIR MAP	7	Sugar Snap Cookie	similar spread to check	sl yellow	6	
1	Beck 725		lactic & sucrose lower than check	SRC, NIR MAP	6	Sugar Snap Cookie	good dough feel, high spread	sl yellow	7	
1	Beck 728	comperable MAP values to check	high lactic	SRC, NIR MAP	7	Sugar Snap Cookie	high spread	yellow, crumbly, uneven browning	5	
1	Beck 732	comprable lactic to check		SRC, NIR MAP	8	Sugar Snap Cookie	similar spread to check	sl crumbly	6	
2	IL16LCSDH-09-T-2664-28	comperable MAP values to check	high lactic	SRC, NIR MAP	7	Sugar Snap Cookie		sl boning	5	
2	IL16-8048	comperable MAP values to check	high lactic	SRC, NIR MAP	7	Sugar Snap Cookie	bright dough	sl crumbly dough	7	
3	MI20R0210	comperable MAP values to check	lactic lower than check	SRC, NIR MAP	7	Sugar Snap Cookie	good surface cracking, high spread factor	sl yellow, crumbly	6	
	Branson*	high lactic		SRC, NIR MAP	8	Sugar Snap Cookie		sl yellow	6	
	Hilliard*	high lactic		SRC, NIR MAP	8	Sugar Snap Cookie	good dough feel		8	
4	OK20056CF-10C24		high protein, v high lactic	SRC, NIR MAP	5	Sugar Snap Cookie	bright dough	crumbly, low spread factor, sl boning	4	no check - comparing to eachother & gen set data
4	OK21424F	low sodium carb	high protein, v high lactic	SRC, NIR MAP	6	Sugar Snap Cookie	bright dough, good dough feel	sl boning	6	no check - comparing to eachother & gen set data
5	18VTK10-23	high lactic, comperable MAP to check		SRC, NIR MAP	8	Sugar Snap Cookie	bright dough	sl crumbly	7	
5	DH19SRW07-321	comperable MAP values to check	high lactic	SRC, NIR MAP	7	Sugar Snap Cookie		low spread	6	
5	VA23W-532	high lactic, comperable MAP values to check		SRC, NIR MAP	8	Sugar Snap Cookie	good dough feel		8	
5	Shirley*			SRC, NIR MAP	8	Sugar Snap Cookie		yellow dough, sl grainey feel	5	

***Check varieties.**

Great Plains Analytical Laboratory Quality Evaluations

Table 30. Solvent retention capacity and cookie baking test parameters by Great Plains Analytical Laboratory

Group	Entry	Solvent Retention Capacity (%)				Cookies (10-50D)			
		Water	Sodium Carbonate	Sucrose	Lactic Acid	Width (mm)	Thickness (mm)	W/T Ratio	Spread Factor
1	Beck 716	52.9	73.3	99.7	115.9	508	57	8.91	87.5
1	Beck 720	54.6	79.2	114.3	140.9	495	57	8.68	85.3
1	Beck 722	51.8	72.8	104.2	133.6	508	57	8.91	87.5
1	Beck 724	56.2	80.7	118.2	144.7	480	59	8.14	79.9
1	Beck 725	51.3	72.3	100.1	101.5	497	56	8.88	87.2
1	Beck 728	52.9	79.1	118.0	138.2				
1	Beck 732	52.7	73.9	101.0	118.4	508	56	9.07	89.1
2	IL16LCSDH-09-T-2664-28	52.4	72.4	104.7	145.6	493	60	8.22	80.7
2	IL16-8048	52.1	70.8	108.9	142.1	492	61	8.07	79.2
3	MI20R0210	50.1	75.9	96.0	101.0	511	57	8.96	88.0
1-3	Branson*	57.2	84.7	115.1	130.7	485	59	8.22	80.7
1-3	Hilliard*	54.8	79.5	102.2	129.5	489	61	8.02	78.7
4	OK20056CF-10C24	55.0	67.3	109.6	151.8	457	68	6.72	66.0
4	OK21424F	51.2	67.3	101.4	145.2	478	61	7.84	77.0
5	18VTK10-23	56.0	75.9	107.7	135.9	470	68	6.91	67.9
5	DH19SRW07-321	51.3	66.8	107.4	126.3	457	68	6.72	66.0
5	VA23W-532	53.5	75.0	106.8	124.0	461	68	6.78	66.6
5	Shirley*	50.5	74.7	104.1	91.7	474	68	6.97	68.5

*Check varieties.

Table 31. Evaluation comments on analytical flour quality by Great Plains Analytical Laboratory

		Analytical Flour Qualities				End Product Performance				
		Score: 1 Poor - 9 Excellent				Score: 1 Poor - 9 Excellent				Aditional Comments
Group	Entry	Likes	Dislikes	Basis	Score	Product	Likes	Dislikes	Score	Mitigating Physical/Chemical Properties
1	Beck 716	High final viscosity	Low flour protein	Protein, RVA	7	Sugar snap cookie		Dark color	4	
1	Beck 720	Good protein, low water SRC, high LA, high final viscosity	High SC SRC	Protein, SRC, RVA	8	Sugar snap cookie	Good top grain		7	This sample may work well for cookies.
1	Beck 722	Good flour protein, high LA SRC, high final viscosity		Protein, SRC, RVA	9	Sugar snap cookie		Low spread factor, poor top grain	4	
1	Beck 724	Good flour protein, high LA SRC, high final viscosity	High SC SRC, high P/L	Protein, SRC, RVA, Alveograph	7	Sugar snap cookie	Good top grain	Low spread factor	6	This sample may work well for crackers.
1	Beck 725	low water %		SRC	8	Sugar snap cookie	Good top grain		7	This sample may work well for cookies.
1	Beck 728	Good protein, high LA SRC, high final viscosity	High SC SRC	Protein, SRC, RVA	7	Sugar snap cookie				
1	Beck 732	High final viscosity	Low flour protein	Protein, RVA	7	Sugar snap cookie	High spread factor,		8	Well suited to cookie application
2	IL16LCSDH-09-T-2664-28	High LA SRC, high final viscosity		Protein, SRC, RVA	9	Sugar snap cookie		Poor top grain	4	
2	IL16-8048	High LA SRC, high final viscosity	High W value	SRC, RVA, Alveograph	6	Sugar snap cookie		Low spread factor	4	This sample may work well for crackers.
3	MI20R0210	Good protein, low water SRC, high LA, high final viscosity		Protein, SRC, RVA	9	Sugar snap cookie	High spread		7	
	Branson*	Good flour protein, high LA SRC, high final viscosity	High SC SRC	Protein, SRC, RVA	7	Sugar snap cookie		Dark color	5	
	Hilliard*	Good flour protein, high LA SRC, high final viscosity	High SC SRC	Protein, SRC, RVA	7	Sugar snap cookie		Low spread factor	5	
4	OK20056CF-10C24	High LA SRC, low SC SRC	Very high protein, low final viscosity, high W value and P/L	Protein, SRC, Alveograph	5	Sugar snap cookie		Low spread factor, dark color	4	may be better suited to pastry flour applications because of the high protein
4	OK21424F	low water %, high LA SRC, low SC SRC	Very high protein, high W value	Protein, SRC, Alveograph	6	Sugar snap cookie		Low spread factor, poor top grain	3	may be better suited to pastry flour applications because of the high protein
5	18VTK10-23	Good protein, High LA SRC	low final viscosity, high W value and P/L	Protein, SRC, RVA, Alveograph	5	Sugar snap cookie		Low spread factor	4	This sample may work well for crackers.
5	DH19SRW07-321	low water %, high LA SRC, low SC SRC	High W value and very high P/L	SRC, Alveograph	5	Sugar snap cookie		Low spread factor	4	This sample may work well for crackers.
5	VA23W-532	Good flour protein, high LA SRC	High P/L	Protein, SRC, Alveograph	6	Sugar snap cookie		Low spread factor	4	
5	Shirley*	low water %, high final viscosity	Low flour protein, low LA SRC, High P/L	Protein, SRC, RVA, Alveograph	5	Sugar snap cookie		Low spread factor	4	

*Check varieties.

Kellanova Quality Evaluations

Table 32. Solvent retention capacity and alveograph parameters by Kellanova

Group	Entry	Solvent Retention Capacity (%)				Alveograph				
		Water	Sodium Carbonate	Sucrose	Lactic Acid	P	L	P/L	le	W
1	Beck 716	50.8	72.2	85.9	114.1	32	102	0.31	43.1	48
1	Beck 720	51.6	76.1	96.2	134.0	46	88	0.52	44.7	71
1	Beck 722	49.3	70.9	89.5	131.0	33	94	0.35	51.3	55
1	Beck 724	54.1	79.0	98.3	143.6	58	62	0.94	52.2	97
1	Beck 725	50.1	69.8	84.9	100.3	26	92	0.28	34.6	36
1	Beck 728	50.4	77.6	99.1	139.5	-	-	-	-	-
1	Beck 732	52.1	71.9	86.5	115.3	41	41	1	45	65
2	IL16LCSDH-09-T-	52.5	68.0	91.4	145.4	37	91	0.41	52.5	61
2	IL16-8048	50.5	67.0	90.8	143.6	50	94	0.53	57.6	87
3	MI20R0210	49.1	72.9	86.2	101.4	25	106	0.24	33.1	34
1-3	Branson*	53.2	79.8	99.2	129.4	40	113	0.35	38.7	58
1-3	Hilliard*	52.2	76.3	94.8	132.4	46	82	0.56	43.2	70
4	OK20056CF-10C24	53.4	66.1	99.3	152.4	97	42	2.31	65.9	182
4	OK21424F	54.8	62.8	92.0	153.0	41	128	0.32	57.1	71
5	18VTK10-23	54.1	73.7	97.4	137.2	79	56	1.41	51.6	133
5	DH19SRW07-321	56.1	69.4	98.4	137.6	94	59	1.59	61.6	168
5	VA23W-532	56.3	75.9	101.2	126.6	68	64	1.06	43.2	106
5	Shirley*	54.4	74.6	95.4	95.7	49	60	0.82	30.4	67

*Check varieties.

Table 33. Farinograph and rapid visco-analyzer parameters by Kellanova

Group	Entry	Farinograph				Rapid Visco-Analyzer						
		Water Absorption (%)	Develop-ment Time (min)	Stab-ility (min)	MTI	Peak Time (min)	Peak (cP)	Trough (cP)	Break-down (cP)	Setback (cP)	Final (cP)	Peak/Final Ratio
1	Beck 716	52.2	0.9	<1.0	180	6.1	3132	1884	1248	1464	3348	0.94
1	Beck 720	52.6	1	1.6	100	6.2	3048	2112	936	1584	3708	0.82
1	Beck 722	51.5	1.2	1.5	140	6.2	3300	2076	1224	1608	3672	0.90
1	Beck 724	54	1.2	1.6	130	6.2	3024	2148	888	1680	3816	0.79
1	Beck 725	50.5	0.8	<1.0	170	6.2	2964	1884	1080	1464	3348	0.89
1	Beck 728	52	1.4	2.1	120	6.1	3204	2016	1176	1668	3684	0.87
1	Beck 732	52.8	0.8	1.1	160	6.1	3264	2016	1248	1680	3696	0.88
2	IL16LCSDH-	52	1.6	2.8	120	6.1	3240	1884	1344	1428	3312	0.98
2	IL16-8048	53.7	1.7	5.2	60	6.0	3036	2028	1008	1632	3660	0.83
3	MI20R0210	51.7	0.9	1	160	6.1	3144	2040	1116	1644	3684	0.85
1-3	Branson*	54.7	1.5	1.6	120	6.2	3180	2148	1032	1620	3768	0.84
1-3	Hilliard*	54.6	1	1.4	110	6.1	2976	1968	996	1536	3504	0.85
4	OK20056CF-	54.4	5.3	27.1	18	6.0	2712	1692	1020	1536	3228	0.84
4	OK21424F	53.3	1.8	4.9	70	6.1	3000	1776	1236	1368	3132	0.96
5	18VTK10-23	57.4	1.4	1.8	80	5.9	2532	1524	1020	1296	2820	0.90
5	DH19SRW07-	56.9	1.4	2.8	75	6.0	2772	1848	924	1644	3492	0.79
5	VA23W-532	56.4	1.6	3.1	100	6.1	2244	1788	456	1596	3384	0.66
5	Shirley*	55.1	1.6	2	120	6.0	2208	1776	420	1740	3516	0.63

*Check varieties.

Table 34. Flour moisture and protein content of the entries by Kellanova

Group	Entry	Moisture (%)	Protein (%)	Damage Starch (%)	Falling Number
1	Beck 716	13.9	7.47	3.3	372
1	Beck 720	13.9	7.98	3.4	447
1	Beck 722	13.9	8.38	3.7	422
1	Beck 724	13.9	8.66	4.1	474
1	Beck 725	13.0	7.75	3.6	382
1	Beck 728	13.8	8.78	3.3	382
1	Beck 732	13.8	7.52	3.2	393
2	IL16LCSDH-09-T-2664-28	13.7	9.29	2.8	445
2	IL16-8048	13.9	9.35	3.7	398
3	MI20R0210	13.7	7.98	3.2	414
1-3	Branson*	13.8	8.89	3.6	469
1-3	Hilliard*	13.8	8.32	3.2	417
4	OK20056CF-10C24	13.8	10.94	3.5	507
4	OK21424F	13.8	10.03	3.9	441
5	18VTK10-23	13.8	8.49	4.0	384
5	DH19SRW07-321	13.8	8.95	5.0	440
5	VA23W-532	13.3	8.38	5.4	509
5	Shirley*	13.1	7.64	5.5	419

*Check varieties.

Table 35. Evaluation comments on analytical flour quality by Kellanova

			Analytical Flour Qualities			
			Score: 1 Poor - 9 Excellent			
#	Group	Entry	Likes	Dislikes	Basis	Score
1	1	Beck 716		Slightly lower protein for cracker making	Protein, SRC	6
2	1	Beck 720	Good protein level		Protein, SRC, Farinograph, Alveo	9
3	1	Beck 722	Good protein level		Protein, SRC, Farinograph, Alveo	9
4	1	Beck 724	Very high protein and SRC-LA; high W value	High water absorption	Protein, SRC, Farinograph, Alveo	8
5	1	Beck 725	Reasonable protein level		Protein, SRC, Farinograph, Alveo	9
6	1	Beck 728	Very high protein and SRC-LA		Protein, SRC, Farinograph, Alveo	9
7	1	Beck 732		Slightly lower protein for cracker making	Protein, SRC, Farinograph, Alveo	6
8	2	IL16LCSDH-09-T-2664-28	Very high protein and SRC-LA		Protein, SRC, Farinograph, Alveo	9
9	2	IL16-8048	Very high protein and SRC-LA	High water absorption, lower MTI (dough snap back risk)	Protein, SRC, Farinograph, Alveo	7
10	3	MI20R0210	Good protein and SRC-LA		Protein, SRC, Farinograph, Alveo	8
11		Branson (check)	High protein and SRC-LA	High water absorption		7
12		Hilliard (check)	High protein and SRC-LA	High water absorption		7
13	4	OK20056CF-10C24	Very high protein and SRC-LA	High water absorption, W very high	Seems to be a hard wheat line, good for HRW applications, or blend with low protein SRW for crackers	8
14	4	OK21424F	Very high protein and SRC-LA	High water absorption	Same as above	9
15	5	18VTK10-23	Very high protein and SRC-LA	Water absorption too high		7
16	5	DH19SRW07-321	Very high protein and SRC-LA	Water absorption too high; W very high		7
17	5	VA23W-532	High protein and SRC-LA	Water absorption too high		7
18	5	Shirley (check)	Reasonable protein and SRC-LA	Water absorption too high		7

*Check varieties.

Mennel Milling Quality Evaluations

Table 36. Solvent retention capacity by Mennel Milling

Group	Entry	Flour Moisture (%)	Damaged Starch (%)	Solvent Retention Capacity (%)			
				Water	Sodium Carbonate	Sucrose	Lactic Acid
1	Beck 716	13.9	3.1	51.5	72.6	91.4	105.7
1	Beck 720	13.8	3.3	53.4	76.8	107.2	128.0
1	Beck 722	13.8	3.3	50.3	73.3	95.2	127.1
1	Beck 724	13.9	3.9	56.9	80.8	105.9	142.8
1	Beck 725	13.7	3.3	51.7	71.6	91.0	96.5
1	Beck 728	13.6	3.1	53.0	80.4	111.0	138.2
1	Beck 732	13.7	3.3	53.3	74.4	93.3	116.4
2	IL16LCSDH-09-T-	13.9	3.3	51.4	71.1	96.1	142.1
2	IL16-8048	13.7	3.7	51.2	68.8	99.0	140.6
3	MI20R0210	14.0	3.0	50.7	75.3	98.5	91.9
1-3	Branson*	13.9	3.5	54.4	83.2	108.6	119.9
1-3	Hilliard*	13.9	3.3	53.1	79.1	105.6	120.9
4	OK20056CF-10C24	13.9	3.6	54.2	68.3	108.1	154.0
4	OK21424F	13.9	3.5	50.6	64.5	97.8	142.3
5	18VTK10-23	14.0	3.9	56.0	75.8	105.2	130.1
5	DH19SRW07-321	13.4	4.3	56.0	71.8	100.9	137.0
5	VA23W-532	13.3	4.6	57.6	78.2	105.2	118.3
5	Shirley*	13.6	4.9	56.5	78.0	99.1	90.2

*Check varieties.

Table 37. Sugar-snap cookie baking test (10-50D) and biscuit test parameters by Mennel Milling

		Cookies (10-50D)					Biscuit		
Group	Entry	Width (mm)	Thickness (mm)	W/T Ratio	Spread Factor	Weight (g)	Width (mm)	Height (mm)	Weight (g)
1	Beck 716	506.5	51.5	9.83	95.9	23.9	54.1	37.4	25.2
1	Beck 720	496.5	54.8	9.07	88.5	22.2	54.2	37.5	25.7
1	Beck 722	498.5	56.4	8.84	86.3	22.5	53.4	38.2	25.2
1	Beck 724	491.0	58.0	8.46	82.6	22.5	51.6	36.1	25.7
1	Beck 725	496.0	51.8	9.57	93.4	22.0	54.3	34.1	24.7
1	Beck 728	499.5	50.6	9.88	96.4	21.3	N/A	N/A	N/A
1	Beck 732	494.0	48.9	10.10	98.6	21.6	52.8	33.0	24.1
2	IL16LCSDH-09-T-	488.5	52.4	9.32	90.9	22.1	53.0	36.3	25.8
2	IL16-8048	500.0	54.7	9.13	89.1	23.0	50.2	39.1	28.4
3	MI20R0210	513.0	50.7	10.13	98.8	23.4	54.1	39.9	25.8
1-3	Branson*	501.0	54.2	9.24	90.2	24.3	52.0	39.4	25.5
1-3	Hilliard*	504.0	56.8	8.87	86.6	24.1	52.8	37.0	25.2
4	OK20056CF-10C24	462.5	67.8	6.83	66.6	24.7	50.8	34.8	23.4
4	OK21424F	481.0	56.1	8.57	83.6	22.5	52.9	35.1	25.1
5	18VTK10-23	477.5	63.4	7.54	73.6	23.4	51.2	35.3	26.6
5	DH19SRW07-321	470.5	60.6	7.77	75.8	22.6	50.8	36.0	27.3
5	VA23W-532	471.5	61.2	7.71	75.2	21.8	51.6	36.7	27.6
5	Shirley*	480.0	62.7	7.66	74.8	22.1	51.6	35.4	26.5

*Check varieties.

Table 38. Rapid Visco-Analyzer parameters by Mennel Milling

Group	Entry	Peak Time (min)	Peak (cP)	Trough (cP)	Break-down (cP)	Setback (cP)	Final (cP)	Pasting Temp. (°C)	Peak/Final Ratio
1	Beck 716	6.2	3126	1834	1292	1513	3347	85.5	0.93
1	Beck 720	6.3	3021	2088	933	1572	3660	86.4	0.83
1	Beck 722	6.3	3251	2017	1234	1543	3560	85.5	0.91
1	Beck 724	6.4	3139	2282	857	1612	3894	86.4	0.81
1	Beck 725	6.3	3062	1916	1146	1469	3385	85.5	0.90
1	Beck 728	6.3	3267	2146	1121	1581	3727	85.4	0.88
1	Beck 732	6.3	3344	2157	1187	1563	3720	84.9	0.90
2	IL16LCSDH-09-T-2664-28	6.3	3379	2077	1302	1449	3526	85.5	0.96
2	IL16-8048	6.3	3115	2196	919	1560	3756	84.8	0.83
3	MI20R0210	6.4	3289	2294	995	1534	3828	84.7	0.86
1-3	Branson*	6.4	3249	2313	936	1558	3871	85.6	0.84
1-3	Hilliard*	6.2	3024	1969	1055	1519	3488	84.8	0.87
4	OK20056CF-10C24	6.3	2802	1839	963	1444	3283	85.5	0.85
4	OK21424F	6.3	3099	1929	1170	1335	3264	86.4	0.95
5	18VTK10-23	6.1	2590	1527	1063	1285	2812	84.8	0.92
5	DH19SRW07-321	6.3	2725	1880	845	1495	3375	86.4	0.81
5	VA23W-532	6.3	2258	1839	419	1519	3358	88.1	0.67
5	Shirley*	6.1	2313	1875	438	1754	3629	85.5	0.64

*Check varieties.

Table 39. Evaluation comments on flour quality and baked product performance by Mennel Milling

		Analytical Flour Qualities					End Product Performance			
		Score: 1 Poor - 9 Excellent					Score: 1 Poor - 9 Excellent			
Group	Entry	Likes	Dislikes	Basis	Score		Product	Likes	Dislikes	Score
1	Beck 716	Above average Pr. Low water SRC%	Low sucrose SRC %,	Protein, SRC, RVA	8		Cookies	Yellow,		7
1	Beck 720		High sodium carbonate , and lactic acid % SRC values.	SRC	8		Cookies	Light colored, edges sealed,	Wrinkles observed	6
1	Beck 722	Low water SRC%	High lactic acid % SRC	SRC, RVA	7		Cookies	Smooth surface, less cracking, light colore/ less yellow to compared to 1		7
1	Beck 724	High final paste viscosity	High lactic acid % SRC	Protein, SRC, RVA	7		Cookies	Light colored/less cracks		8
1	Beck 725		High water SRC%	SRC,	8		Cookies	High spread factor		6
1	Beck 728	Above average Pr. Low water SRC%	High lactic acid % SRC	Protein, SRC, RVA	8		Cookies	Higher spread factor compared to 5	More yellow	8
1	Beck 732				7		Cookies	Cracks visible, less yellow more white. High spread factor		8
2	IL16LCSDH-09-T-2664-28	High protein, low water SRC%	High lactic acid % SRC	Protein, SRC,	7		Cookies			7
2	IL16-8048	High protein, low water SRC%	High lactic acid % SRC	Protein, SRC	7		Cookies	more smooth		7
3	MI20R0210	Low water % and Sodium carbonate % SRC's		Protein, SRC	8		Cookies	Highest spread	More yellow	8
	Branson*	High Pr and final peak viscosity	High sucrose % SRC	Protein, SRC, RVA	7		Cookies			7
	Hilliard*	High protein, low water SRC%	High sucrose % SRC	Protein, RVA	7		Cookies			7
4	OK20056CF-10C24	High Pr.	High sucrose, and lactic acid, SRC %,	Protein, SRC, RVA	8		Cookies		Different, lowest spread, high protein,	6
4	OK21424F	High protein, low water SRC%	High sucrose, and lactic acid, SRC %,	SRC, RVA	8		Cookies			7
5	18VTK10-23		High lactic acid % SRC	SRC, RVA	7		Cookies		Less spread,	6
5	DH19SRW07-321	High Pr.	High lactic acid % SRC	Protein, SRC,	7		Cookies		less spread	6
5	VA23W-532	Above average Pr.		Protein,	8		Cookies			7
5	Shirley*	Above average Pr.	low lactic acid % SRC	Protein	7		Cookies	More yellow, High protein but less trhan 16		8

*Check varieties.

Star of the West Milling Evaluations

Table 40. Solvent retention capacity, cookie baking test and amyloviscograph test parameters by Star of the West Milling

Group	Entry	Solvent Retention Capacity (%)					Cookies (10-50D)				Flour FN	Amylograph Peak Viscosity (BU)
		Water	Sodium Carbonate	Sucrose	Lactic Acid	LA/SC+S	Width (mm)	Thick-ness (mm)	W/T Ratio	Spread Factor		
1	Beck 716	52.4	73.2	92.8	110.1	0.66	493.0	48.0	10.27	99.0	354	830
1	Beck 720	54.0	77.8	107.9	130.1	0.70	479.0	52.0	9.21	89.9	391	778
1	Beck 722	51.0	72.2	96.4	129.9	0.77	479.0	52.0	9.21	88.8	417	884
1	Beck 724	56.8	79.2	105.0	144.8	0.79	473.0	56.5	8.37	81.7	425	786
1	Beck 725	52.2	72.0	91.6	99.0	0.61	484.0	51.0	9.49	92.6	346	676
1	Beck 728	53.6	79.0	112.5	143.2	0.75	489.5	51.5	9.50	92.8	381	888
1	Beck 732	52.0	71.1	97.8	148.0	0.88	487.0	50.0	9.74	93.9	380	856
2	IL16LCSDH-09-	53.8	73.4	92.2	119.5	0.72	485.0	53.0	9.15	88.2	377	883
2	IL16-8048	51.7	68.4	96.6	146.5	0.89	474.0	55.0	8.62	83.1	393	819
3	MI20R0210	51.1	74.2	98.6	92.2	0.53	495.0	52.0	9.52	91.8	370	778
1-3	Branson*	54.2	82.9	111.4	116.5	0.60	474.0	59.0	8.03	77.9	369	743
1-3	Hilliard*	54.5	78.7	107.3	127.1	0.68	474.5	55.0	8.63	84.2	349	513
4	OK20056CF-	54.5	66.9	106.3	152.4	0.88	448.0	68.5	6.54	63.8	445	576
4	OK21424F	50.3	63.7	97.6	141.9	0.88	473.0	57.0	8.30	80.0	372	719
5	18VTK10-23	56.8	75.7	106.1	137.4	0.76	447.0	70.0	6.39	63.1	351	410
5	DH19SRW07-	56.3	71.5	103.1	141.9	0.81	437.5	70.5	6.21	60.2	368	564
5	VA23W-532	58.4	78.5	106.6	122.1	0.66	455.0	69.0	6.59	64.4	431	532
5	Shirley*	56.6	77.6	99.5	92.2	0.52	455.0	68.0	6.69	65.3	364	451

*Check varieties.

Table 41. Evaluation comments on flour quality and baked product performance by Star of the West Milling

Group	Entry	Analytical Flour Qualities				End Product Performance				
		Score: 1 Poor - 9 Excellent				Score: 1 Poor - 9 Excellent				Additional Comments
		Likes	Dislikes	Basis	Score	Product	Likes	Dislikes	Score	Mitigating Physical/Chemical Properties
1	Beck 716	Good overall SRC profile		SRC	7	sugar snap cookies	Best spread of all samples		9	
1	Beck 720		Fairly high sucrose SRC	SRC	6	sugar snap cookies		Little top pattern	7	
1	Beck 722	good overall SRC profile		SRC	9	sugar snap cookies		somewhat yellow cookies	7	Somewhat yellow flour
1	Beck 724		Hghest absorbtion for water, sodium carb SRC	SRC	5	sugar snap cookies		Worst spread of group	5	
1	Beck 725	low sodium carb/good overall SRC profile		SRC	9	sugar snap cookies	good spread with decent top pattern		8	
1	Beck 728		High sucrose and sodium carb absorption	SRC	6	sugar snap cookies	Decent spread numbers	Yellow flour with no top pattern	6	Yellow flour
1	Beck 732	strong flour		SRC	7	sugar snap cookies	Good spread with good top pattern		9	
2	IL16LCSDH-09-T-2664-28	Good overall SRC profile		SRC	8	sugar snap cookies	Decent spread numbers		8	
2	IL16-8048	High lactic acid with low water and sodium carb absorption		SRC	8	sugar snap cookies			7	
3	MI20R0210	low water absorption	low lactic acid absorption	SRC	8	sugar snap cookies	good spread good top pattern		9	
	Branson*		High sucrose and sodium carb absorption	SRC	5	sugar snap cookies			5	
	Hilliard*		High sucrose and sodium carb absorption	SRC	5	sugar snap cookies			7	
4	OK20056CF-10C24	Very low sodium carb considering other solvents are so high		SRC	7	sugar snap cookies		tight spread	4	Overall a very strong flour-too strong for many of our applications.
4	OK21424F	Good SRC profile		SRC	6	sugar snap cookies	best spread of the group		7	
5	18VTK10-23	high lactic acid SRC	High sodium carbonate and sucrose SRC	SRC	7	sugar snap cookies			4	
5	DH19SRW07-321	high lactic acid SRC	High sucrose SRC	SRC	7	sugar snap cookies		tightest spread of all samples	3	
5	VA23W-532		Very high absorption for water, sucrose and sodium carbonate	SRC	5	sugar snap cookies			4	
5	Shirley*		Low lactic acid compared to other solvents	SRC	7	sugar snap cookies	best spread of the group		5	Yellow flour

*Check varieties.

Wheat Marketing Center Quality Evaluations

Table 42. Sponge cake baking test parameters by Wheat Marketing Center

Group	Entry	Sponge Cake					
		External Score	Crumb Grain Score	Texture Score	Volume (ml)	Total Score	Ranking
1	Beck 716	14	19	21	1293	54	14
1	Beck 720	15	19	21	1213	55	10
1	Beck 722	14	20	21	1225	55	9
1	Beck 724	14	21	21	1189	56	6
1	Beck 725	15	20	21	1262	56	5
1	Beck 728	15	19	21	1203	55	12
1	Beck 732	14	20	21	1261	55	7
2	IL16LCSDH-09-T-2664-28	15	21	22	1202	58	1
2	IL16-8048	15	21	21	1260	57	3
3	MI20R0210	15	20	22	1272	57	2
1-3	Branson*	15	19	21	1211	55	11
1-3	Hilliard*	15	21	21	1254	57	4
4	OK20056CF-10C24	13	21	20	1224	54	15
4	OK21424F	14	20	21	1201	55	13
5	18VTK10-23	13	19	21	1124	53	16
5	DH19SRW07-321	13	19	21	1119	53	17
5	VA23W-532	13	21	21	1227	55	8
5	Shirley*	14	16	18	1092	48	18

*Check varieties.

Table 43. Evaluation comments on flour quality and sponge cake baking test performance by Wheat Marketing Center

		Analytical Flour Qualities				End Product Performance				
		Score: 1 Poor - 9 Excellent				Score: 1 Poor - 9 Excellent				Aditional Comments
Group	Entry	Likes	Dislikes	Basis	Score	Product	Likes	Dislikes	Score	Mitigating Physical/Chemical Properties
1	Beck 716	Protien lower than checks	Slightly higher ash than checks	Primary Analysis	7	Japanese Sponge Cake	Good volume, soft texture	Coarse crumb	6.5	
1	Beck 720	Protein similar to checks		Primary Analysis	7	Japanese Sponge Cake	Flat top, soft texture	Coarse crumb	6.5	
1	Beck 722	Protein similar to checks	Slightly higher ash than checks	Primary Analysis	6	Japanese Sponge Cake	Soft texture	Slightly domed	7	
1	Beck 724	Protein similar to checks		Primary Analysis	7	Japanese Sponge Cake		Slightly domed, slightly firmer texture	6	
1	Beck 725	Protein lower than checks	Slightly higher ash than checks	Primary Analysis	7	Japanese Sponge Cake	Good volume		7	
1	Beck 728	Protein similar to checks		Primary Analysis	7	Japanese Sponge Cake	Soft texture		7	
1	Beck 732	Protein lower than checks		Primary Analysis	7	Japanese Sponge Cake	Good volume	Slightly domed	7	
2	IL16LCSDH-09-T-2664-28		Protein higher than checks	Primary Analysis	6	Japanese Sponge Cake	Very soft texture		8	
2	IL16-8048		Protein higher than checks	Primary Analysis	6	Japanese Sponge Cake	Good volume		7	
3	MI20R0210	Protein similar to checks	Slightly higher ash than checks	Primary Analysis	6	Japanese Sponge Cake	Very soft texture, good volume		8	
	Branson*			Primary Analysis	6	Japanese Sponge Cake			6	
	Hilliard*			Primary Analysis	7	Japanese Sponge Cake			7	
4	OK20056CF-10C24		High flour protein	Primary Analysis	5	Japanese Sponge Cake		Domed, slightly firmer texture	5	
4	OK21424F		High flour protein	Primary Analysis	6	Japanese Sponge Cake	Soft texture	Slightly domed	6	
5	18VTK10-23	Ash lower than check	Protein higher than check	Primary Analysis	7	Japanese Sponge Cake	Soft texture	Domed, coarse crumb, poor volume	5	
5	DH19SRW07-321		Protein higher than check	Primary Analysis	6	Japanese Sponge Cake	Soft texture	Domed, coarse crumb, poor volume	5	
5	VA23W-532		Protein hihger than check, ash higher than check	Primary Analysis	5	Japanese Sponge Cake	Soft texture	Domed	6	
5	Shirley*			Primary Analysis	7	Japanese Sponge Cake		Hard clumps on bottom of crumb, poor volume	1	Solidified clumps on the bottom third of the crumb. Very coarse crumb with large airpockets.

*Check varieties.

USDA-ARS Western Wheat Quality Laboratory Quality Evaluations

Table 44. Sugar-snap cookie and sponge cake baking test parameters by USDA-ARS Western Wheat Quality Laboratory

Group	Entry	Cookies (10-52)		Sponge Cake	
		Diameter (cm)	Top Grain Score	Volume (mL)	Texture Score
1	Beck 716	9.3	8	1246	23
1	Beck 720	9.1	7	1211	21
1	Beck 722	9.0	5	1276	21
1	Beck 724	8.6	4	1144	20
1	Beck 725	9.2	8	1192	24
1	Beck 728	9.0	6	1240	24
1	Beck 732	9.1	7	1195	21
2	IL16LCSDH-09-T-2664-28	8.7	4	1268	21
2	IL16-8048	8.6	4	1256	21
3	MI20R0210	9.2	7	1216	20
1-3	Branson*	8.6	4	1245	19
1-3	Hilliard*	8.6	4	1163	20
4	OK20056CF-10C24	8.3	3	1192	21
4	OK21424F	8.6	4	1232	21
5	18VTK10-23	8.4	5	1041	18
5	DH19SRW07-321	8.3	4	1104	18
5	VA23W-532	8.4	3	1093	18
5	Shirley*	8.4	4	1087	22

*Check varieties.

Table 45. Evaluation comments on flour quality and cookie baking performance by USDA-ARS Western Wheat Quality Laboratory

		Analytical Flour Qualities				End Product Performance			
		Score: 1 Poor - 9 Excellent				Score: 1 Poor - 9 Excellent			
Group	Entry	Likes	Dislikes	Basis	Score	Product	Likes	Dislikes	Score
1	Beck 716			Protein and Ash	6	Sugar Snap Cookie	Smooth, easy handling dough		9
1	Beck 720			Protein and Ash	7	Sugar Snap Cookie		Slightly sticky dough	7
1	Beck 722			Protein and Ash	4	Sugar Snap Cookie	Smooth dough		5
1	Beck 724			Protein and Ash	7	Sugar Snap Cookie		Crumbly dough	3
1	Beck 725			Protein and Ash	6	Sugar Snap Cookie	Smooth dough		8
1	Beck 728			Protein and Ash	5	Sugar Snap Cookie	Smooth dough		4
1	Beck 732			Protein and Ash	5	Sugar Snap Cookie		Slightly sticky dough	8
2	IL16LCSDH-09-T-2664-28			Protein and Ash	7	Sugar Snap Cookie		Crumbly dough	3
2	IL16-8048			Protein and Ash	7	Sugar Snap Cookie		Crumbly dough	2
3	MI20R0210			Protein and Ash	6	Sugar Snap Cookie	Smooth, easy handling dough		8
	Branson*			Protein and Ash	6	Sugar Snap Cookie		Crumbly dough	3
	Hilliard*			Protein and Ash	6	Sugar Snap Cookie		Crumbly dough	3
4	OK20056CF-10C24			Protein and Ash	3	Sugar Snap Cookie		Very crumbly dough	2
4	OK21424F			Protein and Ash	7	Sugar Snap Cookie		Crumbly dough	2
5	18VTK10-23			Protein and Ash	6	Sugar Snap Cookie	Smooth dough		1
5	DH19SRW07-321			Protein and Ash	5	Sugar Snap Cookie		Crumbly dough	1
5	VA23W-532			Protein and Ash	4	Sugar Snap Cookie		Crumbly dough	1
5	Shirley*			Protein and Ash	5	Sugar Snap Cookie		Crumbly dough	1

*Check varieties.

Table 46. Evaluation comments on sponge cake baking performance by USDA-ARS Western Wheat Quality Laboratory

		End Product Performance			
		Score: 1 Poor - 9 Excellent			
Group	Entry	Product	Likes	Dislikes	Score
1	Beck 716	Sponge Cake	Light, smooth batter		8
1	Beck 720	Sponge Cake	Airy and light batter		6
1	Beck 722	Sponge Cake	Airy and light batter		7
1	Beck 724	Sponge Cake	Smooth batter		3
1	Beck 725	Sponge Cake	Smooth, somewhat light batter		5
1	Beck 728	Sponge Cake	Smooth, very light batter		8
1	Beck 732	Sponge Cake	Smooth batter		4
2	IL16LCSDH-09-T-2664-28	Sponge Cake	Light and airy batter, easy to work with		5
2	IL16-8048	Sponge Cake	Smooth, light batter		5
3	MI20R0210	Sponge Cake	Smooth, light batter		4
	Branson*	Sponge Cake	Smooth, light batter		4
	Hilliard*	Sponge Cake	Smooth, somewhat light batter		3
4	OK20056CF-10C24	Sponge Cake	Somewhat light batter		4
4	OK21424F	Sponge Cake	Light and airy batter		5
5	18VTK10-23	Sponge Cake		Dense and lumpy batter	1
5	DH19SRW07-321	Sponge Cake		Lumpy batter	2
5	VA23W-532	Sponge Cake		Heavy batter	1
5	Shirley*	Sponge Cake		Dense and heavy batter	1

USDA-ARS Soft Wheat Quality Laboratory Soft Wheat Quality Evaluations

Table 47. Solvent retention capacity and cookie baking test parameters by USDA-ARS Soft Wheat Quality Laboratory

Group	Entry	Solvent Retention Capacity (%)				Cookie (10-52)	
		Water	Sodium	Sucrose	Lactic	Width	Top Grain
1	Beck 716	52.4	73.4	87.4	97.1	19.6	5
1	Beck 720	54.0	78.0	99.6	118.6	19.0	5
1	Beck 722	51.6	73.1	92.7	117.1	19.0	6
1	Beck 724	56.4	80.8	99.9	124.4	18.5	5
1	Beck 725	53.5	71.8	86.3	89.3	19.5	5
1	Beck 728	52.1	78.4	104.8	124.6	19.0	4
1	Beck 732	54.8	74.8	88.6	103.9	19.4	5
2	IL16LCSDH-09-T-2664-28	51.6	72.0	95.1	125.0	18.1	4
2	IL16-8048	52.4	71.4	92.1	125.4	18.6	4
3	MI20R0210	52.6	76.5	90.3	93.3	19.1	5
1-3	Branson*	55.0	82.5	105.3	115.1	18.3	5
1-3	Hilliard*	55.1	79.6	98.5	115.2	18.7	4
4	OK20056CF-10C24	54.8	69.3	102.6	134.7	16.7	3
4	OK21424F	50.7	66.6	92.7	126.8	18.2	6
5	18VTK10-23	56.4	76.1	102.3	121.3	17.7	5
5	DH19SRW07-321	57.7	73.4	99.0	125.0	17.7	5
5	VA23W-532	59.0	80.4	101.6	112.8	18.0	5
5	Shirley*	57.7	78.4	96.4	87.7	17.9	5

*Check varieties.

Table 48. Mixograph parameters by USDA-ARS Soft Wheat Quality Laboratory

Group	Entry	Mixing Absorption (%)	Peak Time (sec)	Peak Value (%)	Peak Width (%)	Width @7min (%)
1	Beck 716	53.0	0.9	38.1	23.7	7.9
1	Beck 720	52.0	1.2	45.1	30.8	8.7
1	Beck 722	53.0	1.3	36.8	12.1	9.6
1	Beck 724	53.0	1.3	43.2	27.9	9.7
1	Beck 725	52.5	0.9	37.2	22.7	4.6
1	Beck 728	52.0	1.2	43.3	25.0	10.8
1	Beck 732	53.0	1.1	36.3	21.4	11.8
2	IL16LCSDH-09-T-2664-28	54.0	6.4	48.9	22.6	10.7
2	IL16-8048	54.0	4.5	51.8	25.0	13.9
3	MI20R0210	52.0	1.0	40.0	23.0	5.0
1-3	Branson*	53.0	1.0	47.9	29.0	9.0
1-3	Hilliard*	53.5	1.0	46.6	32.4	9.5
4	OK20056CF-10C24	56.5	6.0	53.9	24.0	24.0
4	OK21424F	57.0	3.2	49.6	22.9	10.2
5	18VTK10-23	55.0	4.0	44.9	25.4	11.7
5	DH19SRW07-321	59.0	5.2	47.8	22.2	13.5
5	VA23W-532	56.0	2.8	49.0	28.1	11.3
5	Shirley*	54.0	1.2	45.6	25.3	5.3

*Check varieties.

Table 49. ViscoQuick parameters by USDA-ARS Soft Wheat Quality Laboratory

Group	Entry	Peak Time (min)	Peak Viscosity (BU)	Trough (BU)	Break-down (BU)	Setback (BU)	Final Viscosity (BU)	Pasting Temperature (°C)
1	Beck 716	3.8	463	307	151	181	571	79.1
1	Beck 720	3.8	440	321	116	189	591	80.6
1	Beck 722	3.7	463	313	146	186	577	80.9
1	Beck 724	3.8	438	323	112	189	590	81.3
1	Beck 725	3.7	432	287	142	180	542	80.7
1	Beck 728	3.7	449	313	133	191	583	79.6
1	Beck 732	3.8	447	309	134	187	576	78.3
2	IL16LCSDH-09-T-2664-28	3.8	465	301	160	180	560	80.8
2	IL16-8048	3.7	446	312	130	173	563	80.3
3	MI20R0210	3.8	446	319	124	186	585	78.8
1-3	Branson*	3.9	446	316	126	184	584	80.9
1-3	Hilliard*	3.8	434	307	123	183	571	80.2
4	OK20056CF-10C24	3.6	398	295	101	171	538	79.7
4	OK21424F	3.7	450	291	155	162	529	80.3
5	18VTK10-23	3.6	379	260	116	157	487	79.9
5	DH19SRW07-321	3.7	399	294	103	177	547	80.7
5	VA23W-532	3.8	344	292	51	173	540	82.6
5	Shirley*	3.7	370	310	59	189	579	80.1

*Check varieties.

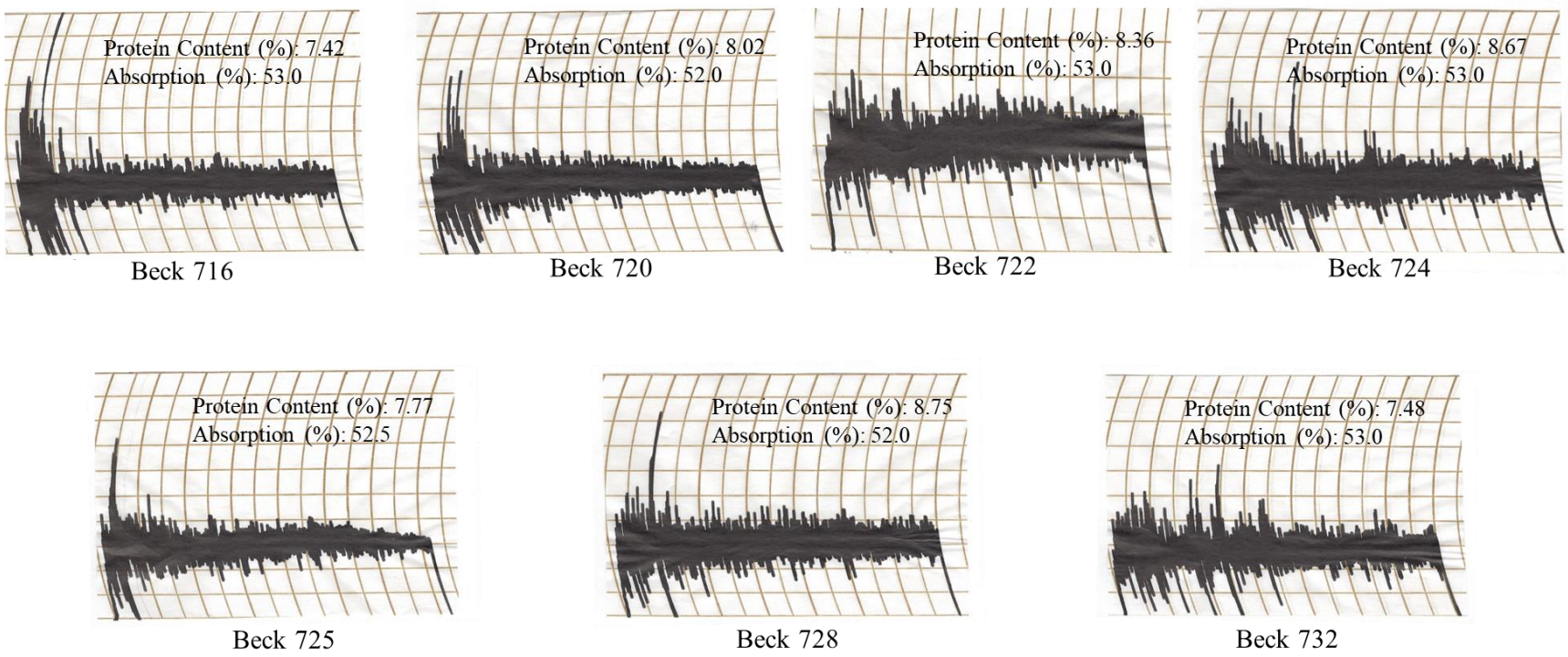
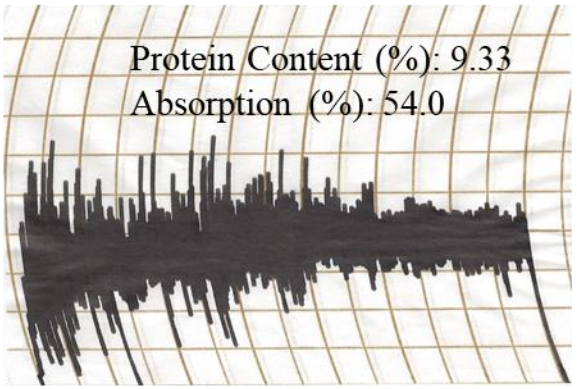
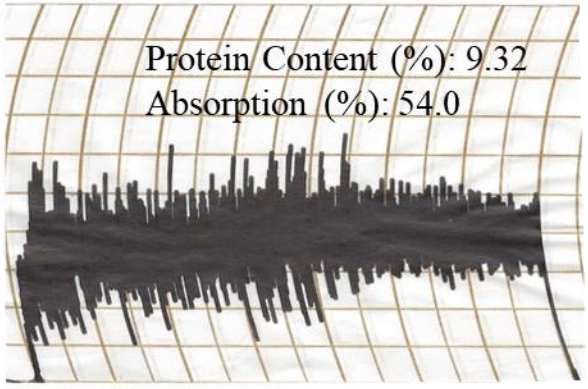


Figure 1. Mixograms of the WQC 2025 crop entries from Beck's Hybrids performed by USDA-ARS Soft Wheat Quality Laboratory.

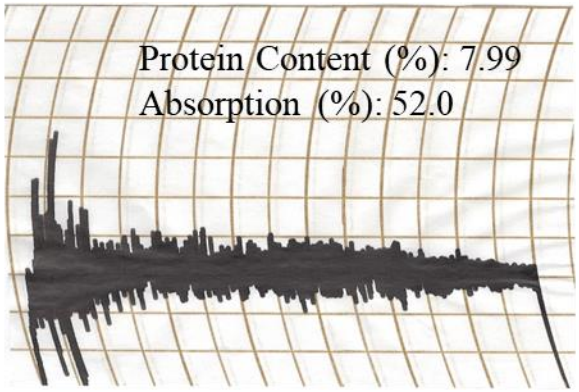


IL16LCSDH-09-T-2664-28

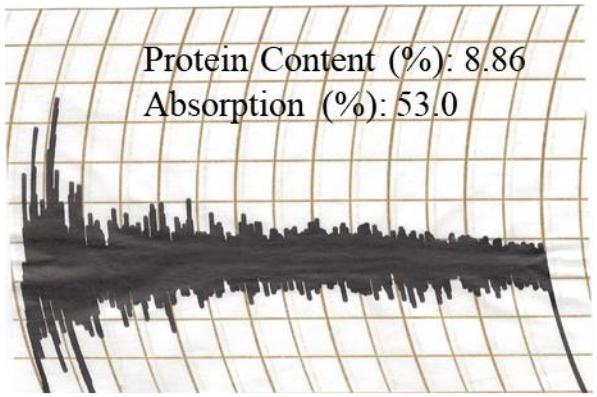


IL16-8048

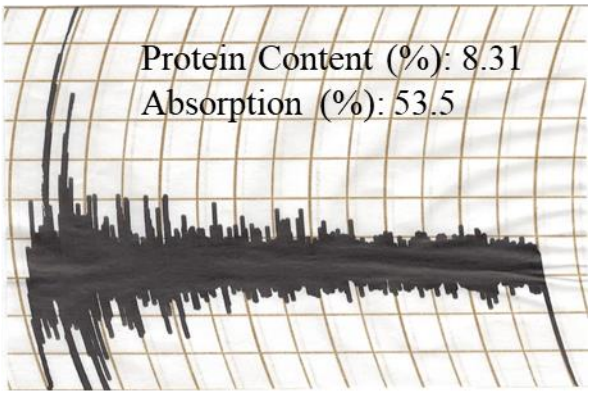
Figure 2. Mixogram of the WQC 2025 crop entry from University of Illinois performed by USDA-ARS Soft Wheat Quality Laboratory.



MI20R0210

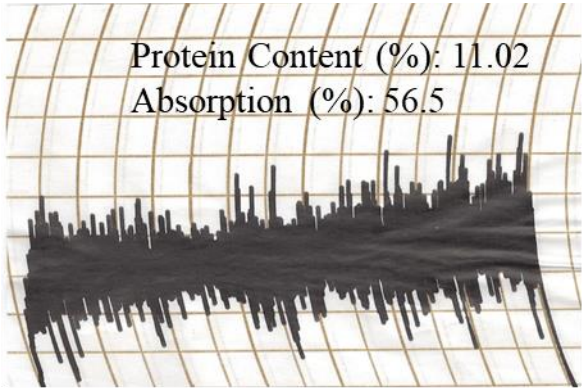


Branson*

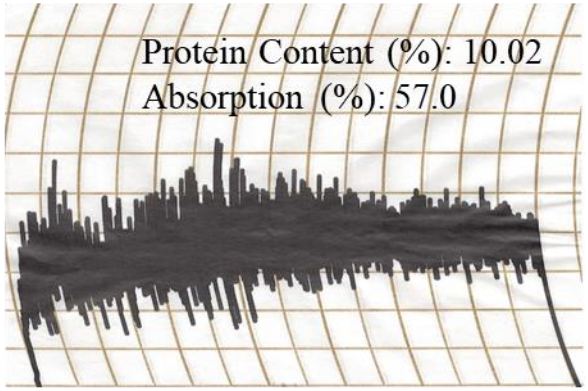


Hilliard*

Figure 3. Mixograms of the WQC 2025 crop entries from Michigan State University and two check varieties performed by USDA-ARS Soft Wheat Quality Laboratory.

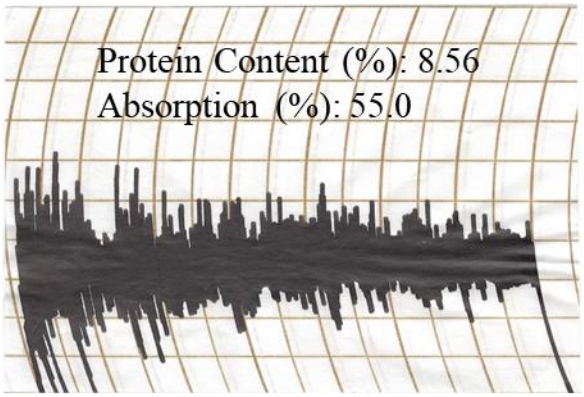


OK20056CF-10C24

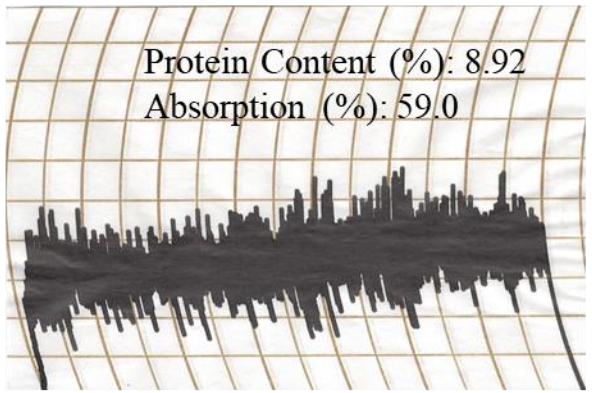


OK21424F

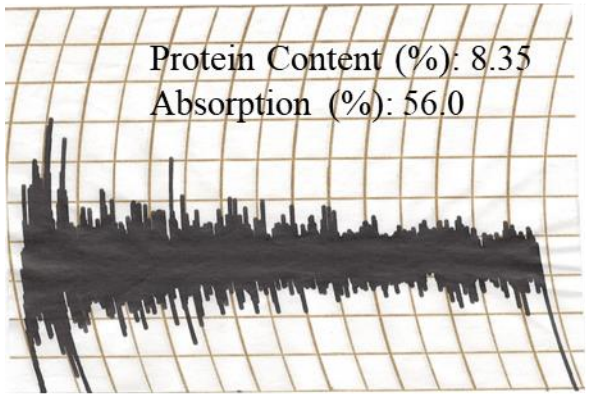
Figure 4. Mixograms of the WQC 2025 crop entries from Oklahoma State University performed by USDA-ARS Soft Wheat Quality Laboratory.



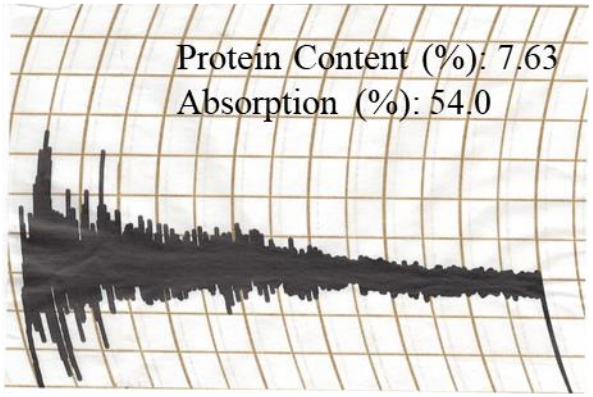
18VTK10-23



DH19SRW07-321



VA23W-532



Shirley*

Figure 5. Mixograms of the WQC 2025 crop entries from Virginia Tech performed by USDA-ARS Soft Wheat Quality Laboratory.

Appendix I. Materials and Methods of the USDA-ARS SWQL

Whole Kernel Protein Content

Whole wheat grain protein content is determined by a nitrogen combustion analysis using the Leco Nitrogen Analyzer for the whole grain meals ground using a Udy Cyclone mill. Protein content is calculated by nitrogen content x 5.7 and expressed on 12% moisture basis.

Falling Number, AACC Method 56-81B

The falling number test measures the travel time of the plunger in seconds (falling number) from the top to the bottom position in a glass tube filled with a suspension of whole grain meal or milled flour, immediately after being cooked in a boiling water jacket to produce gelatinized starch. The higher the viscosity of whole grain meal or flour paste in the glass tube, the longer the travel time of the plunger.

Amylase Activity, AACC Method 22-02-01

Alpha-amylase can be measured directly using a kit from Megazyme, International, Measurement of alpha-Amylase in Plant and Microbial Materials Using the Ceralpha Method. The SWQL uses a modified micro method of the Megazyme assay. Units are expressed in alpha-amylase activity as SKB units/gram (@ 25°C).

Test Weight, AACC Method 55-10

Test weight is measured 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. There is little difference between 1000-kernel weight and milling quality when considering shriveled-free grain. However, small kernel cultivars that have 1000-kernel weight below 30 grams likely will have reduced milling yield of about 0.75%.

Single Kernel Characterization System (SKCS), AACC Method 55-31

SKCS distribution shows percent soft (A), semi-soft (B), semi-hard (C), and hard (D) SKCS hardness index; moisture content; kernel size; and kernel weight; along with standard deviations.

Miag Multomat Experimental Flour Mill Unit

The Miag Multomat Mill is a pneumatic conveyance system consisting of eight pairs of 254 mm diameter x 102 mm wide rolls, and ten sifting passages. Break rolls operate at 340 rpm for the fast rolls and 145 rpm for the slow rolls; 2.34:1 and reduction at 340 rpm fast and 250 rpm slow; 1.36:1. The first three rolls are break rolls; 1st break: 14 corrugations/inch, α 40, β 70, land 0.004”, 8% spiral; 2nd break: 20 corrugations/inch, α 40, β 75, land 0.002”, 10% spiral; 3rd break: 24 corrugations/inch, α 35, β 75, land 0.002”, 10% spiral. The five reduction rolls are smooth, not frosted. Following the second break is the grader and duster following the first reduction; allowing for more sifting surface area respectfully. Each mill run including the grader and duster precedes six sieves. Residue for this system includes head shorts, bran, red dog, and tail shorts.

Experimental Milling Procedure

The Miag Multomat Mill is a pneumatic conveyance system consisting of eight pairs of 254 mm diameter x 102 mm wide rolls, and ten sifting passages. Three of the pairs are corrugated break rolls and five are reduction rolls. Each sifting passage contains six separate sieves. The two top sieves for each of the break rolls are intended to be used as scalp screens for the bran.

Soft red and soft white winter wheat grain is tempered to 14.5% moisture. The tempered grain is held for 24 hours prior to milling and then introduced into the first break rolls at a rate of approximately 600g/min. Straight grade flour is a blend of three break flour streams, grader flour, five reduction streams and 1M re-duster flour. The straight grade flour is then re-bolted to remove any remaining residual by-products not removed by the mill using a stainless steel screen of 165 micron openings. The ash content of the straight grade flour usually ranges from 0.38 and 0.50%. Bran, head shorts, tail shorts and red dog are by-products, which are not included with the flour. Flour yield of eastern soft wheat varies from 70 to 78%. Flour yield depends on wheat variety and is influenced by environmental growing conditions. Sprouted and/or shriveled kernels negatively impact the flour yield. Recovery of all mill products is usually about 98%.

Flour Moisture, Air-oven Method, AACC Method 44-16.01

Wheat flour (~2 g) is dried on a hot aluminum plate in an air oven set at 140°C for 15 min. The moisture content is expressed as the percent loss of weight during drying.

Flour Protein

Protein is determined by a nitrogen combustion analysis using the Leco Nitrogen Analyzer. Protein content is calculated by nitrogen content x 5.7 and expressed on 14% moisture basis.

Flour protein differences among cultivars can be a reliable indicator of genetic variation provided the varieties are grown together, but can vary from year to year at any given location. Flour protein from a single, non-composite sample may not be representative. Based on the Soft Wheat Quality Laboratory grow-outs, protein can vary as much 1.5 % for a cultivar grown at various locations in the same half-acre field. Flour protein of 8% to 9% is representative for breeder's samples and SWQL grow-out cultivars.

Flour Ash, AACC Method 08-01

Flour ash is determined following the basic AACC method, expressed on 14% moisture basis.

Solvent Retention Capacity Test (SRC), AACC Method 56-11

Flour Lactic Acid, Sucrose, Water, and Sodium Carbonate Retention Capacities (SRC) results are expressed as percent solvent retained by weight.

Water SRC is a global measure of the water affinity of the macro-polymers (starch, arabinoxylans, gluten, and gliadins). It is often the best predictor of baked product performance. Lower water values are desired for cookies, cakes, and crackers, with target values below 51% on small experimental mills and 54% on commercial or long-flow experimental mills.

Sucrose SRC is a measure of arabinoxylan (also known as pentosans) content, which can strongly affect water absorption in baked products. Water soluble arabinoxylans are thought to be the

fraction that most greatly increases sucrose SRC. Sucrose SRC probably is the best predictor of cookie quality, with sugar snap cookie diameters decreasing by 0.07 cm for each percentage point increase in sucrose SRC. Soft wheat flours for cookies typically have a target of 95% or less when used by the US baking industry for biscuits and crackers. The 95% target value can be exceeded in flour samples where a higher lactic acid SRC is required for product manufacture since the higher sucrose SRC is due to gluten hydration and not to swelling of the water soluble arabinoxylans.

Sodium carbonate SRC employs a very alkaline solution that ionizes the ends of starch polymers increasing the water binding capacity of the molecule. Sodium carbonate SRC increases as starch damage due to milling increases. Normal values for good milling soft varieties are 68% or less.

Lactic acid SRC measures gluten strength. Typical values are below 85% for "weak" soft varieties and above 105% or 110% for "strong" gluten soft varieties. Lactic acid SRC results correlate to the SDS-sedimentation test. The lactic acid SRC is also correlated to flour protein concentration, but the effect is dependent on genotypes and growing conditions.

Flour Damaged Starch

As measured by the Chopin SDMatic starch damage instrument using the supplied AACC calibration. Starch damage is a measure of the damage to the starch granule occurring during the milling process.

Hot-paste viscosity, ViscoQuick Method

Viscosity units are in Brabender units, peak time in minutes, pasting temperature in degrees centigrade. The hot pasting viscosity/time analysis of starch and flour is accomplished using a ViscoQuick (Brabender GmbH &Co. KG, Duisburg, Germany). The "VQ-Starch" heating profile of that instrument's software is employed to produce pasting curves based on 10.0 g (14% moisture basis) flour and 105 mL deionized water. The pasting profile consists of five distinct segments: A premixing phase that preheats the mixture to 30°C, a 20°C/min heating ramp from 30 to 93°C, a 3 min hold at 93°C, a 15°C/min cooling ramp from 93 to 50°C, and finally a 1 min hold at 50°C. A fixed 250 rpm shear rate is used for all segments except the premixing, which is performed at 100 rpm. Pasting temperatures, peak viscosity, trough viscosity, and final viscosity values are extracted from the resulting viscosity versus time data. Maximum heating temperature is 93°C and minimum cooled temperature is 50°C. Peak pasting viscosity, peak time, trough viscosity during cooling, breakdown viscosity (difference between peak and trough viscosities), final viscosity at the conclusion of cooling, and setback (difference between viscosity when paste is cooled to 50°C and trough viscosity) are determined for each sample.

Sugar Snap Cookie, Micro Method, AACC Method 10-52

Diameter of two cookies expressed in cm, cookie top grain expressed in arbitrary units from unacceptable to outstanding from 1 to 9, respectively, are determined. Diameter and stack height of cookies baked according to this method are measured and used to evaluate flour baking quality.

Cultivars with larger cookie spreads tend to release moisture efficiently during the baking process due to lower water absorption while cultivars yielding smaller diameter cookies tend to be higher in water absorption and hold the moisture longer during baking.

Cookie spread determined within a location is a reliable indicator of the source cultivar's genetic characteristics. However, cookie spread, unlike milling quality, is greatly influenced by environmental conditions. An absolute single value for cookie spread could be misleading. Within a location the single value is significantly important in comparison to known standards. The average cookie spread for three different examples of a cultivar is representative of that wheat.