Wheat Quality Council

Hard Spring Wheat Technical Committee

2007 Crop



February 19 - 21, 2008

Kansas City, MO

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Introduction

Breeders' experimental lines of wheat are evaluated for overall quality before being released for commercial production. The Hard Spring Wheat Technical Committee provides milling and baking quality data on breeders' experimental lines of wheat that are annually submitted to the Wheat Quality Council (WQC). The impact is to provide high quality wheat for commercial production and processing.

Twelve experimental lines of hard spring wheat were grown at up to five locations in 2007 and evaluated for kernel, milling, and bread baking quality against the check variety Glenn. To avoid any bias in the test procedures, code numbers were assigned to the experimental lines and maintained throughout the growing and harvesting of the plots and the milling and baking trials. Samples of wheat were milled at the USDA Hard Red Spring and Durum Wheat Quality Laboratory (WQL), Fargo, ND. Flour samples were shipped to independent laboratories and tested for bread baking quality.

From this report:

The WQC makes no representation regarding the accuracy or conclusiveness of the data developed by and received from the participating laboratories. The data has been scientifically determined and accurately reported from the perspective of the Hard Spring Wheat Technical Committee.

The results relate only to test samples that were volunteered for testing in the 2007 crop year. Test results from additional experimentation in other crop years may differ from those reported herein.

The Hard Spring Wheat Technical Committee, by compilation of data and issuance of this report, does not make or intend any general recommendations or conclusions on its part with respect to the desirability of any wheat included in the tests. Mention of a vendor, product, proprietary product, or procedure does not constitute a guarantee or warranty of the vendor, product, or procedure by the Hard Spring Wheat Technical Committee or by cooperating laboratories, and does not imply its approval to the exclusion of other vendors, products, or procedures that may also be suitable. Data reported herein are not to be used in any publication or literature or for advertising or publicity purposes.

		Crookston		М	inot
Quality		Glenn		Glenn	
Trait	I. USDA/ARS WQL Evaluation	Check	CS 3100L	Check	CS 3100L
1	Wheat Protein (12%mb)	15.6	13.4	16.5	15.7
2	Flour Protein (12%mb)	15.0	12.5	15.6	15.2
3	Market Value (Score 1-6)	4.6	2.3	3.5	3.4
4	Market Value (Score 1-10)	10	3.4	10	7.4
5	Test Weight (lb/bu)	64.8	57.8	59.4	61.9
6	1000 Kernel Weight (g)	31.3	19.8	20.9	27.2
7	Kernel Size % Large	71	6	9	23
8	Kernel Size % Small	3	34	22	16
9	Wheat Moisture (%)	12.4	11.6	12.1	12.8
10	Wheat Ash (14%mb)	1.56	1.75	1.37	1.43
11	Wheat Falling Number (sec)	430	478	388	310
12	Vitreous Kernels (%)	99	74	86	87
	Flour Extraction (%)				
13	Tempered Wheat Basis (%)	67.0	71.3	70.5	66.6
14	Total Product Basis (%)	69.7	74.2	73.4	70.3
15	Flour /Bu Wheat (lbs)	45.1	43.2	43.8	42.5
16	Flour Color Brightness (L*)	90.2	91	90.5	89.8
	Flour Color Yellowness (b*)	9.2	11.7	9.0	9.7
17	Flour Moisture (%)	12.8	12.8	12.2	12.5
18	Flour Ash (14%mb)	0.415	0.531	0.406	0.489
19	Flour Falling Number (Malted) (sec)	267	256	264	255
	Farinograph				
20	Water Absorption (500bu)	67.5	58.8	65.1	63.3
21	Water Absorption (14%mb)	66.1	57.4	63.0	61.6
22	Arrival Time (min)	2.3	2.2	5.2	4.7
23	Peak Time (min)	6.7	6.0	9.4	8.5
24	Dough Stability (min)	12.8	10.0	10.8	10.8
25	MTI (bu)	17	23	26	23
26	TTB (min)	14.9	12.0	15.3	14.3
	II. Cooperator Evaluation				
27	Bake Absorption (Avg %)	65.3±2.9	59.2± 2.8	63.2±1.7	62.7± 2.8
28	Loaf Volume (Avg % of Check)		95.7± 9.3		101.5±5.5

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4 Better Than Check 3 Equivalent To Check 2 Poorer Than Check 1 Much Poorer Than Check 1 Much Poorer Than Check Quality Trait 3-19: Milling 5 Much Better Than Check 4 Better Than Check 2 Poorer Than Check 2 Poorer Than Check 1 Much Poorer Than Check 2 Poorer Than Check 4 Better Than Check 5 Much Better Than Check 4 Better Than Check 4 Better Than Check 4 Better Than Check 5 Much Better Than Check 4 Better Than Check 2 Poorer Than Check 4 Better Than Check 2 Poorer Than Check 4 Better Than Check 5 Much Poorer Than Check 4 Better Than Check 4 Better Than Check 5 Much Better Than Check 4 Better Than Check 4 Better Than Check 5 Much Better Than Check 4 Better Than Check 4 Better Than Check 5 Much Better Than Check 4 Better Than Check 5 Poorer Than Check 6 Poorer Than Check 7 Poorer Than Check 8 Poorer Than Check 9 Poorer Than Check 9 Poorer Than Check		3				
3 Equivalent To Check 2 Poorer Than Check 1 Much Poorer Than Check Ouality Trait 3-19: Milling 5 Much Better Than Check 4 Better Than Check 2 Poorer Than Check 2 Poorer Than Check 1 Much Poorer Than Check 2 Poorer Than Check 1 Much Poorer Than Check 4 Better Than Check 2 Poorer Than Check 4 Better Than Check 4 Better Than Check 4 Better Than Check 2 Poorer Than Check 3 Equivalent To Check 2 Poorer Than Check 1 Much Poorer Than Check 2 Poorer Than Check 4 Better Than Check 2 Poorer Than Check 4 Better Than Check 5 Much Better Than Check 4 Better Than Check 4 Better Than Check 4 Better Than Check 5 Much Better Than Check 4 Better Than Check 4 Better Than Check 5 Poorer Than Check 5 Poorer Than Check						
2 Poorer Than Check 1 Much Poorer Than Check Quality Trait 3-19: Milling 5 Much Better Than Check 4 Better Than Check 2 Poorer Than Check 1 Much Poorer Than Check 2 Poorer Than Check 2 Poorer Than Check 3 Equivalent To Check 4 Better Than Check 2 Poorer Than Check 4 Better Than Check 4 Better Than Check 2 Poorer Than Check 3 Equivalent To Check 2 Poorer Than Check 2 Poorer Than Check 4 Better Than Check 4 Better Than Check 2 Poorer Than Check 4 Better Than Check 5 Equivalent To Check 6 December 2 December 2 December 3 December		. =				
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Quality Trait 3-19: Milling 5 Much Better Than Check 4 Better Than Check 2 Poorer Than Check 1 Much Poorer Than Check Quality Trait 20-33: Baking 5 Much Better Than Check 4 Better Than Check 5 Equivalent To Check 2 Poorer Than Check 1 Equivalent To Check 2 Poorer Than Check 2 Poorer Than Check 1 Much Poorer Than Check 2 Poorer Than Check 4 Better Than Check 4 Better Than Check 4 Better Than Check 4 Better Than Check 5 Equivalent To Check 4 Better Than Check 5 Equivalent To Check 7 Deck 8 Equivalent To Check 9 Poorer Than Check 1 Equivalent To Check 1 Poorer Than Check		1 Much Poorer Than Check				2.7±0.5
5 Much Better Than Check 4 Better Than Check 3 Equivalent To Check 2 Poorer Than Check 1 Much Poorer Than Check Quality Trait 20-33: Baking 5 Much Better Than Check 4 Better Than Check 3 Equivalent To Check 2 Poorer Than Check 1 Much Poorer Than Check 2 Poorer Than Check 0 Latina State S		Quality Trait 3-19: Milling				
4 Better Than Check 3 Equivalent To Check 2 Poorer Than Check 1 Much Poorer Than Check 2 Ouality Trait 20-33: Baking 5 Much Better Than Check 4 Better Than Check 2 Poorer Than Check 2 Poorer Than Check 1 Much Poorer Than Check 2 Poorer Than Check 0 Uality Trait 1-33: Overall Comparison 5 Much Better Than Check 4 Better Than Check 4 Better Than Check 5 Quality Trait 1-33: Overall Comparison 5 Much Better Than Check 4 Better Than Check 7 Deorer Than Check 9 Deorer Than Check						
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4 Better Than Check 3 Equivalent To Check 2 Poorer Than Check 1 Much Poorer Than Check Quality Trait 1-33: Overall Comparison 5 Much Better Than Check 4 Better Than Check 3 Equivalent To Check 2 Poorer Than Check		Quality Trait 20-33: Baking				
3 Equivalent To Check 2 Poorer Than Check 1 Much Poorer Than Check Quality Trait 1-33: Overall Comparison 5 Much Better Than Check 4 Better Than Check 3 Equivalent To Check 2 Poorer Than Check		5 Much Better Than Check				
2 Poorer Than Check 1 Much Poorer Than Check 2.3±1.2 3.4±0.5 Quality Trait 1-33: Overall Comparison 5 Much Better Than Check 4 Better Than Check 3 Equivalent To Check 2 Poorer Than Check		4 Better Than Check				
1 Much Poorer Than Check Quality Trait 1-33: Overall Comparison 5 Much Better Than Check 4 Better Than Check 3 Equivalent To Check 2 Poorer Than Check		3 Equivalent To Check				
Quality Trait 1-33: Overall Comparison 5 Much Better Than Check 4 Better Than Check 3 Equivalent To Check 2 Poorer Than Check		2 Poorer Than Check				
5 Much Better Than Check 4 Better Than Check 3 Equivalent To Check 2 Poorer Than Check		1 Much Poorer Than Check		2.3±1.2		3.4±0.5
4 Better Than Check 3 Equivalent To Check 2 Poorer Than Check		Quality Trait 1-33: Overall Comparison				
3 Equivalent To Check 2 Poorer Than Check		5 Much Better Than Check				
2 Poorer Than Check		4 Better Than Check				
		3 Equivalent To Check				
1 Much Poorer Than Check 2.0±0.9 3.0±0.0		2 Poorer Than Check				
		1 Much Poorer Than Check		2.0±0.9		3.0± 0.0

		С	asselton	ookston	
Quality		Glenn		Glenn	
Trait	I. USDA/ARS WQL Evaluation	Check	MN01311-A-1	Check	MN01311-A-1
1	Wheat Protein (12%mb)	15.0	14.3	15.6	15.4
2	Flour Protein (12%mb)	14.1	13.0	15.0	14.5
3	Market Value (Score 1-6)	4.1	4.1	4.6	5.2
4	Market Value (Score 1-10)	10	8.8	10	8.4
5	Test Weight (lb/bu)	62.8	61.2	64.8	62.6
6	1000 Kernel Weight (g)	27.2	35.3	31.3	41.0
7	Kernel Size % Large	50	65	71	89
8	Kernel Size % Small	7	6	3	2
9	Wheat Moisture (%)	12.7	11.8	12.4	12.2
10	Wheat Ash (14%mb)	1.73	1.62	1.56	1.49
11	Wheat Falling Number (sec)	425	501	430	484
12	Vitreous Kernels (%)	90	61	99	93
	Flour Extraction (%)				
13	Tempered Wheat Basis (%)	68.8	71.2	67.0	71.1
14	Total Product Basis (%)	71.2	74.4	69.7	73.8
15	Flour /Bu Wheat (lbs)	44.8	45.7	45.1	46.5
16	Flour Color Brightness (L*)	90.1	89.7	90.2	89.8
	Flour Color Yellowness (b*)	9.4	12.7	9.2	11.6
17	Flour Moisture (%)	12.8	13.1	12.8	13.1
18	Flour Ash (14%mb)	0.423	0.444	0.415	0.405
19	Flour Falling Number (Malted) (sec)	258	273	267	248
	Farinograph				
20	Water Absorption (500bu)	65.3	61.9	67.5	66.5
21	Water Absorption (14%mb)	64.0	60.9	66.1	65.5
22	Arrival Time (min)	1.8	2.8	2.3	4.1
23	Peak Time (min)	3.8	5.8	6.7	8.0
24	Dough Stability (min)	8.5	8.4	12.8	8.2
25	MTI (bu)	22	26	17	34
26	TTB (min)	9.4	11.3	14.9	12.3
	II. Cooperator Evaluation	(4.5		(F. 0. 0.0	
27	Bake Absorption (Avg %)	64.3± 1.9	61.6±1.9	65.3±2.9	64.5±2.0
28	Loaf Volume (Avg % of Check)		98.1±4.3		98.4±4.3

		C	asselton	Crookston	
Quality Trait	II. Cooperator Results/Evaluation	Glenn Check	MN01311-A-1	Glenn Check	MN01311-A-1
29	Mixing Requirement	CHECK	WINO 1311-A-1	CHECK	WINO 13 11-A-1
	5 Very Long				
	4 Long				
	3 Medium				
	2 Short				
	1 Very Short	3.9±0.9	3.6±0.9	3.7±0.9	3.0±1.3
30	Dough Characteristics				
	5 Bucky-Tough				
	4 Strong-Elastic			—	
	3 Medium-Pliable				
	2 Mellow-Very Pliable				
	1 Weak-Short or Sticky	3.7±1.0	3.7±1.2	4.2±0.7	3.3±1.3
31	Mixing Tolerance				
	5 Much More Tolerance Than Check				
	4 More Tolerance Than Check				
	3 Tolerance Equivalent To Check		. <u></u>		
	2 Less Tolerance Than Check 1 Much Less Tolerance Than Check		2.7±0.5		27.00
32	Internal Crumb Color		2.7±0.5		2.6±0.9
32	5 Much Brighter Than Check				
	4 Brighter Than Check				
	3 Equivalent To Check				
	2 Poorer Than Check				
	1 Much Poorer Than Check		2.6±0.9		2.8±0.8
33	Internal Grain and Texture		2.010.9		2.010.0
	5 Much Better Than Check				
	4 Better Than Check				
	3 Equivalent To Check				
	2 Poorer Than Check				
	1 Much Poorer Than Check		3.2±1.2		3.3±0.7
	III. Cooperator Quality Assessment				
	Quality Trait 1-2: Protein				
	5 Much Better Than Check				
	4 Better Than Check				
	3 Equivalent To Check				
	2 Poorer Than Check				
	1 Much Poorer Than Check		2.1±0.6		2.9±0.3
	Quality Trait 3-19: Milling				
	5 Much Better Than Check				
	4 Better Than Check				
	3 Equivalent To Check 2 Poorer Than Check				
	1 Much Poorer Than Check		3.0±0.7		3.9±0.8
	Quality Trait 20-33: Baking		3.0±0.7		3.7±0.6
	5 Much Better Than Check				
	4 Better Than Check				
	3 Equivalent To Check				
	2 Poorer Than Check				
	1 Much Poorer Than Check		2.7±1.0		2.8±1.0
	Quality Trait 1-33: Overall Comparison				
	5 Much Better Than Check				
	4 Better Than Check				
	3 Equivalent To Check				
	2 Poorer Than Check				
	1 Much Poorer Than Check		2.6±0.7		2.9± 1.1

	_	Cas	sselton	N	/linot	W	Iliston
Quality		Glenn		Glenn		Glenn	
Trait	I. USDA/ARS WQL Evaluation	Check	NDSW0449	Check	NDSW0449	Check	NDSW0449
1	Wheat Protein (12%mb)	15.0	14.8	16.5	16.3	17.6	18.9
2	Flour Protein (12%mb)	14.1	13.6	15.6	15.8	16.9	18.0
3	Market Value (Score 1-6)	4.1	3.3	3.5	3.4	4.1	3.5
4	Market Value (Score 1-10)	10	8.4	10	9.6	10	7.6
5	Test Weight (lb/bu)	62.8	59.8	59.4	59.6	58.2	54.9
6	1000 Kernel Weight (g)	27.2	23.1	20.9	23.0	22.4	20.4
7	Kernel Size % Large	50	23	9	13	7	4
8	Kernel Size % Small	7	18	22	19	17	36
9	Wheat Moisture (%)	12.7	12.1	12.1	12.4	11.7	11.6
10	Wheat Ash (14%mb)	1.73	1.75	1.37	1.39	1.46	1.74
11	Wheat Falling Number (sec)	425	446	388	359	437	429
12	Vitreous Kernels (%)	90	62	86	87	100	98
	Flour Extraction (%)						
13	Tempered Wheat Basis (%)	68.8	70.8	70.5	69.1	69.6	68.0
14	Total Product Basis (%)	71.2	73.7	73.4	72.4	72.8	71.5
15	Flour /Bu Wheat (lbs)	44.8	44.1	43.8	42.9	42.5	39.4
16	Flour Color Brightness (L*)	90.1	88.4	90.5	90.1	90.3	89.6
	Flour Color Yellowness (b*)	9.4	10.6	9.0	9.7	10.0	10.6
17	Flour Moisture (%)	12.8	12.5	12.2	12.4	12.2	12.6
18	Flour Ash (14%mb)	0.423	0.501	0.406	0.460	0.472	0.538
19	Flour Falling Number (Malted) (sec)	258	253	264	252	258	266
	Farinograph						
20	Water Absorption (500bu)	65.3	62.0	65.1	63.8	67.1	66.5
21	Water Absorption (14%mb)	64.0	60.3	63.0	62.0	65.2	64.9
22	Arrival Time (min)	1.8	3.0	5.2	4.5	5.2	5.1
23	Peak Time (min)	3.8	6.8	9.4	7.5	9.4	8.7
24	Dough Stability (min)	8.5	8.7	10.8	7.2	14.8	14.2
25	MTI (bu)	22	34	26	39	16	17
26	TTB (min)	9.4	11.6	15.3	11.5	18.3	18.3
	II. Cooperator Evaluation						
27	Bake Absorption (Avg %)	64.3± 1.9	61.4± 2.1	63.2±1.7	62.7± 2.4	65.6±1.9	65.2± 1.8
28	Loaf Volume (Avg % of Check)		99.0±4.8		96.6±7.7		99.5± 3.1

		Ca	sselton	ı	Minot	Wi	illiston
Quality	II. Cooperator Results/Evaluation	Glenn		Glenn		Glenn	
Trait		Check	NDSW0449	Check	NDSW0449	Check	NDSW0449
29	Mixing Requirement						
	5 Very Long						
	4 Long						
	3 Medium						
	2 Short						
	1 Very Short	3.9±0.9	3.7±1.0	3.7±1.0	3.1±1.5	4.0±0.9	3.7±1.0
30	Dough Characteristics						
	5 Bucky-Tough						
	4 Strong-Elastic 3 Medium-Pliable						
	2 Mellow-Very Pliable						
	1 Weak-Short or Sticky	3.7±1.0	3.8±0.8	4.0±0.7	3.2±1.5	3.9±0.9	4.0±0.9
31	Mixing Tolerance	3.7±1.0	3.0±0.8	4.0±0.7	3.2±1.5	3.7±0.9	4.0±0.9
31	5 Much More Tolerance Than Check						
	4 More Tolerance Than Check						•
	3 Tolerance Equivalent To Check						
	2 Less Tolerance Than Check						·
	1 Much Less Tolerance Than Check		2.7±0.7		2.4±0.9		2.8±0.4
32	Internal Crumb Color						•
	5 Much Brighter Than Check						
	4 Brighter Than Check						
	3 Equivalent To Check						
	2 Poorer Than Check						
	1 Much Poorer Than Check		2.6±0.7		2.4±0.5		2.6±0.9
33	Internal Grain and Texture						
	5 Much Better Than Check						
	4 Better Than Check						
	3 Equivalent To Check						. <u> </u>
	2 Poorer Than Check 1 Much Poorer Than Check		2 2		2 2		20.00
	i wuch Poorer Than Check		3.2±1.1		3.2±0.8		2.8±0.8
	III. Cooperator Quality Assessment						
	Quality Trait 1-2: Protein						
	5 Much Better Than Check						
	4 Better Than Check						
	3 Equivalent To Check						
	2 Poorer Than Check						•
	1 Much Poorer Than Check		2.8±0.4		3.1±0.3		4.0±0.7
	Quality Trait 3-19: Milling						
	5 Much Better Than Check						
	4 Better Than Check						
	3 Equivalent To Check						
	2 Poorer Than Check						
	1 Much Poorer Than Check		2.0±0.5		2.7±0.5		2.4±1.3
	Quality Trait 20-33: Baking 5 Much Better Than Check						
	5 Much Better Than Check 4 Better Than Check						
	3 Equivalent To Check						
	2 Poorer Than Check						
	1 Much Poorer Than Check		2.4±1.1		2.6±1.0		2.9±0.6
	Quality Trait 1-33: Overall Comparison						
	5 Much Better Than Check						
	4 Better Than Check						
	3 Equivalent To Check						
	2 Poorer Than Check						
	1 Much Poorer Than Check		2.3± 0.9		2.2± 1.0		2.7± 0.7

		Brookings		Casselton	
Quality		Glenn		Glenn	
Trait	I. USDA/ARS WQL Evaluation	Check	SD3868	Check	SD3868
1	Wheat Protein (12%mb)	12.8	11.5	15.0	14.4
2	Flour Protein (12%mb)	12.0	10.4	14.1	13.3
3	Market Value (Score 1-6)	3.7	3.5	4.1	3.6
4	Market Value (Score 1-10)	10	7.8	10	8.4
5	Test Weight (lb/bu)	65.7	61.0	62.8	59.3
6	1000 Kernel Weight (g)	31.3	33.9	27.2	31.5
7	Kernel Size % Large	62	73	50	60
8	Kernel Size % Small	5	5	7	7
9	Wheat Moisture (%)	12.3	12.1	12.7	12.0
10	Wheat Ash (14%mb)	1.75	1.56	1.73	1.59
11	Wheat Falling Number (sec)	407	428	425	443
12	Vitreous Kernels (%)	97	71	90	56
	Flour Extraction (%)				
13	Tempered Wheat Basis (%)	66.5	68.9	68.8	70.3
14	Total Product Basis (%)	68.8	72.4	71.2	73.4
15	Flour /Bu Wheat (lbs)	45.3	43.7	44.8	43.6
16	Flour Color Brightness (L*)	90.5	90.8	90.1	90.5
	Flour Color Yellowness (b*)	9.4	10.5	9.4	10.0
17	Flour Moisture (%)	12.5	12.4	12.8	13.1
18	Flour Ash (14%mb)	0.527	0.520	0.423	0.444
19	Flour Falling Number (Malted) (sec)	265	259	258	250
	Farinograph				
20	Water Absorption (500bu)	64.5	61.0	65.3	61.7
21	Water Absorption (14%mb)	62.8	59.2	64.0	60.8
22	Arrival Time (min)	1.6	1.6	1.8	2.4
23	Peak Time (min)	2.9	2.5	3.8	5.5
24	Dough Stability (min)	5.0	5.6	8.5	8.5
25	MTI (bu)	39	32	22	29
26	TTB (min)	6.6	7.2	9.4	11.0
	II. Cooperator Evaluation				
27	, , , , , , , , , , , , , , , , , , ,	62.5±2.6	59.9± 2.1	64.3±1.9	61.7± 2.1
28	Loaf Volume (Avg % of Check)		95.0±6.2		97.9± 3.9

		Brookings		Casselton	
Quality	II. Cooperator Results/Evaluation	Glenn		Glenn	
Trait		Check	SD3868	Check	SD3868
29	Mixing Requirement				
	5 Very Long				
	4 Long				
	3 Medium 2 Short				
	1 Very Short	3.2±1.3	2.2±0.7	3.9±0.9	3.2±0.4
30	Dough Characteristics	J.2±1.3	2.2.0.7	J. 7±0.9	3.210.4
30	5 Bucky-Tough				
	4 Strong-Elastic				
	3 Medium-Pliable				
	2 Mellow-Very Pliable				
	1 Weak-Short or Sticky	3.9±0.9	3.0±0.7	3.7±1.0	3.2±0.7
31	Mixing Tolerance				
	5 Much More Tolerance Than Check				
	4 More Tolerance Than Check				
	3 Tolerance Equivalent To Check				
	2 Less Tolerance Than Check		. 		
	1 Much Less Tolerance Than Check		2.6±1.1		2.6± 0.7
32	Internal Crumb Color				
	5 Much Brighter Than Check				
	4 Brighter Than Check 3 Equivalent To Check				
	2 Poorer Than Check		. <u> </u>		
	1 Much Poorer Than Check		2.7±0.9		2.9±0.6
33	Internal Grain and Texture		2.7±0.9		2.7±0.6
33	5 Much Better Than Check				
	4 Better Than Check				
	3 Equivalent To Check				
	2 Poorer Than Check		·		
	1 Much Poorer Than Check		2.8±0.8		3.0±1.2
	III. Cooperator Quality Assessment				
	Quality Trait 1-2: Protein				
	5 Much Better Than Check				
	4 Better Than Check				
	3 Equivalent To Check				
	2 Poorer Than Check		1.6±0.5		
	1 Much Poorer Than Check				2.1±0.3
	Quality Trait 3-19: Milling 5 Much Better Than Check				
	5 Much Better Than Check 4 Better Than Check				
	3 Equivalent To Check				
	2 Poorer Than Check				
	1 Much Poorer Than Check		2.2±0.4		2.4±0.5
	Quality Trait 20-33: Baking				,,
	5 Much Better Than Check				
	4 Better Than Check				
	3 Equivalent To Check				
	2 Poorer Than Check				
	1 Much Poorer Than Check		2.2±0.8		2.7±1.1
	Quality Trait 1-33: Overall Comparison				
	5 Much Better Than Check				
	4 Better Than Check				
	3 Equivalent To Check				
	2 Poorer Than Check				
	1 Much Poorer Than Check		2.3± 1.0		2.4± 0.9

		Crookston		M	Minot	
Quality		Glenn		Glenn		
Trait	I. USDA/ARS WQL Evaluation	Check	CS 3100Q	Check	CS 3100Q	
1	Wheat Protein (12%mb)	15.6	13.8	16.5	16.1	
2	Flour Protein (12%mb)	15.0	12.7	15.6	15.2	
3	Market Value (Score 1-6)	4.6	3.2	3.5	2.6	
4	Market Value (Score 1-10)	10	5.6	10	7.8	
5	Test Weight (lb/bu)	64.8	60.3	59.4	59.4	
6	1000 Kernel Weight (g)	31.3	25.8	20.9	24.8	
7	Kernel Size % Large	71	27	9	11	
8	Kernel Size % Small	3	13	22	17	
9	Wheat Moisture (%)	12.4	11.9	12.1	12.2	
10	Wheat Ash (14%mb)	1.56	1.72	1.37	1.40	
11	Wheat Falling Number (sec)	430	468	388	271	
12	Vitreous Kernels (%)	99	77	86	19	
	Flour Extraction (%)					
13	Tempered Wheat Basis (%)	67.0	70.4	70.5	69.6	
14	Total Product Basis (%)	69.7	73.2	73.4	73.0	
15	Flour /Bu Wheat (lbs)	45.1	44.5	43.8	43.3	
16	Flour Color Brightness (L*)	90.2	91.6	90.5	90.8	
	Flour Color Yellowness (b*)	9.2	8.8	9.0	8.4	
17	Flour Moisture (%)	12.8	13.1	12.2	12.1	
18	Flour Ash (14%mb)	0.415	0.454	0.406	0.448	
19	Flour Falling Number (Malted) (sec)	267	261	264	257	
	Farinograph					
20	Water Absorption (500bu)	67.5	60.8	65.1	63.1	
21	Water Absorption (14%mb)	66.1	59.8	63.0	61.0	
22	Arrival Time (min)	2.3	2.1	5.2	4.1	
23	Peak Time (min)	6.7	6.9	9.4	7.3	
24	Dough Stability (min)	12.8	10.6	10.8	9.1	
25	MTI (bu)	17	26	26	29	
26	TTB (min)	14.9	12.9	15.3	12.5	
	II. Cooperator Evaluation					
27	Bake Absorption (Avg %)	65.3±2.9	60.7±2.4	63.2±1.7	62.1±2.6	
28	Loaf Volume (Avg % of Check)		100.1±9.8		100.4±2.6	

Duality II. Cooperator Results/Evaluation Glenn Check CS 31000 Check CS 310			Cro	okston	N	linot
Trait	Quality	II. Cooperator Results/Evaluation				
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4 Better Than Check 3 Equivalent To Check		Quality Trait 1-33: Overall Comparison				
3 Equivalent To Check		•				
2 Poorer Than Chark		3 Equivalent To Check				
		2 Poorer Than Check				
1 Much Poorer Than Check 2.7±0.7 3.0±0.7		1 Much Poorer Than Check		2.7± 0.7		3.0± 0.7

		Casselton		Minot	
Quality		Glenn		Glenn	
Trait	I. USDA/ARS WQL Evaluation	Check	CA905-749	Check	CA905-749
1	Wheat Protein (12%mb)	15.0	15.3	16.5	16.3
2	Flour Protein (12%mb)	14.1	13.8	15.6	16.2
3	Market Value (Score 1-6)	4.1	4.4	3.5	3.7
4	Market Value (Score 1-10)	10	10	10	8
5	Test Weight (lb/bu)	62.8	63.3	59.4	61.6
6	1000 Kernel Weight (g)	27.2	29.9	20.9	25.4
7	Kernel Size % Large	50	57	9	20
8	Kernel Size % Small	7	6	22	13
9	Wheat Moisture (%)	12.7	11.8	12.1	12.0
10	Wheat Ash (14%mb)	1.73	1.68	1.37	1.25
11	Wheat Falling Number (sec)	425	428	388	308
12	Vitreous Kernels (%)	90	68	86	71
	Flour Extraction (%)				
13	Tempered Wheat Basis (%)	68.8	71.0	70.5	68.9
14	Total Product Basis (%)	71.2	74.3	73.4	72.1
15	Flour /Bu Wheat (lbs)	44.8	46.9	43.8	44.4
16	Flour Color Brightness (L*)	90.1	90.7	90.5	90.3
	Flour Color Yellowness (b*)	9.4	9.9	9.0	8.8
17	Flour Moisture (%)	12.8	12.9	12.2	12.4
18	Flour Ash (14%mb)	0.423	0.511	0.406	0.402
19	Flour Falling Number (Malted) (sec)	258	268	264	251
	Farinograph				
20	Water Absorption (500bu)	65.3	65.2	65.1	64.1
21	Water Absorption (14%mb)	64.0	63.9	63.0	62.3
22	Arrival Time (min)	1.8	2.5	5.2	5.2
23	Peak Time (min)	3.8	6.7	9.4	9.3
24	Dough Stability (min)	8.5	9.4	10.8	10.4
25	MTI (bu)	22	30	26	27
26	TTB (min)	9.4	11.6	15.3	14.4
	II. Cooperator Evaluation				
27	Bake Absorption (Avg %)	64.3±1.9	63.8±1.8	63.2±1.7	63.3± 2.3
28	Loaf Volume (Avg % of Check)		97.4± 5.5		102.6±6.7

		Ca	isselton		Minot
Quality	II. Cooperator Results/Evaluation	Glenn		Glenn	
Trait	550ps. 210. 1100a.110/ 2 10.12110.1	Check	CA905-749	Check	CA905-749
29	Mixing Requirement	- CHOOK	011700 7 17	- CIICOII	011700 7 17
-/	5 Very Long				
	4 Long				
	3 Medium				
	2 Short				
	1 Very Short	3.9±0.9	3.8±0.8	3.7±1.0	3.8±1.1
30	Dough Characteristics	3.710.9	3.0±0.8	3.7±1.0	3.011.1
30	5 Bucky-Tough				
	4 Strong-Elastic				
	3 Medium-Pliable				
	2 Mellow-Very Pliable				
	1 Weak-Short or Sticky	3.7±1.0	3.9±0.8	4.0±0.7	3.7±0.9
21		3.7±1.0	3.9±0.8	4.0±0.7	3.7±0.9
31	Mixing Tolerance 5 Much More Tolerance Than Check				
	4 More Tolerance Than Check			_	
	3 Tolerance Equivalent To Check				
	2 Less Tolerance Than Check 1 Much Less Tolerance Than Check		0.0		
			2.9±0.6		3.0±0.7
32	Internal Crumb Color				
	5 Much Brighter Than Check				
	4 Brighter Than Check				
	3 Equivalent To Check				
	2 Poorer Than Check				
	1 Much Poorer Than Check		2.8±0.7		3.6±0.9
33	Internal Grain and Texture				
	5 Much Better Than Check				
	4 Better Than Check				
	3 Equivalent To Check				. <u>—</u>
	2 Poorer Than Check				
	1 Much Poorer Than Check		3.1±1.1		3.0±1.0
	III. Cooperator Quality Accessment				
	III. Cooperator Quality Assessment Quality Trait 1-2: Protein				
	5 Much Better Than Check				
	4 Better Than Check			_	
				_	
	3 Equivalent To Check 2 Poorer Than Check			_	
			0.0		20
	1 Much Poorer Than Check		2.9±0.6		3.2±0.7
	Quality Trait 3-19: Milling 5 Much Better Than Check				
	• <u></u>			_	
	4 Better Than Check				
	3 Equivalent To Check				
	2 Poorer Than Check		2.4		2.2
	1 Much Poorer Than Check		3.4±1.0		3.2±0.7
	Quality Trait 20-33: Baking				
	5 Much Better Than Check				
	4 Better Than Check				
	3 Equivalent To Check				
	2 Poorer Than Check				
	1 Much Poorer Than Check		2.7±1.0		3.4±1.0
	Quality Trait 1-33: Overall Comparison				
	5 Much Better Than Check				
	4 Better Than Check				
	3 Equivalent To Check				
	2 Poorer Than Check				
	1 Much Poorer Than Check		2.7± 0.7		3.3±0.7

		Casselton		Willi	iston
Quality		Glenn		Glenn	
Trait	I. USDA/ARS WQL Evaluation	Check	06 Inc 2	Check	06 Inc 2
1	Wheat Protein (12%mb)	15.0	16.2	17.6	18.6
2	Flour Protein (12%mb)	14.1	15.1	16.9	17.4
3	Market Value (Score 1-6)	4.1	4.1	4.1	3.8
4	Market Value (Score 1-10)	10	8.4	10	9.4
5	Test Weight (lb/bu)	62.8	59.4	58.2	56.8
6	1000 Kernel Weight (g)	27.2	33.6	22.4	26.2
7	Kernel Size % Large	50	64	7	23
8	Kernel Size % Small	7	6	17	9
9	Wheat Moisture (%)	12.7	11.4	11.7	11.4
10	Wheat Ash (14%mb)	1.73	1.75	1.46	1.64
11	Wheat Falling Number (sec)	425	462	437	489
12	Vitreous Kernels (%)	90	54	100	95
	Flour Extraction (%)				
13	Tempered Wheat Basis (%)	68.8	71.0	69.6	69.4
14	Total Product Basis (%)	71.2	74.2	72.8	72.8
15	Flour /Bu Wheat (lbs)	44.8	44.3	42.5	41.4
16	Flour Color Brightness (L*)	90.1	90.1	90.3	89.8
	Flour Color Yellowness (b*)	9.4	9.6	10.0	10.3
17	Flour Moisture (%)	12.8	12.9	12.2	12.0
18	Flour Ash (14%mb)	0.423	0.526	0.472	0.613
19	Flour Falling Number (Malted) (sec)	258	259	258	274
	Farinograph				
20	Water Absorption (500bu)	65.3	61.5	67.1	65.4
21	Water Absorption (14%mb)	64.0	60.2	65.2	63.1
22	Arrival Time (min)	1.8	2.5	5.2	5.4
23	Peak Time (min)	3.8	8.0	9.4	10.8
24	Dough Stability (min)	8.5	15.6	14.8	14.5
25	MTI (bu)	22	19	16	7
26	TTB (min)	9.4	15.4	18.3	20.0
	II. Cooperator Evaluation				
27	Bake Absorption (Avg %)	64.3±1.9	62.0± 2.9	65.6±1.9	63.9± 1.9
28	Loaf Volume (Avg % of Check)		95.8±8.1		91.1 ±14.0

		Cass	selton	Williston		
Quality	II. Cooperator Results/Evaluation	Glenn		Glenn		
Trait 29	Missing Demoisement	Check	06 Inc 2	Check	06 Inc 2	
29	Mixing Requirement 5 Very Long					
	4 Long					
	3 Medium					
	2 Short					
	1 Very Short	3.9±0.9	4.7±0.5	4.0±0.9	4.6±0.7	
30	Dough Characteristics					
	5 Bucky-Tough					
	4 Strong-Elastic					
	3 Medium-Pliable					
	2 Mellow-Very Pliable					
24	1 Weak-Short or Sticky	3.7±1.0	4.4± 1.0	3.9±0.9	4.2±1.0	
31	Mixing Tolerance 5 Much More Tolerance Than Check					
	4 More Tolerance Than Check					
	3 Tolerance Equivalent To Check					
	2 Less Tolerance Than Check					
	1 Much Less Tolerance Than Check		3.6±1.2		3.1±0.9	
32	Internal Crumb Color		0.022		3112017	
	5 Much Brighter Than Check					
	4 Brighter Than Check					
	3 Equivalent To Check					
	2 Poorer Than Check					
	1 Much Poorer Than Check		2.9±0.6		3.0±1.1	
33	Internal Grain and Texture					
	5 Much Better Than Check					
	4 Better Than Check					
	3 Equivalent To Check					
	2 Poorer Than Check 1 Much Poorer Than Check		2.4		20	
	I Much Poorer I nan Check		3.4±0.9		2.8±1.1	
	III. Cooperator Quality Assessment					
	Quality Trait 1-2: Protein					
	5 Much Better Than Check					
	4 Better Than Check					
	3 Equivalent To Check					
	2 Poorer Than Check					
	1 Much Poorer Than Check		4.2±1.0		3.8±0.7	
	Quality Trait 3-19: Milling					
	5 Much Better Than Check					
	4 Better Than Check					
	3 Equivalent To Check					
	2 Poorer Than Check 1 Much Poorer Than Check		2 2		2.8±1.2	
	Quality Trait 20-33: Baking		2.3±0.5		2.0±1.2	
	5 Much Better Than Check					
	4 Better Than Check					
	3 Equivalent To Check					
	2 Poorer Than Check		—			
	1 Much Poorer Than Check		2.6±1.1		2.9±1.3	
	Quality Trait 1-33: Overall Comparison					
	5 Much Better Than Check					
	4 Better Than Check					
	3 Equivalent To Check					
	2 Poorer Than Check				0.0	
	1 Much Poorer Than Check		2.3± 1.0		2.6± 1.1	

	_	Br	ookings	Casselton		Cro	ookston
Quality		Glenn		Glenn		Glenn	
Trait	I. USDA/ARS WQL Evaluation	Check	00S0120-3W	Check	00S0120-3W	Check	00S0120-3W
1	Wheat Protein (12%mb)	12.8	12.4	15.0	14.7	15.6	13.4
2	Flour Protein (12%mb)	12.0	11.3	14.1	13.6	15.0	12.6
2	Market Value (Gazza 4 ()	2.7	2.4	4.4	2.0		4.0
3	Market Value (Score 1-6)	3.7	3.6	4.1	2.9	4.6	4.0
4	Market Value (Score 1-10)	10	8.2	10	8	10	6.8
5	Test Weight (lb/bu)	65.7	61.9	62.8	59.4	64.8	62.0
6	1000 Kernel Weight (g)	31.3	33.4	27.2	27.8	31.3	31.1
7	Kernel Size % Large	62	43	50 _	37	71	41
8	Kernel Size % Small	5	12	7	12	3	7
9	Wheat Moisture (%)	12.3	12.2	12.7	12.5	12.4	11.4
10	Wheat Ash (14%mb)	1.75	1.76	1.73	1.63	1.56	1.45
11	Wheat Falling Number (sec)	407	454	425	374	430	467
12	Vitreous Kernels (%)	97	91	90	15	99	83
	Flour Extraction (%)						
13	Tempered Wheat Basis (%)	66.5	67.7	68.8	70.8	67.0	68.0
14	Total Product Basis (%)	68.8	70.6	71.2	73.6	69.7	70.9
15	Flour /Bu Wheat (lbs)	45.3	43.7	44.8	43.7	45.1	44.5
16	Flour Color Brightness (L*)	90.5	91.5	90.1	91.8	90.2	91.1
	Flour Color Yellowness (b*)	9.4	10.1	9.4	10.6	9.2	10.3
17	Flour Moisture (%)	12.5	12.3	12.8	12.5	12.8	12.5
18	Flour Ash (14%mb)	0.527	0.493	0.423	0.464	0.415	0.418
19	Flour Falling Number (Malted) (sec)	265	250	258	255	267	250
	Farinograph						
20	Water Absorption (500bu)	64.5	64.4	65.3	64.2	67.5	67.6
21	Water Absorption (14%mb)	62.8	62.5	64.0	62.5	66.1	65.9
22	Arrival Time (min)	1.6	1.3	1.8	2.6	2.3	1.9
23	Peak Time (min)	2.9	2.7	3.8	6.7	6.7	3.7
24	Dough Stability (min)	5.0	4.5	8.5	8.7	12.8	6.9
25	MTI (bu)	39	48	22	34	17	29
26	TTB (min)	6.6	5.8	9.4	10.6	14.9	8.3
	II. Cooperator Evaluation						
27	Bake Absorption (Avg %)	62.5±2.6	61.7±2.7	64.3±1.9	63.1±2.1	65.3±2.9	64.6± 2.9
28	Loaf Volume (Avg % of Check)		99.3±4.7		99.3± 6.5		96.1±5.8

		В	rookings Casselton		asselton	Crookston	
Quality	II. Cooperator Results/Evaluation	Glenn		Glenn		Glenn	
Trait		Check	00S0120-3W	Check	00S0120-3W	Check	00S0120-3W
29	Mixing Requirement						
	5 Very Long						
	4 Long						
	3 Medium 2 Short	_					
	1 Very Short	3.2±1.3	3.3±1.4	3.9±0.9	3.7±1.1	3.7±0.9	3.0±1.5
30	Dough Characteristics	3.2±1.3	3.3±1.4	3.9±0.9	3.7±1.1	3.7±0.9	3.0±1.5
30	5 Bucky-Tough						
	4 Strong-Elastic						
	3 Medium-Pliable						
	2 Mellow-Very Pliable						
	1 Weak-Short or Sticky	3.9±0.9	4.0±0.9	3.7±1.0	3.8±0.8	4.2±0.7	3.2±1.6
31	Mixing Tolerance						
	5 Much More Tolerance Than Check						
	4 More Tolerance Than Check						
	3 Tolerance Equivalent To Check						
	2 Less Tolerance Than Check						
	1 Much Less Tolerance Than Check		3.0±0.5		2.8±0.4		2.4±1.0
32	Internal Crumb Color						
	5 Much Brighter Than Check						
	4 Brighter Than Check						
	3 Equivalent To Check 2 Poorer Than Check						
	1 Much Poorer Than Check		2.3±0.5		3.0±1.0		2.7±1.0
33	Internal Grain and Texture		2.3±0.5		3.0±1.0		2.7±1.0
55	5 Much Better Than Check						
	4 Better Than Check						
	3 Equivalent To Check						
	2 Poorer Than Check						
	1 Much Poorer Than Check		3.0±0.5		3.2±1.3		3.1±0.6
	III. Cooperator Quality Assessment						
	Quality Trait 1-2: Protein						
	5 Much Better Than Check						
	4 Better Than Check						
	3 Equivalent To Check						1 2
	2 Poorer Than Check		2.2±0.4		2.0.07		1.3±0.5
	1 Much Poorer Than Check Quality Trait 3-19: Milling		Z.Z±0.4		2.9±0.6		
	5 Much Better Than Check						
	4 Better Than Check						
	3 Equivalent To Check						
	2 Poorer Than Check						
	1 Much Poorer Than Check		2.2±0.4		2.2±0.7		2.9±0.3
	Quality Trait 20-33: Baking						
	5 Much Better Than Check						
	4 Better Than Check						
	3 Equivalent To Check						
	2 Poorer Than Check						
	1 Much Poorer Than Check		2.8±0.8		3.2±1.0		2.4±1.0
	Quality Trait 1-33: Overall Comparison						
	5 Much Better Than Check 4 Better Than Check						
	4 Better Than Check 3 Equivalent To Check						
	2 Poorer Than Check						
	1 Much Poorer Than Check		2.7±0.5		2.8± 0.8		2.3±1.0

		Cass	elton	Mi	not	Will	iston
Quality		Glenn		Glenn		Glenn	
Trait	I. USDA/ARS WQL Evaluation	Check	ND 901	Check	ND 901	Check	ND 901
1	Wheat Protein (12%mb)	15.0	16.5	16.5	16.4	17.6	18.6
2	Flour Protein (12%mb)	14.1	15.3	15.6	15.8	16.9	18.2
3	Market Value (Score 1-6)	4.1	3.9	3.5	3.4	4.1	3.7
4	Market Value (Score 1-10)	10	9.2	10	9.6	10	9.6
5	Test Weight (lb/bu)	62.8	61.0	59.4	58.8	58.2	58.0
6	1000 Kernel Weight (g)	27.2	28.4	20.9	23.9	22.4	21.1
7	Kernel Size % Large	50	54	9	13	7	7
8	Kernel Size % Small	7	6	22	19	17	26
9	Wheat Moisture (%)	12.7	12.4	12.1	12.1	11.7	11.5
10	Wheat Ash (14%mb)	1.73	1.95	1.37	1.39	1.46	1.69
11	Wheat Falling Number (sec)	425	509	388	350	437	473
12	Vitreous Kernels (%)	90	77	86	86	100	98
	Flour Extraction (%)						
13	Tempered Wheat Basis (%)	68.8	71.2	70.5	66.1	69.6	68.1
14	Total Product Basis (%)	71.2	73.9	73.4	69.2	72.8	71.2
15	Flour /Bu Wheat (lbs)	44.8	45.1	43.8	40.7	42.5	41.6
16	Flour Color Brightness (L*)	90.1	90.6	90.5	90.3	90.3	89.8
	Flour Color Yellowness (b*)	9.4	10.5	9.0	10.1	10.0	11.1
17	Flour Moisture (%)	12.8	12.7	12.2	11.9	12.2	12.6
18	Flour Ash (14%mb)	0.423	0.477	0.406	0.414	0.472	0.445
19	Flour Falling Number (Malted) (sec)	258	250	264	252	258	249
	Farinograph						
20	Water Absorption (500bu)	65.3	66.8	65.1	64.6	67.1	68.6
21	Water Absorption (14%mb)	64.0	65.3	63.0	62.2	65.2	67.0
22	Arrival Time (min)	1.8	5.0	5.2	5.7	5.2	5.3
23	Peak Time (min)	3.8	8.9	9.4	10.5	9.4	8.2
24	Dough Stability (min)	8.5	9.9	10.8	11.1	14.8	14.7
25	MTI (bu)	22	25	26	28	16	13
26	TTB (min)	9.4	15.1	15.3	16.1	18.3	20.0
	II. Cooperator Evaluation						
27	Bake Absorption (Avg %)	64.3±1.9	64.8±1.8	63.2±1.7	62.9±2.2	65.6±1.9	66.5±1.7
28	Loaf Volume (Avg % of Check)		105.3±4.6		107.1±9.1		102.8±4.4

Mixing Requirement			Cass	elton	Mii	not	Willi	ston
Mixing Requirement S Very Long 4 Long 3 Medium 2 Short 1 Very Short 3,920.9 3,320.7 3,721.0 3,821.1 4,020.9 3,821.0	-	II. Cooperator Results/Evaluation		ND 001		ND 001		ND 001
S Very Long		Mixing Requirement	Check	ND 901	Check	ND 901	Check	ND 901
A Long 3 Medium 2 Short 1 Very Short 3.9e.0 3.3e.0 3.7e.10 3.8e.11 4.0e.0 3.8e.10 3.7e.10 3.9e.0 3.3e.0 3.7e.10 3.8e.11 4.0e.0 3.8e.10 3.7e.10 3.8e.10 3.7e.10 3.8e.10 3.7e.10 3.8e.11 4.0e.0 3.8e.10 3.7e.10 3.8e.10 3.7e.10 3.8e.10 3.7e.10 3.8e.10 3.7e.10 3.7e.10 3.9e.0 3.8e.10 3.7e.10 3.9e.0 3.9e.11 3.9e.0 3.8e.10 3.7e.10 3.9e.0 3.9e.11 3.9e.0 3.8e.10 3.9e.0 3.9e.0 3.9e.11 3.9e.0		- .						
3 Medum 2 Short 1 Very Short 3 7 3,920,9 3 3,320,7 3 7,210 3 821,1 4 0,020,9 3 8,210 3 Dough Characteristics 5 Bucky-Tough 4 Strong-Elastic 3 Medium-Plaible 1 Weak-Short or Sticky 3 7,210 3 0,211 3 Mixing Tolerance 5 Much More Tolerance Than Check 4 More Tolerance Than Check 2 Less Tolerance Than Check 3 Tolerance Equivalent To Check 2 Less Tolerance Than Check 4 Brighter Than Check 3 Equivalent To Check 2 Poorer Than Check 3 Equivalent To Check 3 Equivalent To Check 2 Poorer Than Check 3 Equivalent To Check 3 Equivalent To Check 4 Better Than Check 5 Much Better Than Check 6 Depart Than Check 7 Equivalent To Check 8 Equivalent To Check 9 Coughty Trait 1-1: Protein 1 Much Poorer Than Check 1 Equivalent To Check 2 Poorer Than Check 3 Equivalent To Check 4 Better Than Check 4 Better Than Check 4 Better Than Check 5 Med Better Than Check 6 Depart Than Check 1 Much Poorer Than Check 1 Much Poorer Than Check 1 Equivalent To Check 2 Poorer Than Check 1 Much Poorer Than Check 1 Sequivalent To Check 2 Poorer Than Check 1 Much Poorer Than Check 1 Sequivalent To Check 2 Poorer Than Check 1 Sequivalent To Check 2 Poorer Than Check 1 Sequivalent To Check 2 Poorer Than Check 1 Much Poorer Than Check 1 Sequivalent To Check 2 Poorer Than Check 1 Sequivalent To Check 2 Poorer Than Check 2 Poorer Than Check 1 Sequivalent To Check 2 Poorer Than Check 2 Poorer Than Check 2 Sequivalent To Check 2 Poorer Than Check 3 Sequivalent To Check 2 Poorer Than Check 4 Better								
1 Very Short 3,9±0,9 3,3±0,7 3,7±1,0 3,8±1,1 4,0±0,9 3,8±1,0 4,0±0,9 4,1±0,8 4 Strong-Elastic 3,4 Medium-Plable 2,4 Mellow-Very Plable 1,4 Weak-Short or Sticky 3,7±1,0 3,6±0,9 4,0±0,7 3,9±1,1 3,9±0,9 4,1±0,8 1,0		<u>-</u>						
Dough Characteristics 5 Bucky-Tough 4 Strong-Elastic 3 Medium-Pliable 2 Mellow-Very Pliable 1 Weak-Short or Sticky 3.7±10 3.6±0.9 4.0±0.7 3.9±11 3.9±0.9 4.1±0.6 3 Medium-Pliable 1 Weak-Short or Sticky 3.7±10 3.6±0.9 4.0±0.7 3.9±11 3.9±0.9 4.1±0.6 3.7±10 3.6±0.9 4.0±0.7 3.9±11 3.9±0.9 4.1±0.6 4 More Tolerance Than Check 2 Less Tolerance Than Check 3 Tolerance Equivalent To Check 2 Less Tolerance Than Check 4 Brighter Than		2 Short						
S Bucky-Tough		1 Very Short	3.9±0.9	3.3±0.7	3.7±1.0	3.8±1.1	4.0±0.9	3.8±1.0
A Strong-Elastic 3 Medium-Pilable 2 Mellow-Very Pilable 1 Weak-Short or Sticky 3.7±10 3.6±0.9 4.0±0.7 3.9±11 3.9±0.9 4.1±0.6	30	Dough Characteristics						
3 Medium-Pilable 2 Mellow-Very Pilable 1 Weak-Short or Sticky 3.7a1.0 3.6a0.9 4.0a0.7 3.9a1.1 3.9a0.9 4.1a0.6		5 Bucky-Tough						
2 Mellow-Very Pilable 1 Weak-Short or Sticky 3.7±10 3.6±0.9 4.0±0.7 3.9±11 3.9±0.9 4.1±0.6 Mixing Tolerance 5 Much More Tolerance Than Check 4 More Tolerance Equivalent To Check 2 Less Tolerance Than Check 1 Much Less Tolerance Than Check 4 Brighter Than Check 3 Equivalent To Check 2 Poorer Than Check 1 Much Poorer Than Check 4 Better Than Check 2 Poorer Than Check 3 Equivalent To Check 2 Poorer Than Check 4 Better Than Check 4 Better Than Check 2 Poorer Than Check 1 Much Poorer Than Check 4 Better Than Check 2 Poorer Than Check 1 Much Poorer Than Check 4 Better Than Check 2 Poorer Than Check 4 Better Than Check 2 Poorer Than Check 4 Better Than Check 4 Better Than Check 4 Better Than Check 4 Better Than Check 5 Much Better Than Check 4 Better Than Check		4 Strong-Elastic						
1 Weak-Short or Sticky 3.7±10 3.6±0.9 4.0±0.7 3.9±11 3.9±0.9 4.1±0.6								
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4 Better Than Check 3 Equivalent To Check 2 Poorer Than Check		·						
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		1 Much Poorer Than Check		3.1±1.1		3.2±0.4		3.3± 0.5

		Casselton		ľ	Minot	
Quality		Glenn		Glenn		
Trait	I. USDA/ARS WQL Evaluation	Check	CA905-750	Check	CA905-750	
1	Wheat Protein (12%mb)	15.0	15.6	16.5	16.4	
2	Flour Protein (12%mb)	14.1	14.2	15.6	15.7	
3	Market Value (Score 1-6)	4.1	4.3	3.5	3.9	
4	Market Value (Score 1-10)	10	10	10	10	
5	Test Weight (lb/bu)	62.8	62.2	59.4	59.4	
6	1000 Kernel Weight (g)	27.2	29.2	20.9	24.8	
7	Kernel Size % Large	50	56	9	17	
8	Kernel Size % Small	7	7	22	17	
9	Wheat Moisture (%)	12.7	12.1	12.1	12.2	
10	Wheat Ash (14%mb)	1.73	1.68	1.37	1.30	
11	Wheat Falling Number (sec)	425	468	388	412	
12	Vitreous Kernels (%)	90	87	86	87	
	Flour Extraction (%)					
13	Tempered Wheat Basis (%)	68.8	70.2	70.5	69.6	
14	Total Product Basis (%)	71.2	73.7	73.4	72.7	
15	Flour /Bu Wheat (lbs)	44.8	45.4	43.8	43.1	
16	Flour Color Brightness (L*)	90.1	90.3	90.5	90.2	
	Flour Color Yellowness (b*)	9.4	9.8	9.0	9.5	
17	Flour Moisture (%)	12.8	12.6	12.2	12.1	
18	Flour Ash (14%mb)	0.423	0.527	0.406	0.436	
19	Flour Falling Number (Malted) (sec)	258	262	264	248	
	Farinograph					
20	Water Absorption (500bu)	65.3	66.7	65.1	65.0	
21	Water Absorption (14%mb)	64.0	65.1	63.0	62.8	
22	Arrival Time (min)	1.8	3.2	5.2	4.5	
23	Peak Time (min)	3.8	7.5	9.4	8.3	
24	Dough Stability (min)	8.5	10.2	10.8	8.8	
25	MTI (bu)	22	27	26	33	
26	TTB (min)	9.4	12.3	15.3	12.6	
	II. Cooperator Evaluation					
27	Bake Absorption (Avg %)	64.3±1.9	64.8±2.0	63.2±1.7	63.5±1.9	
28	Loaf Volume (Avg % of Check)		95.5± 7.5		103.8±6.3	

		Ca	sselton	Minot		
Quality	II. Cooperator Results/Evaluation	Glenn		Glenn		
Trait		Check	CA905-750	Check	CA905-750	
29	Mixing Requirement					
	5 Very Long					
	4 Long					
	3 Medium					
	2 Short					
	1 Very Short	3.9±0.9	3.6±0.7	3.7±1.0	3.3±1.1	
30	Dough Characteristics					
	5 Bucky-Tough					
	4 Strong-Elastic					
	3 Medium-Pliable					
	2 Mellow-Very Pliable					
0.4	1 Weak-Short or Sticky	3.7±1.0	3.4±1.2	4.0±0.7	3.7±1.3	
31	Mixing Tolerance					
	5 Much More Tolerance Than Check					
	4 More Tolerance Than Check					
	3 Tolerance Equivalent To Check		·			
	2 Less Tolerance Than Check 1 Much Less Tolerance Than Check		2.7		2.4	
22			2.7±1.1		2.4±1.1	
32	Internal Crumb Color 5 Much Brighter Than Check					
	4 Brighter Than Check 3 Equivalent To Check					
	2 Poorer Than Check					
	1 Much Poorer Than Check		2.4±0.7		3.2±0.7	
33	Internal Grain and Texture		2.4±0.7		3.2±0.7	
33	5 Much Better Than Check					
	4 Better Than Check		•			
	3 Equivalent To Check		·			
	2 Poorer Than Check					
	1 Much Poorer Than Check		3.2±1.1		3.1±0.6	
			0.22		31120.0	
	III. Cooperator Quality Assessment					
	Quality Trait 1-2: Protein					
	5 Much Better Than Check					
	4 Better Than Check					
	3 Equivalent To Check					
	2 Poorer Than Check					
	1 Much Poorer Than Check		3.6±0.5		3.1±0.3	
	Quality Trait 3-19: Milling					
	5 Much Better Than Check					
	4 Better Than Check					
	3 Equivalent To Check					
	2 Poorer Than Check					
	1 Much Poorer Than Check		2.9±0.6		2.7±0.7	
	Quality Trait 20-33: Baking					
	5 Much Better Than Check					
	4 Better Than Check					
	3 Equivalent To Check					
	2 Poorer Than Check				0.0	
	1 Much Poorer Than Check		2.3±1.0		3.3±1.0	
	Quality Trait 1-33: Overall Comparison					
	5 Much Better Than Check					
	4 Better Than Check					
	3 Equivalent To Check					
	2 Poorer Than Check 1 Much Poorer Than Check		2.4±0.9		2.9± 1.1	
	i Much Foorer man check		∠. ∓±0.9		2.9±1.1	

		Cass	selton	Crook	ston	Mi	inot	Will	iston
Quality		Glenn		Glenn		Glenn		Glenn	
Trait	I. USDA/ARS WQL Evaluation	Check	ND 809	Check	ND 809	Check	ND 809	Check	ND 809
1	Wheat Protein (12%mb)	15.0	15.7	15.6	13.8	16.5	16.4	17.6	17.7
2	Flour Protein (12%mb)	14.1	14.1	15.0	12.9	15.6	15.8	16.9	16.7
3	Market Value (Score 1-6)	4.1	4.2	4.6	4.5	3.5	3.9	4.1	3.7
4	Market Value (Score 1-10)	10	9.6	10	7.4	10	10	10	9.6
5	Test Weight (lb/bu)	62.8	61.6	64.8	63.1	59.4	59.7	58.2	56.8
6	1000 Kernel Weight (g)	27.2	28.8	31.3	36.1	20.9	22.2	22.4	24.7
7	Kernel Size % Large	50	63	71	80	9	20	7	10
8	Kernel Size % Small	7	4	3	2	22	15	17	18
9	Wheat Moisture (%)	12.7	12.4	12.4	13.1	12.1	12.3	11.7	11.6
10	Wheat Ash (14%mb)	1.73	1.66	1.56	1.59	1.37	1.40	1.46	1.55
11	Wheat Falling Number (sec)	425	439	430	434	388	413	437	454
12	Vitreous Kernels (%)	90	74	99	49	86	96	100	100
	Flour Extraction (%)								
13	Tempered Wheat Basis (%)	68.8	70.6	67.0	70.4	70.5	66.7	69.6	69.2
14	Total Product Basis (%)	71.2	73.5	69.7	73.6	73.4	69.5	72.8	72.5
15	Flour /Bu Wheat (lbs)	44.8	45.2	45.1	46.0	43.8	41.5	42.5	41.2
16	Flour Color Brightness (L*)	90.1	89.8	90.2	89.9	90.5	90.1	90.3	90.1
	Flour Color Yellowness (b*)	9.4	9.7	9.2	9.4	9.0	9.4	10.0	10.6
17	Flour Moisture (%)	12.8	13.0	12.8	12.7	12.2	12.7	12.2	12.4
18	Flour Ash (14%mb)	0.423	0.463	0.415	0.429	0.406	0.426	0.472	0.478
19	Flour Falling Number (Malted)	258	244	267	260	264	256	258	256
	Farinograph								
20	Water Absorption (500bu)	65.3	67.0	67.5	67.0	65.1	66.3	67.1	69.1
21	Water Absorption (14%mb)	64.0	66.1	66.1	65.5	63.0	64.9	65.2	67.3
22	Arrival Time (min)	1.8	3.2	2.3	2.2	5.2	5.0	5.2	6.0
23	Peak Time (min)	3.8	5.7	6.7	4.2	9.4	8.9	9.4	10.7
24	Dough Stability (min)	8.5	11.7	12.8	11.9	10.8	11.3	14.8	11.6
25	MTI (bu)	22	16	17	7	26	21	16	24
26	TTB (min)	9.4	15.0	14.9	14.1	15.3	15.9	18.3	17.8
	II. Cooperator Evaluation								
27	Bake Absorption (Avg %)	64.3±1.9	65.2±2.0	65.3±2.9	64.5± 2.6	63.2±1.7	64.6±1.7	65.6±1.9	66.4± 1.9
28	Loaf Volume (Avg % of Check)		103.2±6.7		95.4± 7.9		104.4±8.6		100.6±5.2

	_	Cass	elton	Croo	kston	Mi	not	Willi	iston
Quality	II. Cooperator Results/Evaluation	Glenn		Glenn		Glenn		Glenn	
Trait		Check	ND 809						
29	Mixing Requirement								
	5 Very Long								
	4 Long								
	3 Medium								
	2 Short	2 0+0 0	2 240 0	3.7±0.9	2 2+1 0	3.7±1.0	3.7±1.0	4.0±0.9	3.9±0.8
30	1 Very Short Dough Characteristics	3.9±0.9	3.3±0.9	3.7±0.9	3.3±1.0	3.7±1.0	3.7±1.0	4.0±0.9	3.9±0.8
30	5 Bucky-Tough								
	4 Strong-Elastic								
	3 Medium-Pliable								
	2 Mellow-Very Pliable								
	1 Weak-Short or Sticky	3.7±1.0	3.3±1.1	4.2±0.7	3.3±1.1	4.0±0.7	3.8±1.0	3.9±0.9	3.6±1.4
31	Mixing Tolerance	0172110	0.02		0.02		0.02	01720.7	0.02
	5 Much More Tolerance Than Check								
	4 More Tolerance Than Check		•						•
	3 Tolerance Equivalent To Check								
	2 Less Tolerance Than Check				_				
	1 Much Less Tolerance Than Check		2.6± 1.3		2.8±0.8		3.3±0.5		2.8±1.0
32	Internal Crumb Color								
	5 Much Brighter Than Check								
	4 Brighter Than Check								
	3 Equivalent To Check								
	2 Poorer Than Check								
	1 Much Poorer Than Check		3.3±0.7		3.1±0.6		3.1±0.8		3.7±0.9
33	Internal Grain and Texture								
	5 Much Better Than Check								
	4 Better Than Check								
	3 Equivalent To Check								
	2 Poorer Than Check								
	1 Much Poorer Than Check		3.1±1.1		3.0±0.5		3.0±1.0		3.6±0.9
	III. Cooperator Quality Assessment								
	Quality Trait 1-2: Protein								
	5 Much Better Than Check								•
	4 Better Than Check		•						•
	3 Equivalent To Check 2 Poorer Than Check				1 4.05		_		. ——
	1 Much Poorer Than Check		3.4±0.5		1.4±0.5		3.1±0.3		3.1±0.3
	Quality Trait 3-19: Milling		J.4±0.5				J. 1 ±0.3		J. 1±0.3
	5 Much Better Than Check								
	4 Better Than Check								
	3 Equivalent To Check								
	2 Poorer Than Check								
	1 Much Poorer Than Check		3.1±0.6		3.3±0.5		2.3±0.9		2.8±1.1
	Quality Trait 20-33: Baking								
	5 Much Better Than Check								
	4 Better Than Check								
	3 Equivalent To Check								
	2 Poorer Than Check								
	1 Much Poorer Than Check		3.1±0.9		3.0±1.0		3.6±0.7		3.3±1.0
	Quality Trait 1-33: Overall Comparison								
	5 Much Better Than Check								
	4 Better Than Check								
	3 Equivalent To Check								
	2 Poorer Than Check								
	1 Much Poorer Than Check		3.0± 0.7		3.0± 0.7		2.9± 0.8		3.2± 0.8

		Cass	elton	Williston		
Quality		Glenn		Glenn		
Trait	I. USDA/ARS WQL Evaluation	Check	06 Inc1	Check	06 Inc1	
1	Wheat Protein (12%mb)	15.0	15.2	17.6	19.2	
2	Flour Protein (12%mb)	14.1	14.4	16.9	17.5	
3	Market Value (Score 1-6)	4.1	4.5	4.1	3.8	
4	Market Value (Score 1-10)	10	10	10	9.2	
5	Test Weight (lb/bu)	62.8	62.4	58.2	56.3	
6	1000 Kernel Weight (g)	27.2	29.7	22.4	21.1	
7	Kernel Size % Large	50	41	7	2	
8	Kernel Size % Small	7	12	17	41	
9	Wheat Moisture (%)	12.7	12.2	11.7	11.3	
10	Wheat Ash (14%mb)	1.73	1.48	1.46	1.70	
11	Wheat Falling Number (sec)	425	488	437	498	
12	Vitreous Kernels (%)	90	59	100	97	
	Flour Extraction (%)					
13	Tempered Wheat Basis (%)	68.8	72.0	69.6	69.2	
14	Total Product Basis (%)	71.2	75.0	72.8	72.0	
15	Flour /Bu Wheat (lbs)	44.8	46.6	42.5	40.8	
16	Flour Color Brightness(L*)	90.1	91.1	90.3	89.7	
	Flour Color Yellowness (b*)	9.4	9.9	10.0	10.4	
17	Flour Moisture (%)	12.8	12.8	12.2	12.5	
18	Flour Ash (14%mb)	0.423	0.430	0.472	0.435	
19	Flour Falling Number (Malted) (sec)	258	248	258	246	
	Farinograph					
20	Water Absorption (500bu)	65.3	65.1	67.1	67.0	
21	Water Absorption (14%mb)	64.0	60.2	65.2	65.3	
22	Arrival Time (min)	1.8	2.6	5.2	4.3	
23	Peak Time (min)	3.8	7.8	9.4	7.9	
24	Dough Stability (min)	8.5	9.8	14.8	12.5	
25	MTI (bu)	22	34	16	18	
26	TTB (min)	9.4	12.1	18.3	17.9	
	II. Cooperator Evaluation					
27	Bake Absorption (Avg %)	64.3± 1.9	62.0± 2.4	65.6±1.9	65.5± 2.0	
28	Loaf Volume (Avg % of Check)		101.0±5.5		97.5± 5.4	

Trait			Cass	elton	Williston		
Mixing Requirement 5 Very Long 4 Long 3 Medium 2 Short 1 Very Short 1 Very Short 1 Very Short 3.920.9 3.120.6 4.020.9 3.621.2	Quality	II. Cooperator Results/Evaluation					
S Very Long		AND THE PROPERTY OF	Check	06 Inc1	Check	06 Inc1	
1	29						
3 Medium 2 Short 1 Very Short 3.9±0.9 3.1±0.6 4.0±0.9 3.6±1.2 3 Dough Characteristics 5 Bucky-Tough 4 Strong-Elastic 3 Medium-Pliable 2 Mellow-Very Pliable 1 Weak-Short or Sticky 3.7±1.0 3.4±0.5 3.9±0.9 3.7±1.3 31 Mixing Tolerance 1 Weak-Short or Sticky 3.7±1.0 3.4±0.5 3.9±0.9 3.7±1.3 32 Mixing Tolerance Equivalent To Check 2 Less Tolerance Than Check 3 Tolerance Equivalent To Check 2 Less Tolerance Than Check 4 Brighter Than Check 3 Equivalent To Check 2 Poorer Than Check 3 Equivalent To Check 2 Poorer Than Check 4 Better Than Check 5 Equivalent To Check 6 Department 5 Much Better Than Check 6 Department 6 Medical Poorer Than Check 7 Department 7 Check 8 Department 7 Check 9 Department 7 Che							
2 Short 1 Very Short 2 Shucky-Tough 4 Strong-Elastic 3 Medium-Pilable 2 Mellow-Very Pilable 1 Weak-Short or Sticky 3.7±1.0 3.4±0.5 3.7±1.0 3.4±0.5 3.7±1.0 3.4±0.5 3.7±1.0 3.4±0.5 3.7±1.0 3.4±0.5 3.7±1.0 3.4±0.5 3.7±1.0 3.4±0.5 3.7±1.0 3.4±0.5 3.7±1.0 3.4±0.5 3.7±1.0 3.4±0.5 3.7±1.0 3.4±0.5 3.7±1.0 3.4±0.5 3.7±1.0 3.4±0.5 3.7±1.0 3.4±0.5 3.7±1.0 3.4±0.5 3.7±1.0 3.4±0.5 3.7±1.0 3.4±0.5 3.7±1.0 3.4±0.5 3.7±1.0 3.4±0.5 3.4±0.7		9					
S Bucky-Tough 4 Strong-Elastic 2 Mellow-Very Pilable 1 Weak-Short or Sticky 3.7±1.0 3.4±0.5 3.9±0.9 3.7±1.3 3 Mixing Tolerance 5 Much More Tolerance Than Check 4 More Tolerance Than Check 3 Tolerance Equivalent To Check 2 Less Tolerance Than Check 2 Less Tolerance Than Check 3 Tolerance Equivalent To Check 2 Less Tolerance Than Check 4 Mighter Than Check 4 Brighter Than Check 4 Brighter Than Check 2 Poorer Than Check 2 Poorer Than Check 3 Equivalent To Check 2 Poorer Than Check 4 Better Than Check 3 Equivalent To Check 2 Poorer Than Check 3 Equivalent To Check 4 Better Than Check 4 Bette							
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A Strong-Elastic 2 Mellow-Very Pliable 1 Weak-Short or Sticky 3.7±1.0 3.4±0.5 3.9±0.9 3.7±1.3 3.1 Mixing Tolerance 5 Much More Tolerance Than Check 4 More Tolerance Than Check 2 Less Tolerance Than Check 1 Much Less Tolerance Than Check 2 Less Tolerance Than Check 1 Much Less Tolerance Than Check 2 Less Tolerance Than Check 4 Brighter Than Check 4 Brighter Than Check 2 Less Tolerance Than Check 4 Brighter Than Check 2 Less Tolerance Than Check 4 Brighter Than Check 2 Less Tolerance Than Check 2 Less Tolerance Than Check 2 Less Tolerance Than Check 3 Equivalent To Check 2 Less Tolerance Than Check 4 Less T	30	Dough Characteristics					
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2 Mellow-Very Pliable 1 Weak-Short or Sticky 3.7±1.0 3.4±0.5 3.9±0.9 3.7±1.3 31 Mixing Tolerance 5 Much More Tolerance Than Check 4 More Tolerance Than Check 2 Less Tolerance Than Check 1 Much Less Tolerance Than Check 2 Less Tolerance Than Check 2 Less Tolerance Than Check 3 Tolerance Than Check 4 Brighter Than Check 3 Equivalent To Check 2 Poorer Than Check 3 Equivalent To Check 2 Poorer Than Check 4 Better Than Check 3 Equivalent To Check 2 Poorer Than Check 4 Better Than Check 3 Equivalent To Check 2 Poorer Than Check 4 Better Than Check 3 Equivalent To Check 2 Poorer Than Check 4 Better Than Check 5 Much Better Than Check 4 Better Than Check 4 Better Than Check 5 Equivalent To Check 2 Poorer Than Check 4 Better Than Check 4 Better Than Check 4 Better Than Check 5 Equivalent To Check 2 Poorer Than Check 4 Better Than Check 4 Better Than Check 5 Equivalent To Check 2 Poorer Than Check 4 Better Than Check 4 Better Than Check 4 Better Than Check 5 Equivalent To Check 2 Poorer Than Check 4 Better Than Check 4 Better Than Check 5 Equivalent To Check 2 Poorer Than Check 4 Better Than Check 4 Better Than Check 5 Equivalent To Check 2 Poorer Than Check 4 Better Than Check 4 Better Than Check 4 Better Than Check 5 Equivalent To Check 2 Poorer Than Check 4 Better Than Check 4 Better Than Check 4 Better Than Check 5 Equivalent To Check 6 Equivalent To Check 6 Equivalent To Check 7 Equivalent To Check 8 Equivalent To Check 9 Poorer Than Check 1 Much Poore		4 Strong-Elastic					
1 Weak-Short or Sticky 3.7±1.0 3.4±0.5 3.9±0.9 3.7±1.3 Mixing Tolerance 5 Much More Tolerance Than Check 4 More Tolerance Than Check 2 Less Tolerance Than Check 2 Less Tolerance Than Check 2 Less Tolerance Than Check 4 Brighter Than Check 4 Brighter Than Check 3 Equivalent To Check 2 Poorer Than Check 4 Brighter Than Check 4 Brighter Than Check 2 Poorer Than Check 4 Better Than Check 5 Poorer Than Check 6 Poorer Than Check 7 Poorer Than Check 9 Poorer Than Che							
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Source of Wheat

Source - Breeding Program	Code#	<u>Identification</u>
Meridian	1	CS 3100L*
University of Minnesota	2	MN01311-A-1
North Dakota State University	3	NDSW0449
South Dakota State University	4	SD3868
Meridian	5	CS 3100Q*
Westbred	6	CA905-749
Trigen	7	06 Inc 2
AgriPro	9	00S0120-3W
North Dakota State University	10	ND901
Westbred	11	CA905-750
North Dakota State University	12	ND809
Trigen	13	06 Inc 1
Glenn Check	8	

^{*}Second year of testing in WQC trials

Field Plot Locations and Procedures

The experimental lines and check variety were grown at the following locations in the spring wheat region:

South Dakota State University, Brookings, SD – Jack Ingmanson Northwest Experiment Station, Crookston, MN – John Wiersma Agronomy Seed Farm, Casselton, ND – Tom Teigen North Central Agricultural Experiment Station, Minot, ND – Jay Fisher Williston Agricultural Experiment Station, Williston, ND

Wheat was seeded in large-scale plots of ½ acre in size to approximate commercial production. Cultural practices such as tillage and weed control common to each area were used. Consideration was also given to germination, seed size, and planting depth to provide stand uniformity. Based on soil test results from each location, nitrogen fertilizer was applied to the test plots at rates approaching higher levels than used commercially to more fully express the potential of each experimental line. Levels of phosphorus and potassium were applied in sufficient amounts so as not to be limiting factors. Each plot was individually harvested and the grain produced was thoroughly blended to obtain a uniform sample representing the entire plot.

2007 Hard Spring Wheat Production Sites

Entry #	Entry	Reference	Brookings	Casselton	Crookston	Minot	Williston
1	CS 3100L	Meridian			X	X	
2	MN01311-A-1	Un of MN		X	X		
3	NDSW0449	NDSU		X		X	X
4	SD3868	SDSU	X	X			
5	CS 3100Q	Meridian			X	X	
6	CA905-749	Westbred		X		X	
7	06 Inc 2	Trigen		X			Χ
8	Glenn	Check	X	X	X	X	Χ
9	00S0120-3W	AgriPro	X	X	X	na	
10	ND 901	NDSU		X		X	Χ
11	CA905-750	Westbred		X		X	
12	ND 809	NDSU		Χ	X	X	Χ
13	06 Inc1	Trigen		X			Х

Descriptions of 2007 Experimental Lines

CS 3100L - SWQAC 1

CS 3100L hard white spring wheat was bred and developed by New Zealand Crop and has been extensively tested in the USA by Meridian Seeds LLC. It will be released in 2007. CS 3100L has short-intermediate height and intermediate straw strength. The variety has full season maturity and good test weight with intermediate protein concentration. Suitable for milling for hard white wheat programs.

MN01311-A-1 - SWQAC 2

MN01311-A-1, pedigree 97T-1003 (Verde/Sonja)/Verde, was released as 'Tom' in 2008. Tom has medium maturity, height, and straw strength. Tom has shown consistently high grain yields, especially in northern locations, moderate leaf rust resistance, and Fusarium head blight resistance comparable to Alsen. Tom is resistant to the Ug99 race of stem rust. Tom has large kernels, above average test weight and grain protein content, and very good resistance to preharvest sprouting. The name 'Tom' was chosen to honor the contributions to the wheat industry of Tom Anderson, who passed away in 2007. Tom Anderson was a visionary leader for agriculture at the local, regional, and national levels. Tom farmed near Barnesville, MN, served as co-chair of the U.S. Wheat and Barley Scab Initiative and as a grower representative on numerous research and search committees.

NDSW0449 – SWQAC 3

NDSW0449 was selected from the cross (Ernest//ND622/Keene /3/*2//SD3310/SD3414). It is a hard red spring wheat developed primarily for its resistance to the wheat stem sawfly. It is medium-tall height, awned, and matures approximately 2 days later than Reeder. NDSW0449 is susceptible to FHB, moderately susceptible to leaf rust, and resistant to moderately resistant to stem rust. It has excellent resistance to wheat stem sawfly infestation despite exhibiting less stem-solidity compared with the variety Choteau. NDSW0449 has exhibited excellent milling and baking characteristics, with generally better than average grain protein content, higher loaf volume, and stronger mix characteristics compared with other hard red spring wheat varieties.

SD3868 – SWQAC 4

SD3868 is an F_4 derived line from the cross ND 2897/SD3479//SD3411. SD3868 was first included in our AYT trials during the 2004 growing season. During this testing period, SD3868 was consistently among those entries able to produce the most grain. Test weight, protein concentration, and heading date measures for SD3868 are approximately average when tested with other SD derived entries. It is slightly taller than Briggs, Granger, and Traverse. Our plan was to further increase seed of SD3868 during the 2008 growing season in anticipation of release as a cultivar in 2009. During the 2007 growing season, however, SD3868 was found to be very susceptible to leaf rust infection. SD3868 will not be further considered for cultivar release as it has been discarded from the program.

CS 3100Q - SWQAC 5

CS 3100Q hard white spring wheat was bred and developed by New Zealand Crop and found and has been extensively tested in the USA by Meridian Seeds LLC. It will be released in 2007. CS 3100Q is a medium-tall variety with intermediate straw strength. The variety has early-medium maturity and good test weight with good protein concentration. Suitable for milling for hard white wheat programs.

CA905-749 - SWQAC 6

CA905-749 is a good standing, medium tall, medium maturity wheat that can achieve high yield of high test weight, medium protein grain in the hard red spring wheat growing areas of the Northern Great Plains. It has spikes that are oblong and tan in color. CA905-749 is resistant to stem rust and moderately resistant to moderately susceptible to leaf rust and foliar disease (tan spot and Septoria tritici). It is moderately resistant to Fusarium head blight, and is moderately susceptible to susceptible to stripe rust. Quality of CA905-749 is good based on the test weight, protein and flour SDS sedimentation values.

06 Inc 2 – SWQAC 7

06 Inc 2 is a semi-dwarf hard red spring wheat adapted to the Northern Plains. It heads early but is somewhat later maturing than entry 06 Inc 1. It is derived from a cross between the Brazilian variety BRS 177 and the Argentine variety Prointa Granar. Its yield and test weight are quite similar to those of Freyr, but it is somewhat shorter with better straw strength. It also has excellent protein content. We had hoped it would be a niche variety, but in light of the performance of newer varieties, our assessment today is that its future usefulness is as a parent.

00S0120-3W - SWQAC 9

00S0120-3W is a hard white spring wheat developed by AgriPro. It was derived from the cross "Sunelg/Russ/3/Russ//China Scab #22/N92-0248". It has exhibited good yield and test weight over three years of testing in the Northern Plains. Yields have been competitive with the majority of hard red spring varieties. It is a semidwarf with medium-early heading. It is moderately susceptible to leaf rust and it has average tolerance to other foliar diseases. Its rating for FHB is moderately resistant, similar to Freyr. Limited quantities of Foundation seed was produced in 2007. Our release decision is pending industry interest.

ND901 - SWQAC 10

ND901CF is the first NDSU HRSW 'Clearfield" herbicide resistant line. ND901CF is selected from the first HRSW generation with the Clearfield resistance based on 2 genes system. It includes in its parentage "Grandin" and "Kulm", two NDSU HRSW adapted to Western regions of ND. It is recommended for rain-fed and dryland regions. Grain yield of ND901CF is higher than AP 603CL, the HRSW Clearfield resistant released by AgriPro in 2006. Average yield of ND 901 across ND in 2006 and 2007 was comparable to Alsen and slightly lower than Reeder. ND901CF is a semi dwarf (similar to Glenn and AP 603CL) with medium earliness (similar to Parshall and Steele-ND) but earlier than

AP603CL. It has a very good straw strength. ND901CF has excellent milling and baking properties in general. It is a very high protein (very close to Dapps) cultivar with good test weight (similar to Alsen). ND901CF is in general resistant to medium resistant to leaf rust; medium susceptible to medium resistant to stem rust and susceptible to scab. That is why ND 901CL is recommended for Western regions where diseases may not be so critical under normal growing conditions.

CA905-750 - SWQAC 11

CA905-750 is a good standing, medium tall, medium maturity wheat that can achieve high yield of high test weight, medium protein grain in the hard red spring wheat growing areas of the Northern Great Plains. It has spikes that are tapering in shape and tan in color. CA905-750 is resistant to stem rust and moderately resistant to moderately susceptible to leaf rust and foliar disease (tan spot, and Septoria tritici). It is moderately resistant to Fusarium head blight, and is moderately susceptible to susceptible to stripe rust. Quality of CA905-750 is good based on the test weight, protein, and flour SDS sedimentation values

ND809 - SWQAC 12

ND 809 was selected from a 3-way cross involving an NDSU experimental line (ND 2831) that is derived from "Sumai 3", a major source of resistance to Fusarium head blight (FHB) or scab. Therefore, ND 809 has medium resistance to FHB. It has very good resistance to other foliar diseases including stem and leaf rusts. It is an early line with medium straw strength and semi-dwarf. ND 809 has high grain yield comparable to Faller but superior to Alsen, Reeder, and Parshall. It has high test weight and grain protein content compared to Alsen. ND 809 has high protein and very good milling and baking characteristics.

06 Inc 1 – SWQAC 13

06 Inc 1 is an attractive, medium-early maturing, awned, semi-dwarf hard red spring wheat with hollow stem internodes from Trigen Seed LLC adapted to the Northern Plains. It is derived from a cross between the Brazilian variety Ruby and the Argentine variety Prointa Real. Especially notable are its above average yield potential, strong straw and good tolerance to Fusarium Head Blight. For these reasons, we have called it Hat Trick and will release it in 2008. It also has a broad array of resistance to leaf rust and about an average response to leaf diseases. Powdery Mildew has been observed on Hat Trick, but ordinarily, this disease causes little damage in the Northern Plains. Test weight and protein values are good, as is its falling number with timely harvest. It also has the same set of high molecular weight glutenin sub units as are found in Alsen, Glenn, Howard, and other high quality bread varieties. Depending on growing conditions, there are about 12,000 to 14,000 kernels per pound.

Grain Cleaning and Milling Procedures

Wheat (approximately 6 bu/variety) was cleaned in a Carter-Day Bulldog seed cleaner that was equipped with two rotating indent cylinders (#24 – coarse and #16 fine), a sizer cylinder (#5), vibrator, and air aspiration. Sixty pounds of cleaned wheat was tempered to 16.5% moisture basis and conditioned 16-18 hours. The tempered wheat

was milled in a Buhler Experimental Mill, MLU, at an average feed rate of 175 g/min. Flour from three break (B1, B2, B3) and three reduction (R1, R2, R3) sections of the mill were combined to straight grade flour. Prior to milling the experimental lines, the Buhler Experimental Mill was adjusted to optimize mill extraction of the Glenn check that was grown at Crookston, which represented the highest quality check among the 5 growing locations. No further adjustments were made to optimize mill extraction for the experimental lines, thus, flour extraction of individual samples was relative to flour extraction of the Crookston Glenn check.

Methods of Analyses

Wheat Market Value Score

Test Weight (AACC Method 55-10)

Wheat and Flour Protein (AACC46-30 – combustion method)

Wheat and Flour Ash (AACC Method 08-01)

Kernel Size (Sieving according to USDA/ARS WQL)

Wheat Falling Number (Perten Falling Number Instrument)

Vitreous Kernel Content (DHV analyses by FGIS grain testing service)

Flour Color (Minolta Colorimeter L* b* values)

Flour Extraction: % Total Product Basis (TPB), % Tempered Wheat Basis (TWB), and Pounds Patent Flour Per Bushel Wheat.

Farinograph

Water Absorption (Brabender Computerized Farinograph w/50 g bowl) – 14%mb and 500 bu.

Arrival Time: time required for the top of the curve to reach the 500 BU line after addition of water.

Peak Time: time between addition of water and development of the maximum consistency of the dough

Stability: difference in time between the point at which the top of the curve first intercepts the 500 BU line (arrival time) and the point at which the top of the curve leaves the 500 BU line (departure time).

Mechanical Tolerance Index (MTI): difference in BU between the top of the curve at the peak and the top of the curve measured 5 min after the peak is reached.

Time to Breakdown (TTB): time from the start of mixing to the time at which consistency has decreased 30 BU from the peak point.

Bake Cooperator Results/Evaluation:

Bake Absorption (Actual - %)
Loaf Volume (% of Check)
Mixing Requirement
Dough Characteristics
Mixing Tolerance
Internal Crumb Color
Internal Crumb Grain and Texture

Bake Cooperator Quality Assessment:

Protein Content Milling Baking Overall Comparison

C-Cell (Images – Pages 69-103)

Cell

This displays the individual cells within the product slice. Each one is colour coded according to its prominence. This is based on a combination of its area and depth. Small cells are colored in dark blue and larger ones are shown in lighter shades of blue, green and yellow. Cells large enough to be classified as holes are outlined in red.

Volume contours

This displays contours of the coarseness of the texture, based on volume measurements of cells. The coarsest 50% of the slice area is shaded in red and the finest regions are shaded in blue. The range of values displayed in this image is used for calculation of cell size measurements on the Coarse/Fine Clustering. The shape of the red and blue regions is used for calculation of the Circularity measurement.

Brightness correction

This image shows a view of the slice, corrected to remove any differences in overall product reflectance. The image is shaded in brown to avoid confusion with the raw image.

Elongation

This image represents the orientation and elongation of cells. Short red lines are drawn parallel to the long axis of cells at each point in the slice. The length of the lines indicates the degree of elongation of the cells. For regions that show some curvature, green lines are also drawn that point towards the centre of the curvature. The length of the green lines indicates the degree of local curvature. Yellow lines are also shown that divide regions of the slice that show curvature in opposite directions. Regions of the slice that show a complete 360 degree rotational structure are shaded in bright blue. Those that show a rotational structure that turns through 180 degrees are shaded in pale blue. Those showing no full rotation are left in grey.

Shape

This shows a view of the slice with particular shape features shown in color. A white rectangular box is shown enclosing the slice. The corners of the slice are also identified

and are connected by white lines to each other and to the centre of the slice. Concavities in the sides of the slice are shown in blue for the bottom, green for the sides and red for the top. Where oven spring is detected, this is shown in yellow. The points used for measuring the slice height are marked as yellow points on the top edge. High points are identified at either side of the top edge and the lowest point between them is also marked. Where there is no clear dip in the top, some of these points may coincide and it may not be possible to see three distinct points.

Raw Image

A raw image of a slice selected for analysis

Test Bake Procedures

Samples of flour were shipped to the following cooperators for evaluation of baking properties. The flour had been uniformly malted to a falling number of approximately 250 sec. Bleach was not added to the flour. Each cooperator test baked the flour according to their standard method using the straight dough, sponge and dough, or other test bake method. Cooperator data were returned to the WQL for compilation of results.

Bake Cooperators

ADM Milling
Bay State Milling Company
Cargill (Horizon Milling)
Cereal Food Processors, Inc.
General Mills, Inc
North Dakota State Mill
North Dakota State University
Department of Cereal Science
USDA/ARS Grain Marketing &
Production Research Center
USDA/ARS Hard Red Spring & Durum
Wheat Quality Laboratory

Olathe, Kansas Winona, Minnesota Minnetonka, Minnesota Wichita, Kansas Minneapolis, Minnesota Grand Forks, North Dakota

Fargo, North Dakota

Manhattan, Kansas

Fargo, North Dakota

2007 Spring Wheat Field Production Data

		Locati	on				
Variable	Brookings	Casselton	Crookston	Minot	Williston		
Planting Date	4/27/2007	5/11/2007	4/27/2007	5/24/2007	5/10/2007		
Harvest Date	8/1/	8/16/2007	8/9/2007	8/17/2007	8/16/2007		
Fertilizer (lbs/A)							
N	60	82@NH2+25@20-20-10	42 + 138	200lbs urea	50 plus 140 lb Urea		
Р	100	25	14	30lbs 11-52-0	17		
K	180	10	242		29.5		
Herbicide/rate							
Broadleaf	Bronate Advanced/0.8 Pt	Widematch 1 pt+ MCPA@ .5pt	Bronate/1 pt/A Widematch, 2/10oz Harmon /10pt		/10pt Puma-1pt Bronate Adv		
Grass	Puma/10 oz.	Puma/ 1/2 pt.	Puma/1/2 pt/A	.66 pt Puma	0		
Fungicide	Quilt/7 oz.	*	*	*	0		
* = No Application		•		•			
		Climatolog	ic Data				
Month	Average Temperature (°F)/Precipitation (in)						
	Brookings	Casselton	Crookston	Minot	Williston		
April	/	49.6/2.57	41.6/1.33		44.4 - 0.26		
May	60/1.85	59.0/4.03	58.1/3.72	67.1 deg /8.07"rain	58.6 - 4.95		
June	69/2.99	68.7/4.01	68.1/4.86	77.0 deg / 2.16"rain	67.4 - 2.64		
July	72/0.14	72.9/1.13	71.5/1.88	87.2 deg /1.10"rain	77.2 - 1.13		
August	/	66.6/1.63	65.8/3.05	80.4 deg /.33"rain	71.5 - 0.45		
* = Not Applicable							
		Yield D	ata				
Cultivar		Yield (bu/acre) / Test Wt / 9	% Moisture/(heading date	e - Casselton site only)			
	Brookings	Casselton	Crookston ¹	Minot	Williston		
SWQAC 1	*	*	40.4/57/13.4	41#	*		
SWQAC 2	*	50.04/57/12.1/7-2	64.7/59/13.2	*	*		
SWQAC 3	*	47.89/57/11.1/7-3	*	96#	**		
SWQAC 4	37.1/59.3/11.2	67.91/58/11.1/6-28	*	*	*		
SWQAC 5	*	*	43.8/59/13.1	144#	*		
SWQAC 6	*	61.97/62/13.8/7-1	*	120#	*		
SWQAC 7	*	58.52/58/11.6/6-28	*	*	**		
SWQAC 8	33.9/62.3/12.2	62.6/57/11.6/6-28	63.5/62/13.0	118#	**		
SWQAC 9	34.6/60.2/11.5	54.19/57/11.5/7-1	48.2/60/13.2	122#	*		
SWQAC 10	*	58.53/56/11.6/6-28	*	146#	**		
SWQAC 11	*	60.18/60/13.8/7-1	*	138#	*		
SWQAC 12	*	66.26/60/12.3/6-28	42.6/58/15.8	168#	**		
SWQAC 13	*	56.43/59/11.0/7-3	*	*	**		

^{*} Not Increased at this site ** = No data available 1 = adjusted to 13.5% moisture (Crookston).

Production as related to climate, disease, and field conditions

At Planting	Planting conditions were less than ideal because of excess moisture. Poor stands.	Seeded into an ideal seedbed 3 days after a 2.5 inch rain	The 2007 Spring Wheat Quality Trial was planted into some of our lighter soil. The soil conditions were moist at planting and made for an excellent seed bed.	Extremely wet conditions at time of planting. Stand establishment was slow but the plants compensated. This lead to shallow root development.	Marginal moisture. Showers started after planting.
During Growth	No moisture after June 18th. Good early moisture.	Moist early season, then drier than normal July and Aug.	The spring wheat trial continued to develop with no apparent problems observed.	Adequate rainfall early in the season. From June through the rest of the summer the rainfall was significantly less.	Avove average rainfall. Good growing conditions. Headed between 7/4 to 7/9.
At Flowering	Dry-No heavy dews or lengthly wet periods.	No rain until 0.33 inch at completion of flowering, relatively disease free conditions.	The plants progressed rapidly and the environment at flowering and previous to that time was not conducive to the developement of leaf diseases or Fusarium head blight.	Dry warm conditions caused a severe decrease in yield. Grain fill in the head was poor which caused overall poor yields in the Minot area.	Subsoil moisture adequate temperature was hot. No further rain this growing season.
During Maturation	Dry-Moderate drought 3rd driest July on record.	Unremarkable	During this time period it remained dry which was a benefit for good quality and color.	Warm and dry.	Very hot - dry conditions
At Harvest	DRY No rain for seven weeks	Unremarkable	There were no apparent problems at harvest and the trial was taken off in a timely manner to ensure the best possible grain quality.	Warm and dry. Good harvest conditions.	Hot and dry. Great harvest conditions.

Wheat Marketing Score

The development of a Wheat Marketing Score (WMS) or Export Marketing Score was discussed at the Hard Spring Wheat planning meeting in March, 2004. The purpose for developing a WMS was to facilitate a better understanding of wheat quality in marketing systems. Two WMS methods were developed and tested. For each method, the quality variables of TW, 1000 KWT, FN, Wheat Protein, and Wheat Ash were incorporated for calculating the WMS. Method #1 was developed on a scale of 0 to 6 where the Glenn Check was evaluated along with the experimental lines for each growing location. Method #2 was developed on a scale of 0 to 10 where the experimental lines were evaluated against the Glenn Check for each growing location.

Wheat Marketing Score – Method #1

WHEAT MARKETING SCORE or EXPORT MARKETING SCORE

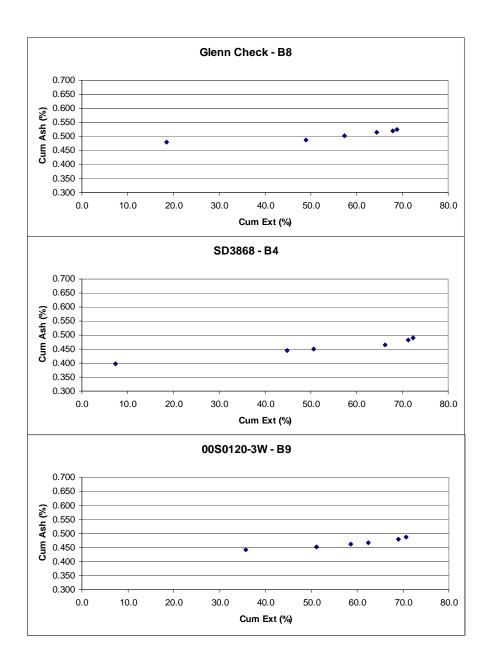
				-		
	_	Test Weight	1000 KWT	Falling Number	Wheat Protein	Wheat Ash
Variation(+/-) from Target Value:	CORE-	1lb/bu	3 g up, 4 g down	25 sec	1.0%	0.1%
Ü	6	63 lb/bu	39 g	425 sec	16.5%	1.35%
	5	62 lb/bu	36 g	400 sec	15.5%	1.45%
	4	61 lb/bu	33g	375 sec	14.5%	1.55%
TARGET VALUE:	[3	60 lb/bu	30 g	350 sec	13.5%	1.65%
	2	59 lb/bu	26 g	325 sec	12.5%	1.75%
	1	58 lb/bu	22 g	300 sec	11.5%	1.85%
	0	57 lb/bu	18 g	275 sec	10.5%	1.95%

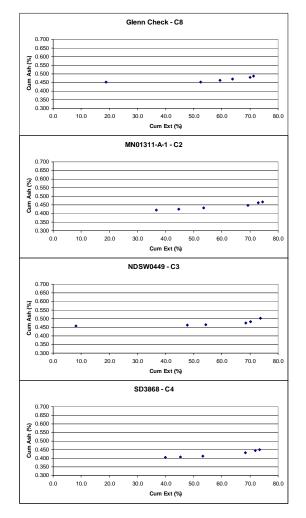
Wheat Marketing Score = (TW*2) + (1000KWT*2) + (FN*2) + (Protein*3) + (Ash*1)/10

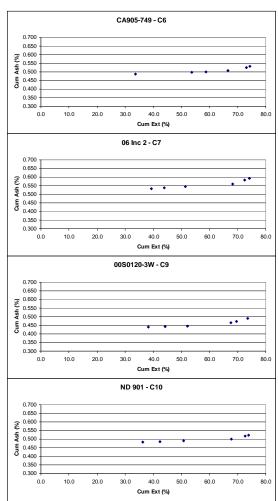
Wheat Marketing Score – Method #2

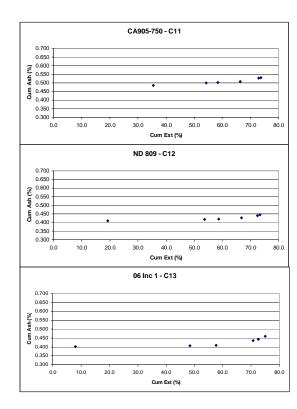
Rules for Score Calculation

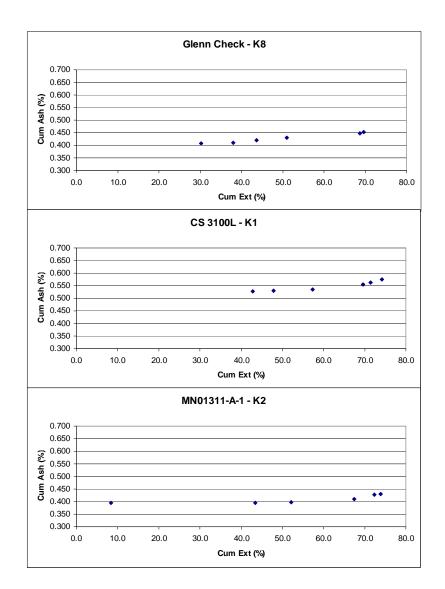
Weight of each Factor Protein Test Weight (TW) Falling Number Thousand Kernel Weight (TKW) Wheat Ash	Weighting 0.3 0.2 0.2 0.2 0.2 0.1					
		Entered Line minus	s Check value equ	als difference (D	iff)	
Component Score	0	2	4	6	8	
Protein	Diff<-2.5	-2.501 <diff<-2< td=""><td>-2.001<diff<-1.5< td=""><td>-1.501<diff<-1< td=""><td>-1.001<diff<-0.5< td=""><td></td></diff<-0.5<></td></diff<-1<></td></diff<-1.5<></td></diff<-2<>	-2.001 <diff<-1.5< td=""><td>-1.501<diff<-1< td=""><td>-1.001<diff<-0.5< td=""><td></td></diff<-0.5<></td></diff<-1<></td></diff<-1.5<>	-1.501 <diff<-1< td=""><td>-1.001<diff<-0.5< td=""><td></td></diff<-0.5<></td></diff<-1<>	-1.001 <diff<-0.5< td=""><td></td></diff<-0.5<>	
TestWeight	Diff<-5	-5.001 <diff<-4< td=""><td>-4.001<diff<-3< td=""><td>-3.001<diff<-2< td=""><td>-2.001<diff<-1< td=""><td></td></diff<-1<></td></diff<-2<></td></diff<-3<></td></diff<-4<>	-4.001 <diff<-3< td=""><td>-3.001<diff<-2< td=""><td>-2.001<diff<-1< td=""><td></td></diff<-1<></td></diff<-2<></td></diff<-3<>	-3.001 <diff<-2< td=""><td>-2.001<diff<-1< td=""><td></td></diff<-1<></td></diff<-2<>	-2.001 <diff<-1< td=""><td></td></diff<-1<>	
Falling Number	Diff<-125	-125.01 <diff<-100< td=""><td>-100.01<diff<75< td=""><td>-75.01<diff<50< td=""><td>-50.01<diff<-25< td=""><td></td></diff<-25<></td></diff<50<></td></diff<75<></td></diff<-100<>	-100.01 <diff<75< td=""><td>-75.01<diff<50< td=""><td>-50.01<diff<-25< td=""><td></td></diff<-25<></td></diff<50<></td></diff<75<>	-75.01 <diff<50< td=""><td>-50.01<diff<-25< td=""><td></td></diff<-25<></td></diff<50<>	-50.01 <diff<-25< td=""><td></td></diff<-25<>	
Thousand Kernel Weight	Diff<-10	-10.001 <diff<-8< td=""><td>-8.001<diff<-6< td=""><td>-6.001<diff<-4< td=""><td>-4.001<diff<-2< td=""><td></td></diff<-2<></td></diff<-4<></td></diff<-6<></td></diff<-8<>	-8.001 <diff<-6< td=""><td>-6.001<diff<-4< td=""><td>-4.001<diff<-2< td=""><td></td></diff<-2<></td></diff<-4<></td></diff<-6<>	-6.001 <diff<-4< td=""><td>-4.001<diff<-2< td=""><td></td></diff<-2<></td></diff<-4<>	-4.001 <diff<-2< td=""><td></td></diff<-2<>	
Wheat Ash						
Component Score	10	8	6	4	2	0
Protein		i 2 <diff<3.001< td=""><td>3<diff<4.001< td=""><td>4<diff<5.001< td=""><td>5<diff<6.001< td=""><td>Diff>6</td></diff<6.001<></td></diff<5.001<></td></diff<4.001<></td></diff<3.001<>	3 <diff<4.001< td=""><td>4<diff<5.001< td=""><td>5<diff<6.001< td=""><td>Diff>6</td></diff<6.001<></td></diff<5.001<></td></diff<4.001<>	4 <diff<5.001< td=""><td>5<diff<6.001< td=""><td>Diff>6</td></diff<6.001<></td></diff<5.001<>	5 <diff<6.001< td=""><td>Diff>6</td></diff<6.001<>	Diff>6
TestWeight		i 2 <diff<4.001< td=""><td>4<diff<6.001< td=""><td>6<diff<8.001< td=""><td>8<diff<10.001< td=""><td>Diff>10</td></diff<10.001<></td></diff<8.001<></td></diff<6.001<></td></diff<4.001<>	4 <diff<6.001< td=""><td>6<diff<8.001< td=""><td>8<diff<10.001< td=""><td>Diff>10</td></diff<10.001<></td></diff<8.001<></td></diff<6.001<>	6 <diff<8.001< td=""><td>8<diff<10.001< td=""><td>Diff>10</td></diff<10.001<></td></diff<8.001<>	8 <diff<10.001< td=""><td>Diff>10</td></diff<10.001<>	Diff>10
Falling Number	-1.001 <d< td=""><td></td><td>4\Diii\0.001</td><td>0.001</td><td>0\Diii\10.001</td><td>DIII > 10</td></d<>		4\Diii\0.001	0.001	0\Diii\10.001	DIII > 10
Thousand Kernel Weight		i 4 <diff<8.001< td=""><td>8<diff<12.001< td=""><td>12<diff<16.001< td=""><td>16<diff<20.001< td=""><td>Diff>20</td></diff<20.001<></td></diff<16.001<></td></diff<12.001<></td></diff<8.001<>	8 <diff<12.001< td=""><td>12<diff<16.001< td=""><td>16<diff<20.001< td=""><td>Diff>20</td></diff<20.001<></td></diff<16.001<></td></diff<12.001<>	12 <diff<16.001< td=""><td>16<diff<20.001< td=""><td>Diff>20</td></diff<20.001<></td></diff<16.001<>	16 <diff<20.001< td=""><td>Diff>20</td></diff<20.001<>	Diff>20
Wheat Ash		10.1 <diff<0.201< td=""><td>0.2<diff<0.301< td=""><td>0.3<diff<0.401< td=""><td>0.4<diff<0.501< td=""><td>Diff>0.5</td></diff<0.501<></td></diff<0.401<></td></diff<0.301<></td></diff<0.201<>	0.2 <diff<0.301< td=""><td>0.3<diff<0.401< td=""><td>0.4<diff<0.501< td=""><td>Diff>0.5</td></diff<0.501<></td></diff<0.401<></td></diff<0.301<>	0.3 <diff<0.401< td=""><td>0.4<diff<0.501< td=""><td>Diff>0.5</td></diff<0.501<></td></diff<0.401<>	0.4 <diff<0.501< td=""><td>Diff>0.5</td></diff<0.501<>	Diff>0.5

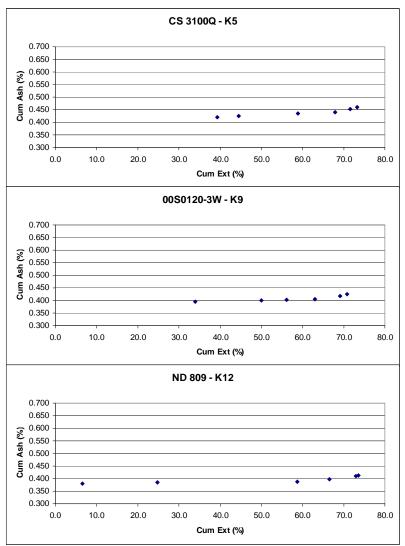


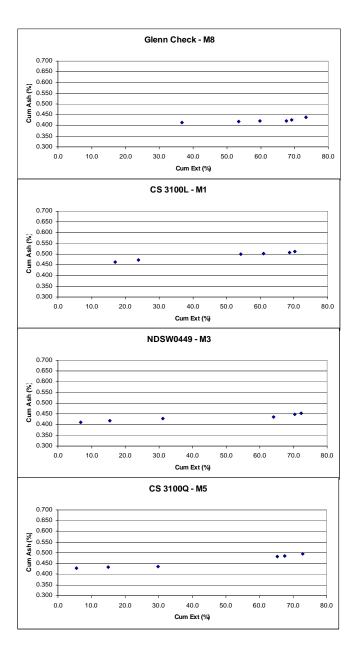


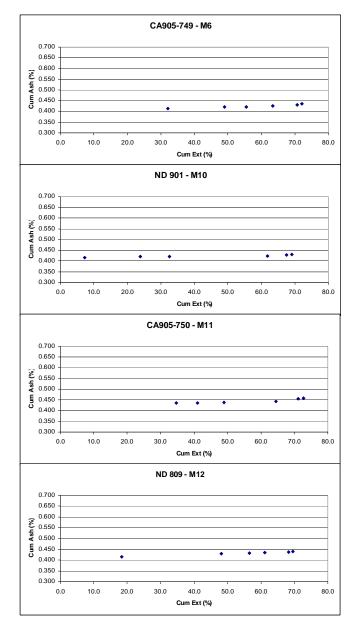


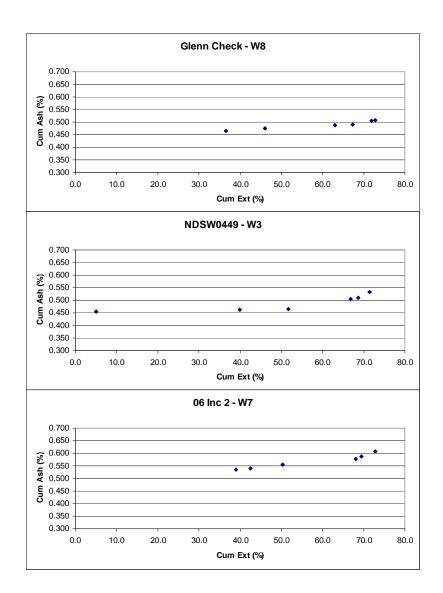


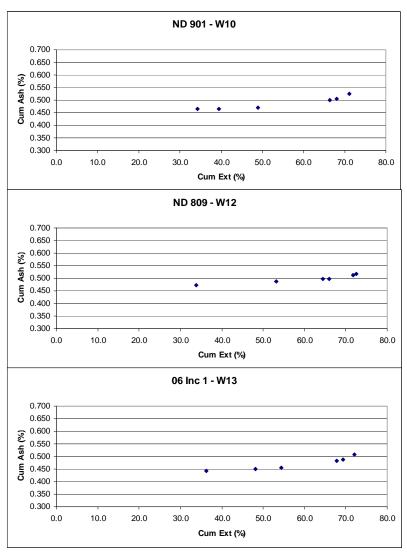




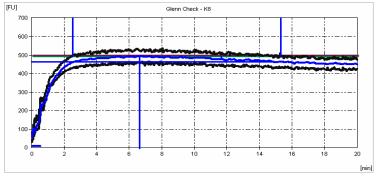




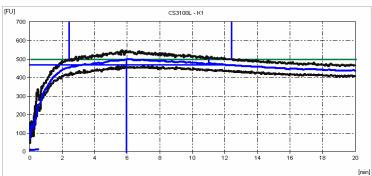




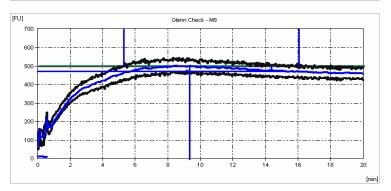
		Farinograph						
	•	Water Abs	Water Abs		-			
		500 bu	14%mb	Arrival Time	Peak Time	Dough Stability	MTI	TTB
Cultivar	Location	%	%	min	min	min	bu	min
Glenn	B8	64.5	62.8	1.6	2.9	5.0	39	6.6
SD3868	B4	61.0	59.2	1.6	2.5	5.6	32	7.2
00S0120-3W	В9	64.4	62.5	1.3	2.7	4.5	48	5.8
Glenn	C8	65.3	64.0	1.8	3.8	8.5	22	9.4
MN01311-A-1	C2	61.9	60.9	2.8	5.8	8.4	26	11.3
NDSW0449	C3	62.0	60.3	3.0	6.8	8.7	34	11.6
SD3868	C4	61.7	60.8	2.4	5.5	8.5	29	11.0
CA905-749	C6	65.2	63.9	2.5	6.7	9.4	30	11.6
06 Inc 2	C7	61.5	60.2	2.5	8.0	15.6	19	15.4
00S0120-3W	C9	64.2	62.5	2.6	6.7	8.7	34	10.6
ND 901	C10	66.8	65.3	5.0	8.9	9.9	25	15.1
CA905-750	C11	66.7	65.1	3.2	7.5	10.2	27	12.3
ND 809	C12	67.0	66.1	3.2	5.7	11.7	16	15.0
06 Inc1	C13	65.1	60.2	2.6	7.8	9.8	34	12.1
Clamp	K8	67.5	66.1	2.3	6.7	12.8	17	14.9
Glenn		58.8			6.0	10.0		
CS 3100L	K1 K2	66.5	57.4 65.5	2.2 4.1	8.0	8.2	23 34	12.0 12.3
MN01311-A-1	K2 K5	60.8	59.8	2.1	6.9	0.2 10.6	34 26	12.3
CS 3100Q 00S0120-3W	K9	67.6	65.9	1.9	3.7	6.9	29	8.3
ND 809	K12	67.0	65.5	2.2	4.2	11.9	7	14.1
ND 007	K1Z	07.0	03.3	2.2	4.2	11.7	,	14.1
Glenn	M8	65.1	63.0	5.2	9.4	10.8	26	15.3
CS 3100L	M1	63.3	61.6	4.7	8.5	10.8	23	14.3
NDSW0449	M3	63.8	62.0	4.5	7.5	7.2	39	11.5
CS 3100Q	M5	63.1	61.0	4.1	7.3	9.1	29	12.5
CA905-749	M6	64.1	62.3	5.2	9.3	10.4	27	14.4
ND 901	M10	64.6	62.2	5.7	10.5	11.1	28	16.1
CA905-750	M11	65.0	62.8	4.5	8.3	8.8	33	12.6
ND 809	M12	66.3	64.9	5.0	8.9	11.3	21	15.9
Glenn	W8	67.1	65.2	5.2	9.4	14.8	16	18.3
NDSW0449	W3	66.5	64.9	5.1	8.7	14.2	17	18.3
06 Inc 2	W7	65.4	63.1	5.4	10.8	14.5	7	20.0
ND 901	W10	68.6	67.0	5.3	8.2	14.7	13	20.0
ND 809	W12	69.1	67.3	6.0	10.7	11.6	24	17.8
06 Inc1	W13	67.0	65.3	4.3	7.9	12.5	18	17.9



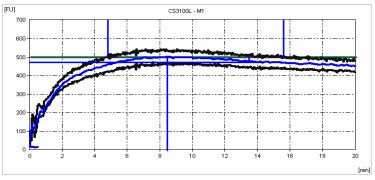
Glenn Check K8



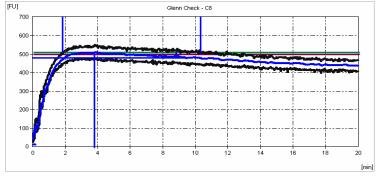
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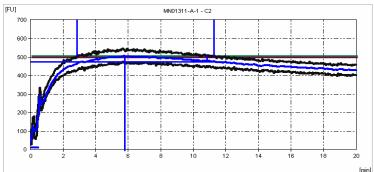
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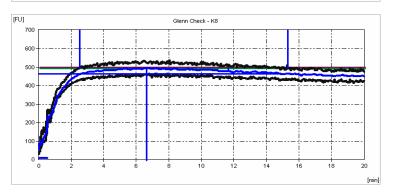
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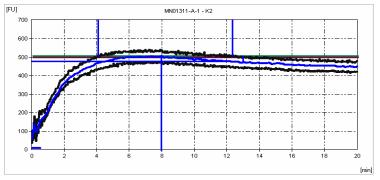
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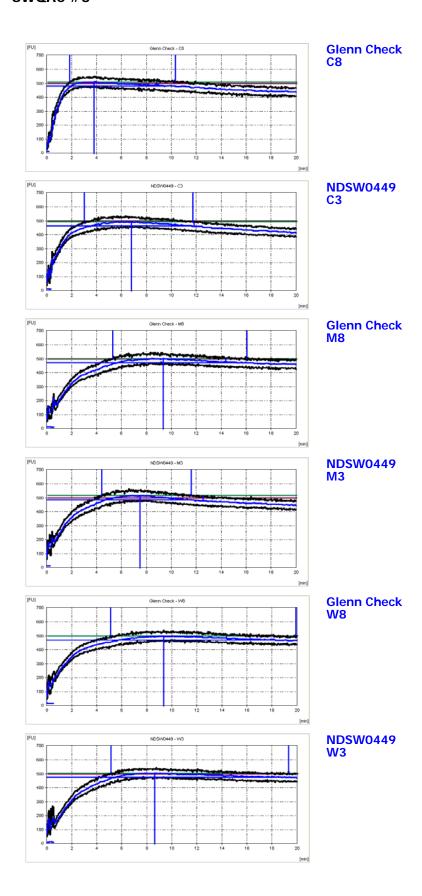
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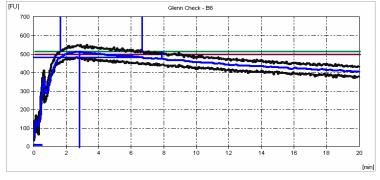


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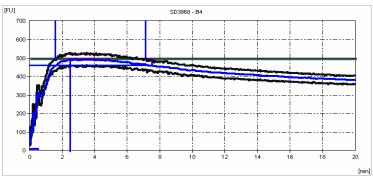


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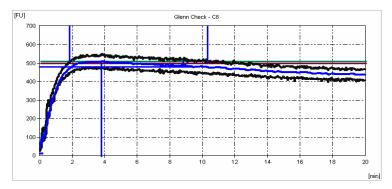




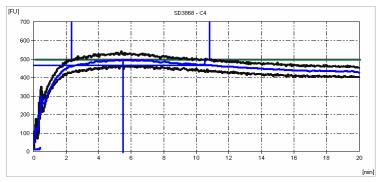
Glenn Check B8



SD3868 B4

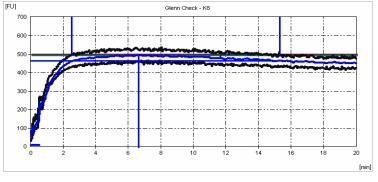


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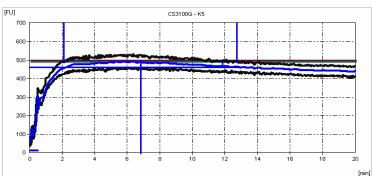


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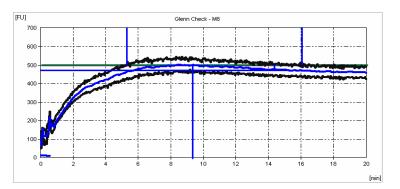
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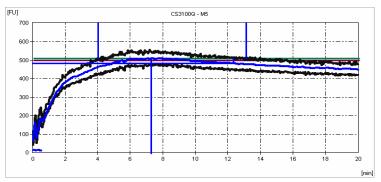
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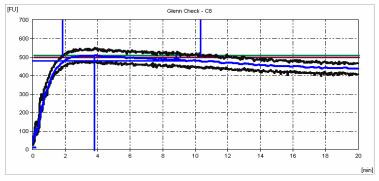
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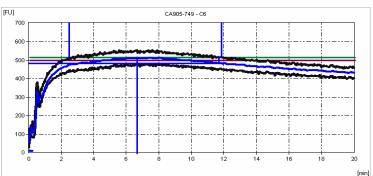
Glenn Check M8



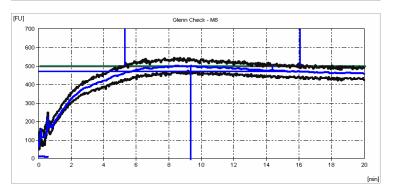
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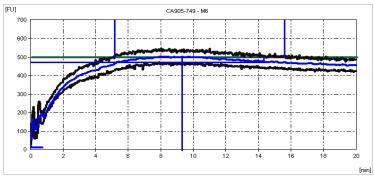
Glenn Check C8



CA905-749 C6

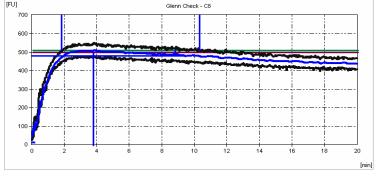


Glenn Check M8

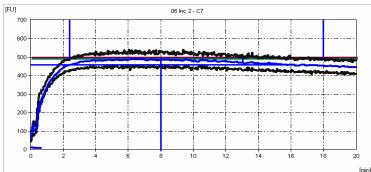


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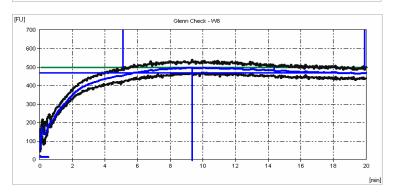
06 Inc 2 SWQAC #7



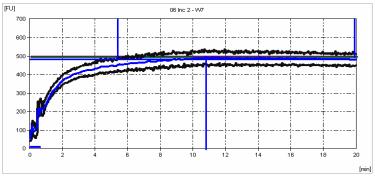
Glenn Check C8



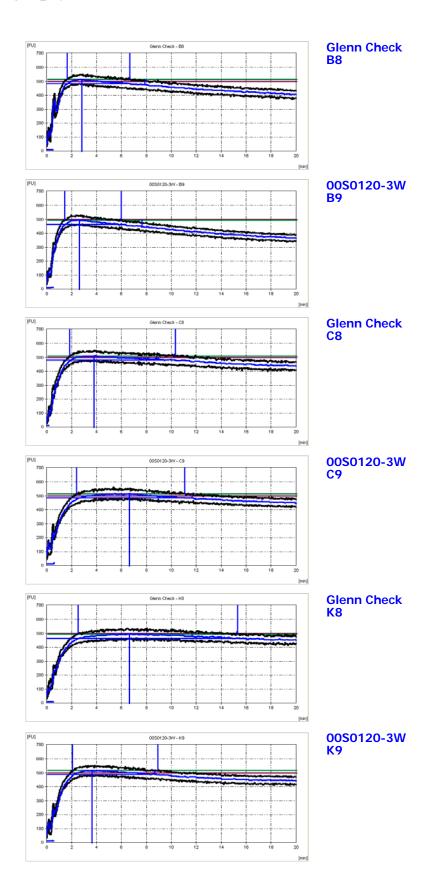
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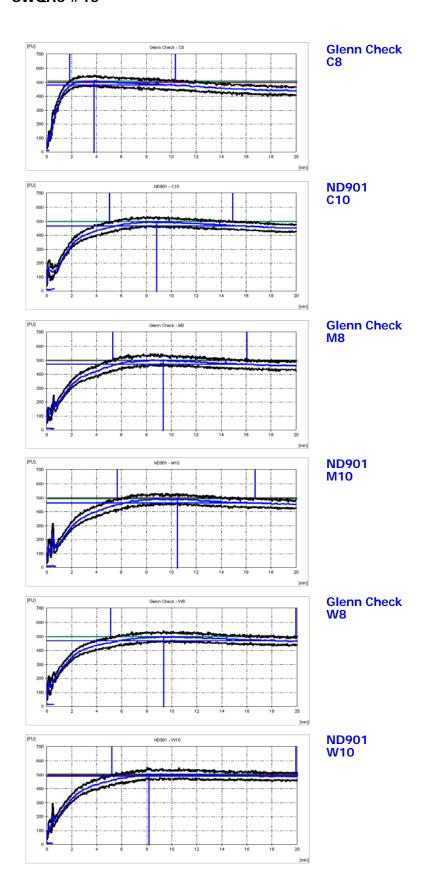


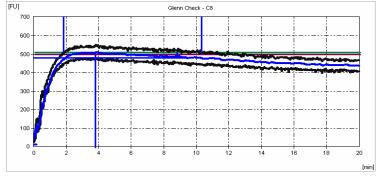
Glenn Check W8



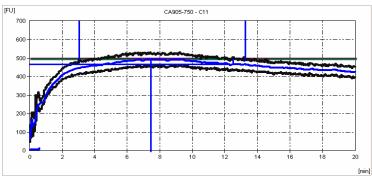
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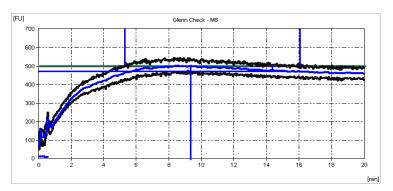




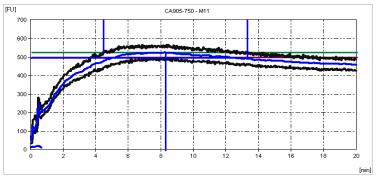
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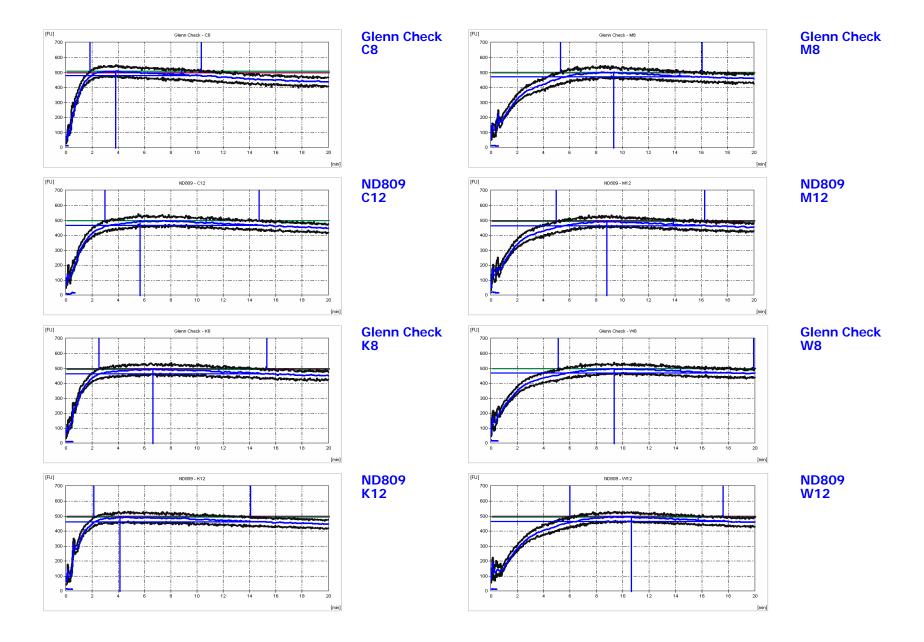
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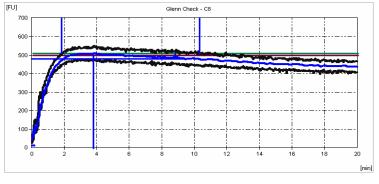
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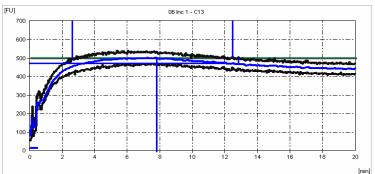
CA905-750 M11



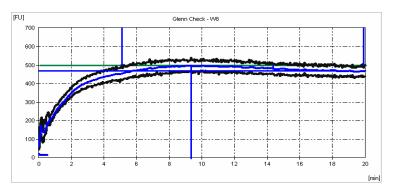
06 Inc 1 SWQAC #13



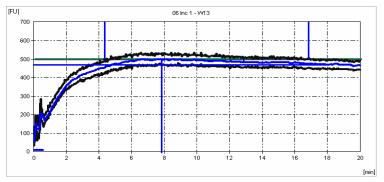
Glenn Check C8



06 Inc 1 C13



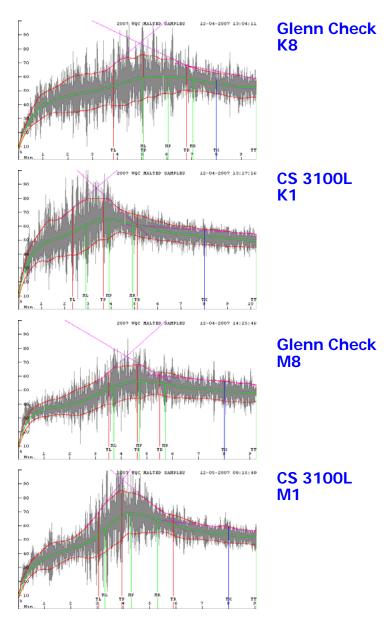
Glenn Check W8



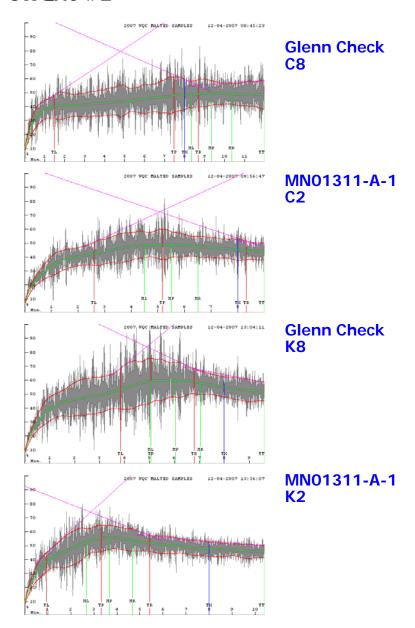
06 Inc 1 W13

		Mixograph						
		ENVELOPE PEAK TIME	ENVELOPE PEAK VALUE	ENVELOPE PEAK WIDTH	MID LINE PEAK TIME	MID LINE PEAK VALUE	MID LINE PEAK WIDTH	MID LINE PEAK INTEGRAL
Cultivar	Location	MINUTES	%	%	MINUTES	%	%	%TQ*MIN.
Glenn	B-8	5.1	76.5	41.1	6.1	56.1	23.7	281.8
SD3868	B-4	4.4	54.0	14.1	4.5	46.6	13.9	180.1
00S0120-3W	B-9	5.0	55.3	19.7	5.1	45.3	19.6	209.1
Glenn	C-8	7.5	61.3	25.5	9.4	49.4	17.4	399.5
MN01311-A-1	C-2	5.2	60.0	21.9	5.5	49.0	18.3	222.3
NDSW0449	C-3	5.7	60.4	23.1	5.3	48.8	19.3	210.0
SD3868	C-4	4.8	58.9	19.9	5.1	48.9	17.0	203.6
CA905-749	C-6	4.5	76.8	32.1	5.0	61.0	28.3	228.2
06 Inc 2	C-7	9.1	62.9	26.1	10.0	50.4	22.6	399.0
00S0120-3W	C-9	5.5	60.2	23.0	6.4	48.9	16.0	267.1
ND 901	C-10	3.4	67.9	25.2	4.2	56.9	19.7	185.3
CA905-750	C-11	5.1	65.6	21.0	5.2	54.7	20.2	225.4
ND 809	C-12	3.3	74.2	28.2	4.1	61.6	22.1	195.5
06 Inc1	C-13	4.8	63.4	20.8	5.0	52.9	18.5	206.9
Glenn	K-8	5.1	75.7	32.0	6.1	60.0	24.7	290.4
CS 3100L	K-0 K-1	3.7	80.1	29.7	3.9	64.9	27.8	198.9
MN01311-A-1	K-1	3.7	64.6	18.7	3.7	55.8	17.1	159.5
CS 3100Q	K-2	5.0	53.3	20.6	6.2	44.4	14.4	243.7
00S0120-3W	K-9	4.2	59.3	21.7	4.8	48.6	15.6	209.5
ND 809	K-12	5.6	60.7	22.2	6.1	49.9	16.1	269.9
			40.0	04.0	. 7	F.(0	04.0	100 7
Glenn	M-8	4.6	68.2	24.3	4.7	56.0	24.2	198.7
CS 3100L	M-1	3.9	85.3	35.2	4.3	68.6	28.9	195.9
NDSW0449	M-3	3.7	79.0	28.5	3.9	64.2	27.0	173.5
CS 3100Q	M-5	4.0	73.0	28.3	4.2	59.2	24.9	183.3
CA905-749	M-6	4.1	72.9	29.7	4.8	61.1	20.0	204.3
ND 901	M-10	3.9	75.9	27.2	4.0	62.1	26.7	173.1
CA905-750	M-11	3.3	88.5	37.6	3.7	70.3	28.7	179.0
ND 809	M-12	3.5	85.2	32.8	3.8	70.1	28.9	182.4
Glenn	W-8	4.8	71.3	26.4	5.1	58.0	24.0	217.3
NDSW0449	W-3	4.8	60.7	17.3	4.5	51.8	15.4	176.3
06 Inc 2	W-7	8.5	64.5	27.5	10.1	53.3	18.9	393.9
ND 901	W-10	4.1	68.8	25.1	5.1	56.7	20.3	227.7
ND 809	W-12	3.8	80.7	30.4	3.9	65.8	30.0	180.2
06 Inc1	W-13	2.7	66.8	30.3	3.7	55.7	16.7	160.8

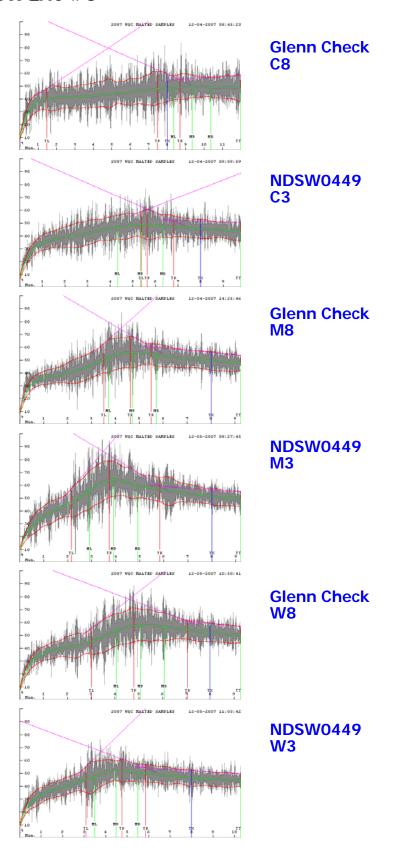
CS3100OL SWQAC #1



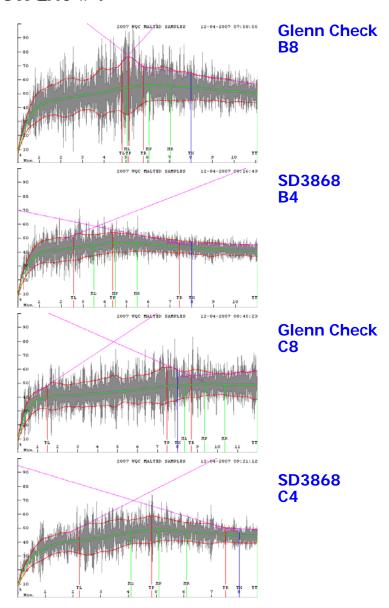
MN01311-A-1 SWQAC #2



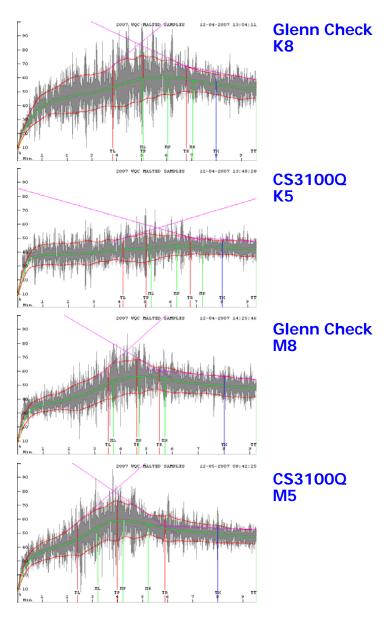
NDSW0449 SWQAC #3



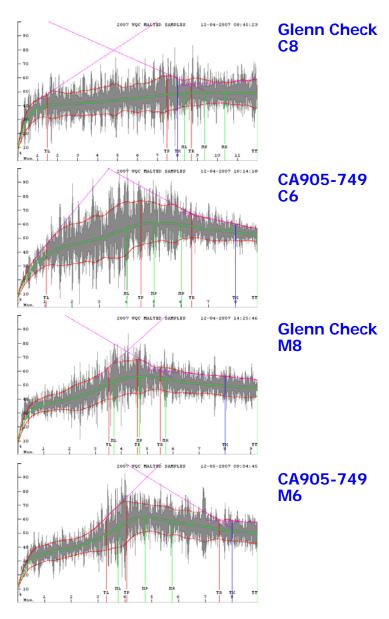
SD3868 SWQAC #4



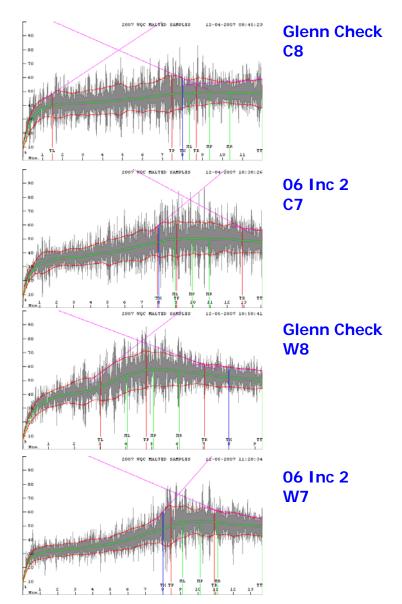
CS3100Q SWQAC #5



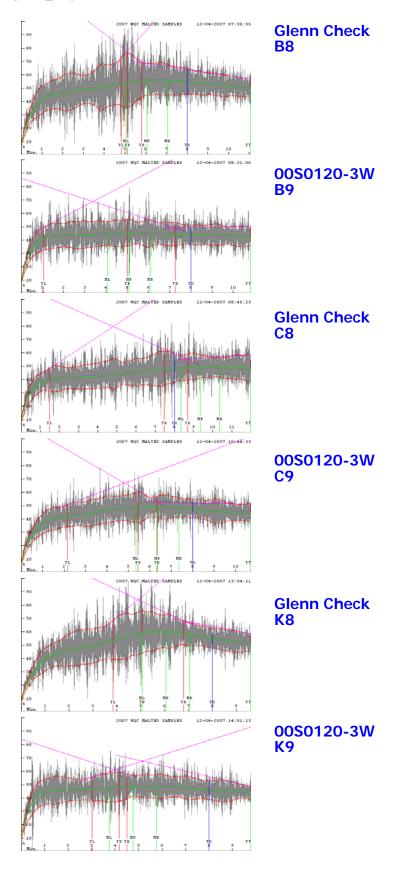
CA905-749 SWQAC #6



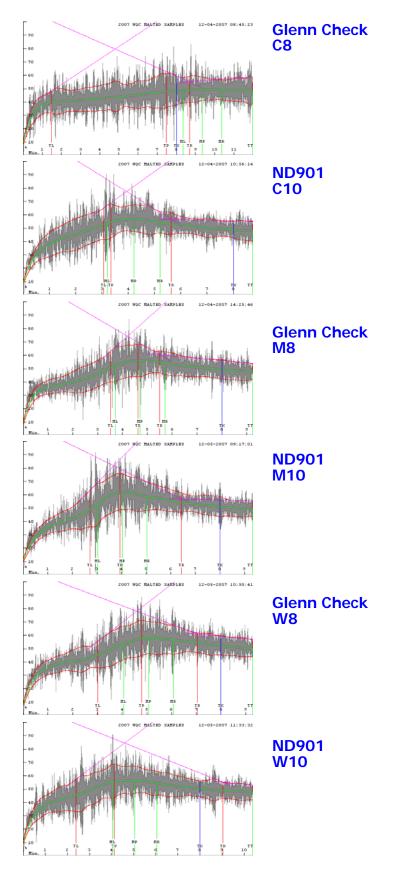
06 Inc 2 SWQAC #7



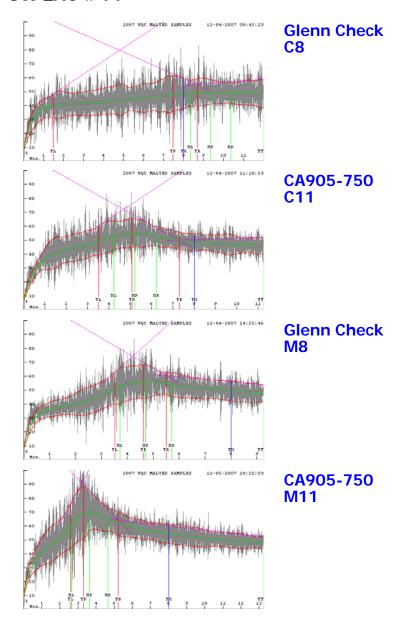
00S0120-3W SWQAC #9

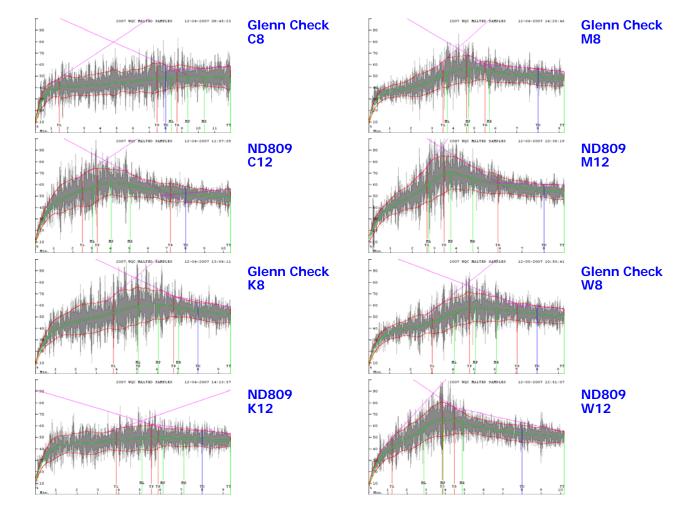


ND901 SWQAC #10

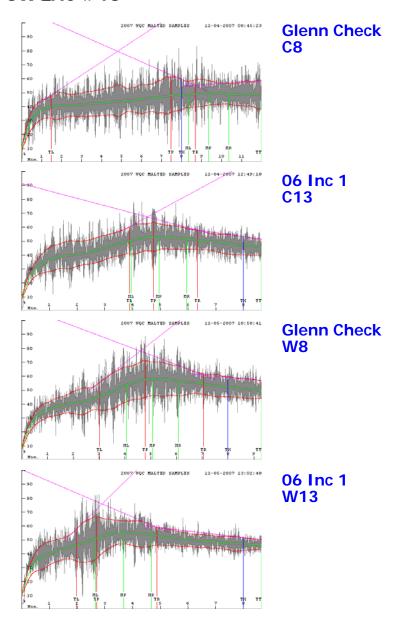


CA905-750 SWQAC #11





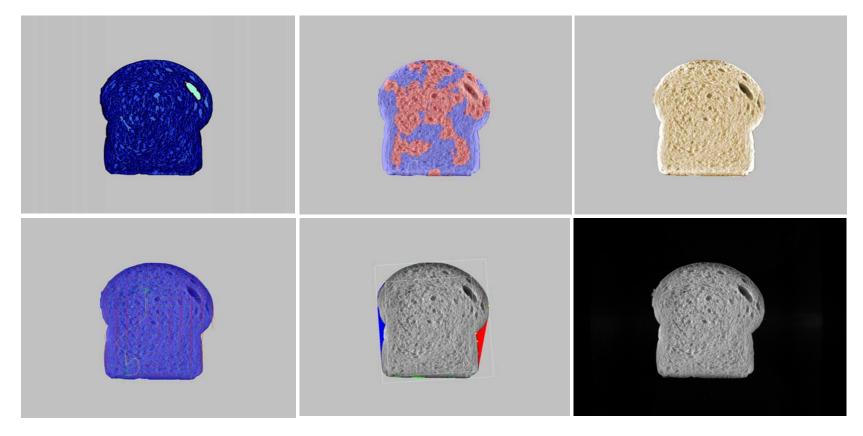
06 Inc 1 SWQAC #13



		Slice_Area	Wrapper_Length	Slice_Brightness
Cultivar	ID	Pixel Units	Pixel Units	0-240 Gray Scale
Glenn	B8	269611	1941	141.5
SD3868	B4	248768	1829	147.7
00S0120-3W	B9	268728	1928	149.3
Glenn	C8	280551	1997	140.4
MN01311-A-1	C2	278120	1986	146.3
NDSW0449	C3	272417	1950	141.6
SD3868	C4	291689	2040	143.8
CA905-749	C6	277279	1975	140.3
06 Inc 2	C7	260401	1906	142.5
00S0120-3W	C9	304327	2086	142.0
ND 901	C10	303407	2073	135.5
CA905-750	C11	284418	2025	141.0
ND 809	C12	313851	2144	137.5
06 Inc1	C13	297051	2063	141.1
Glenn	K8	306444	2106	140.4
CS 3100L	K1	246752	1849	143.0
MN01311-A-1	K2	292343	2028	145.5
CS 3100Q	K5	272207	1949	149.1
00S0120-3W	К9	294345	2066	144.4
ND 809	K12	285774	2026	142.5
Glenn	M8	281630	2016	137.5
CS 3100L	М1	312306	2129	141.4
NDSW0449	М3	305678	2083	142.8
CS 3100Q	M5	309482	2087	143.7
CA905-749	М6	312358	2103	147.7
ND 901	M10	343688	2212	141.1
CA905-750	M11	326374	2153	139.0
ND 809	M12	328745	2178	142.4
Glenn	W8	309279	2131	136.4
NDSW0449	W3	332160	2165	129.5
06 Inc 2	W7	194230	1593	139.6
ND 901	W10	363551	2257	132.7
ND 809	W12	365699	2294	123.1
06 Inc1	W13	338022	2199	130.4

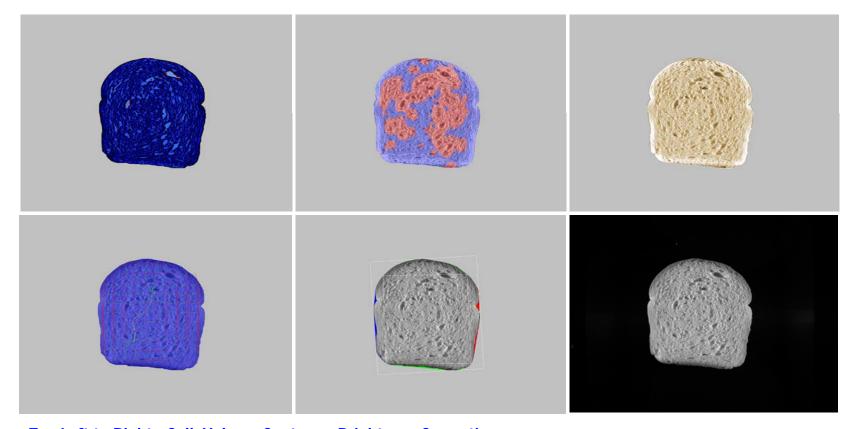
The following C-Cell images depict bake test results at the USDA/ARS Wheat Quality Laboratory using a straight dough method, 100 g flour. Because of differences in baking methods, these results may vary among cooperating laboratories.

Glenn Check - B8



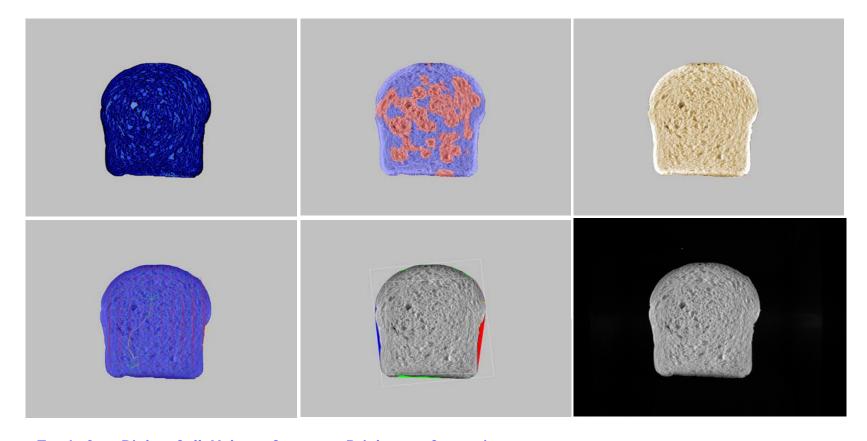
Top Left to Right: Cell, Volume Contours, Brightness Correction Bottom Left to Right: Elongation, Shape, Raw Image

SD3868 - B4 71



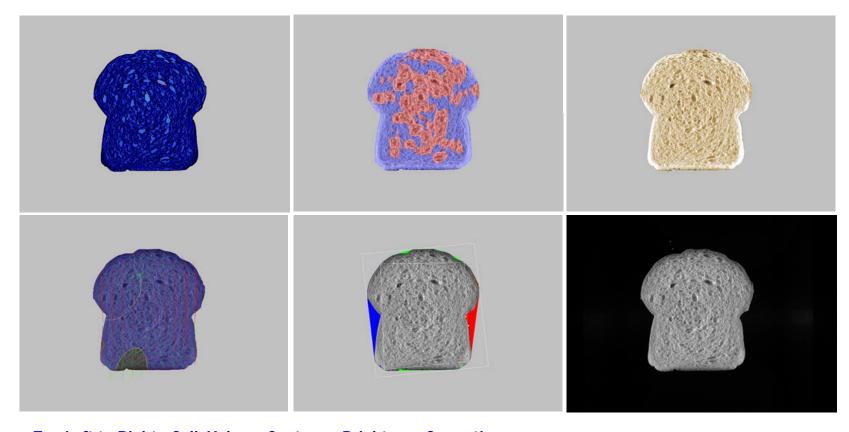
Top Left to Right: Cell, Volume Contours, Brightness Correction Bottom Left to Right: Elongation, Shape, Raw Image

00S0120-3W - B9 72



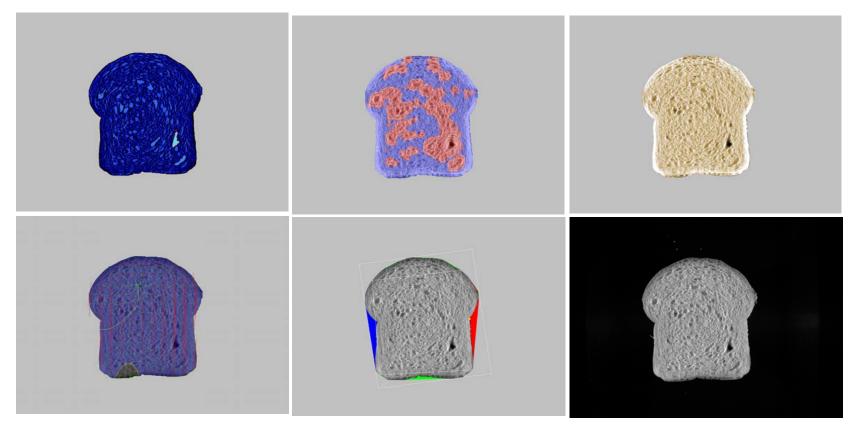
Top Left to Right: Cell, Volume Contours, Brightness Correction Bottom Left to Right: Elongation, Shape, Raw Image

Glenn Check - C8



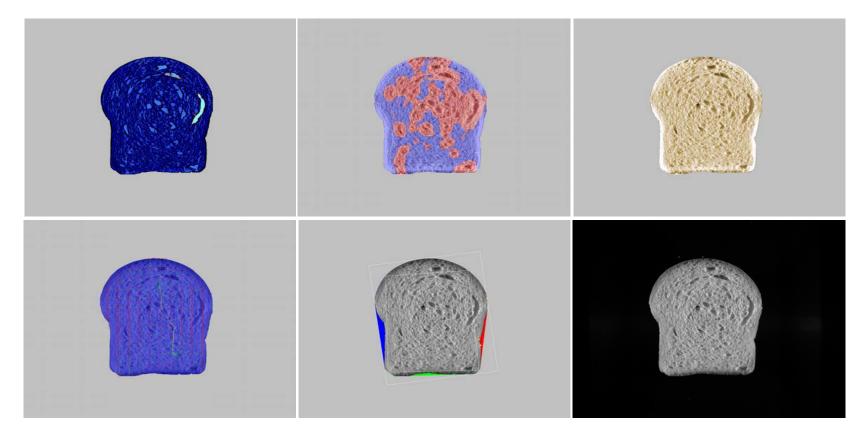
Top Left to Right: Cell, Volume Contours, Brightness Correction Bottom Left to Right: Elongation, Shape, Raw Image

MN01311-A-1 - C2 74



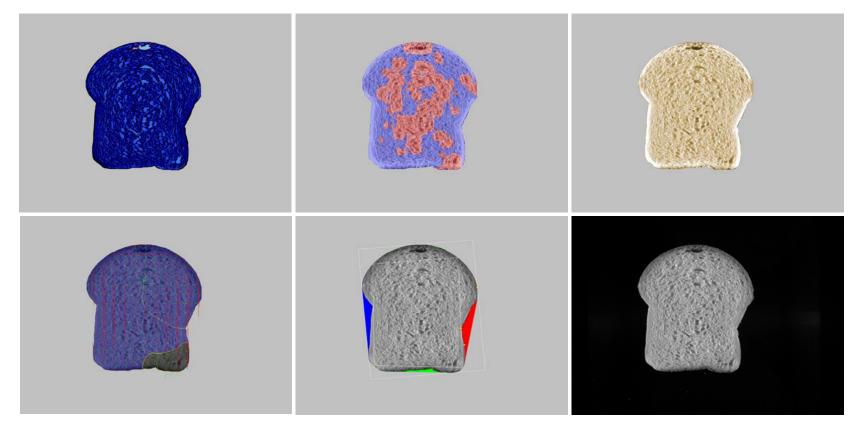
Top Left to Right: Cell, Volume Contours, Brightness Correction Bottom Left to Right: Elongation, Shape, Raw Image

NDSW0449 - C3 75



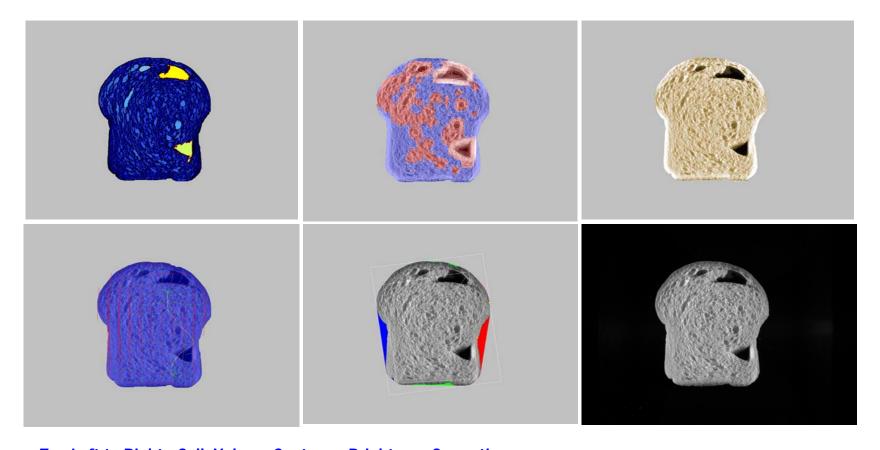
Top Left to Right: Cell, Volume Contours, Brightness Correction Bottom Left to Right: Elongation, Shape, Raw Image

SD3868 - C4 76



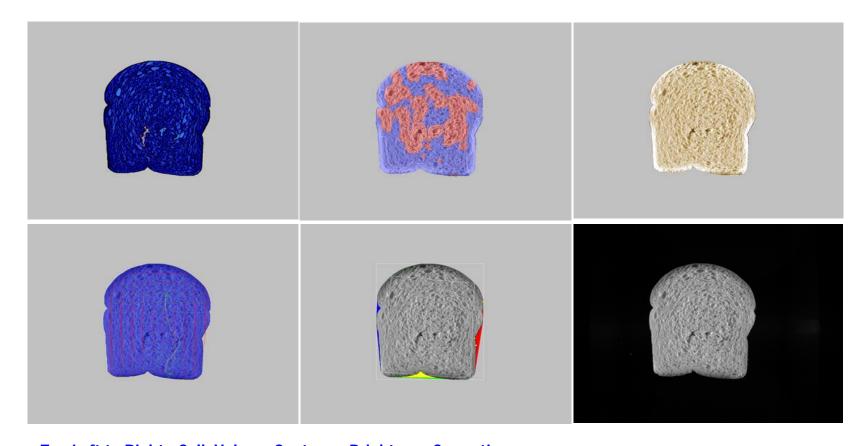
Top Left to Right: Cell, Volume Contours, Brightness Correction Bottom Left to Right: Elongation, Shape, Raw Image

CA905-749 - C6 77



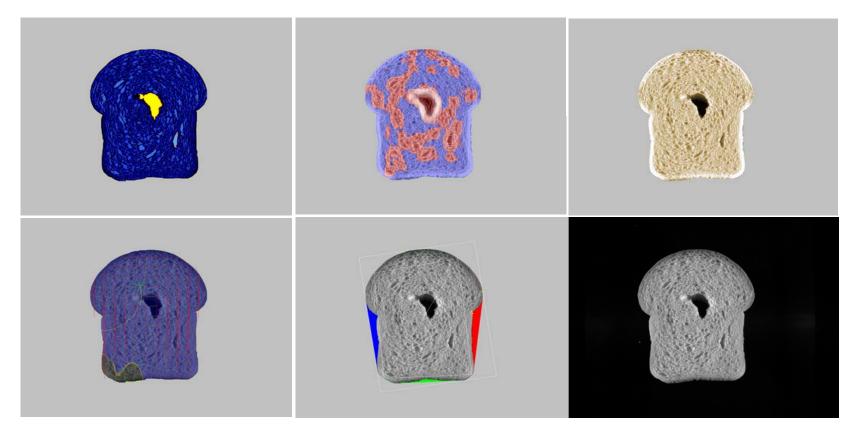
Top Left to Right: Cell, Volume Contours, Brightness Correction Bottom Left to Right: Elongation, Shape, Raw Image

06 Inc 2 - C7



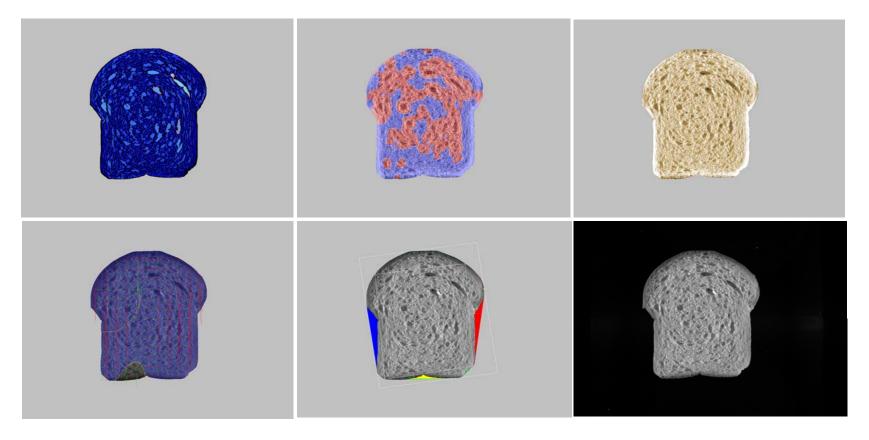
Top Left to Right: Cell, Volume Contours, Brightness Correction Bottom Left to Right: Elongation, Shape, Raw Image

00120-3W - C9 79



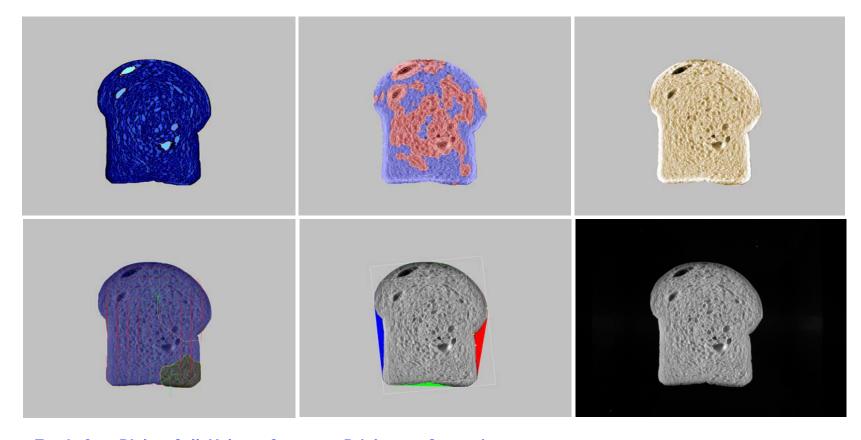
Top Left to Right: Cell, Volume Contours, Brightness Correction Bottom Left to Right: Elongation, Shape, Raw Image

ND901 - C10



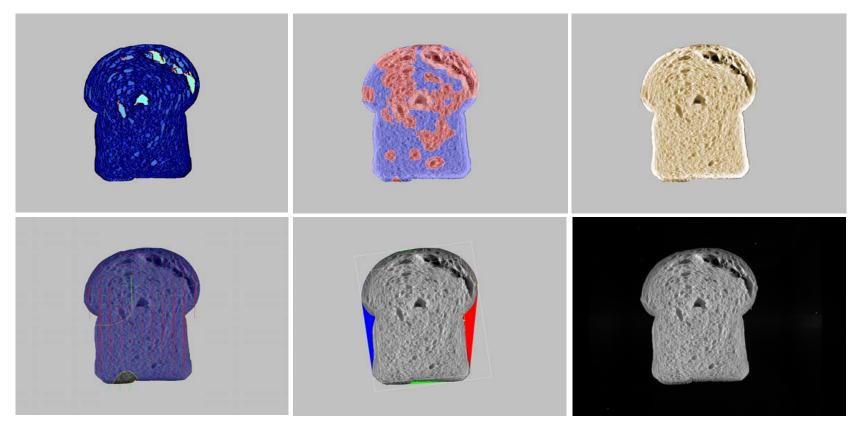
Top Left to Right: Cell, Volume Contours, Brightness Correction Bottom Left to Right: Elongation, Shape, Raw Image

CA905-750 - C11 81



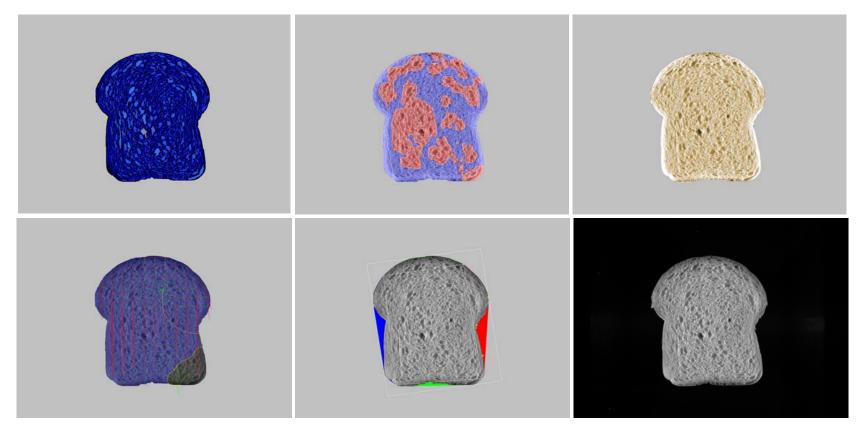
Top Left to Right: Cell, Volume Contours, Brightness Correction Bottom Left to Right: Elongation, Shape, Raw Image

ND809 - C12



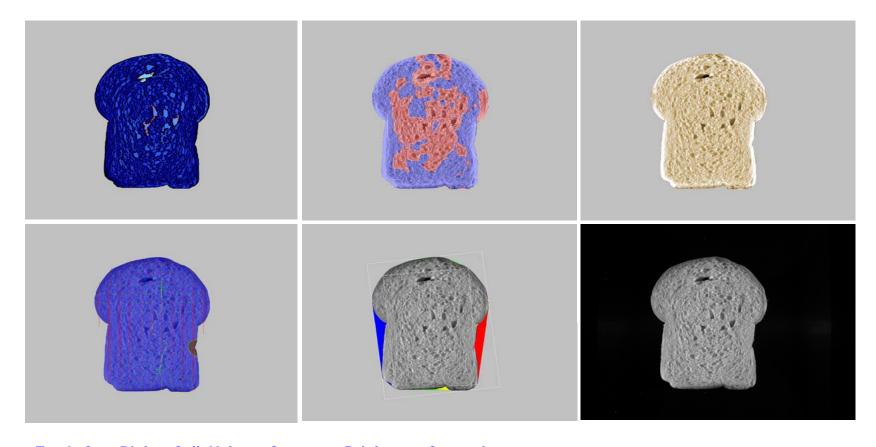
Top Left to Right: Cell, Volume Contours, Brightness Correction Bottom Left to Right: Elongation, Shape, Raw Image

06 Inc 1 - C13



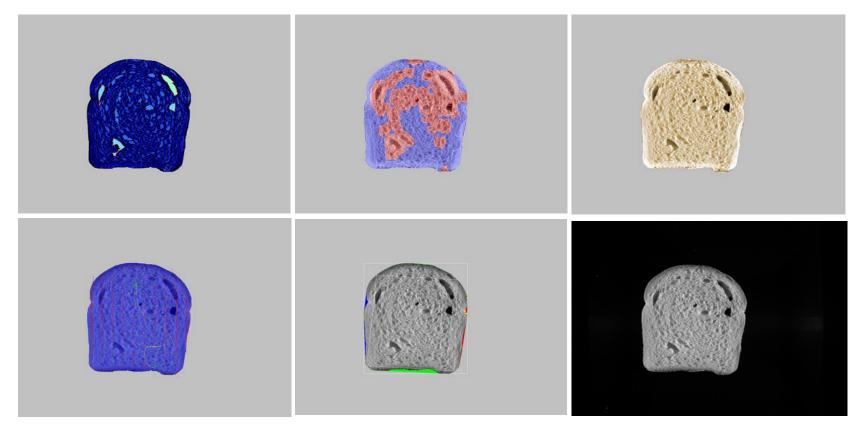
Top Left to Right: Cell, Volume Contours, Brightness Correction Bottom Left to Right: Elongation, Shape, Raw Image

Glenn Check - K8



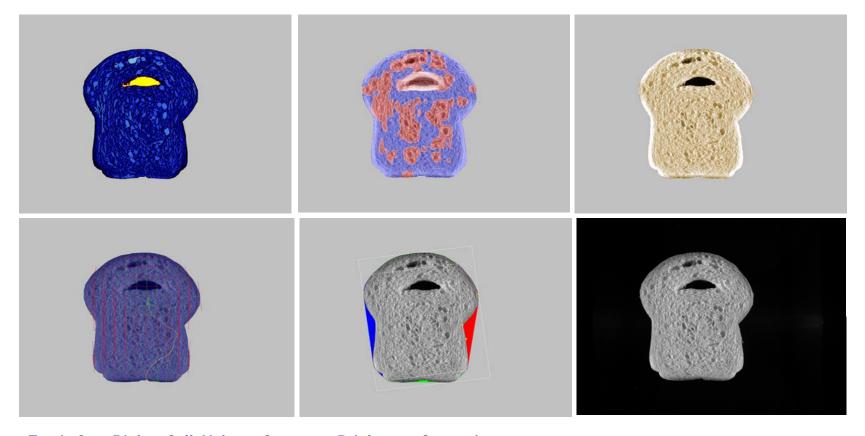
Top Left to Right: Cell, Volume Contours, Brightness Correction Bottom Left to Right: Elongation, Shape, Raw Image

CS 3100L - K1



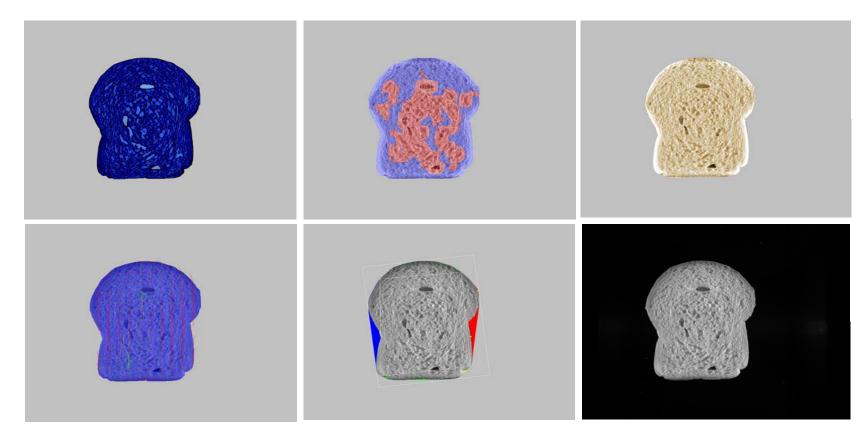
Top Left to Right: Cell, Volume Contours, Brightness Correction Bottom Left to Right: Elongation, Shape, Raw Image

MN01311-A-1 - K2



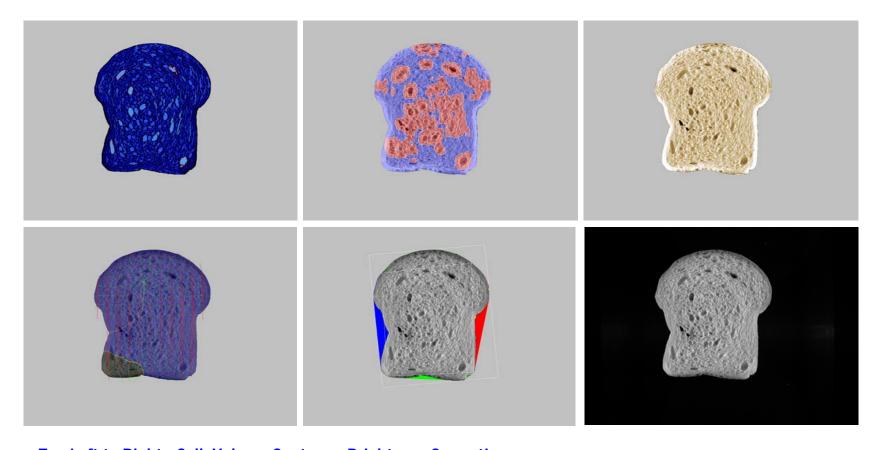
Top Left to Right: Cell, Volume Contours, Brightness Correction Bottom Left to Right: Elongation, Shape, Raw Image

CS 3100Q - K5



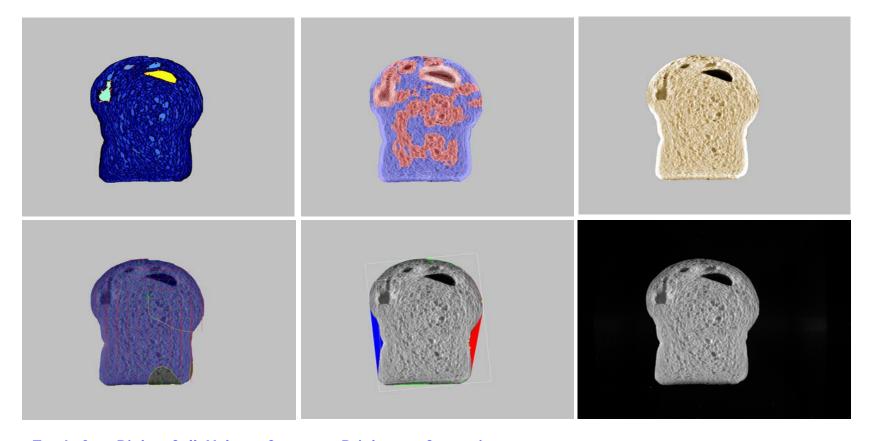
Top Left to Right: Cell, Volume Contours, Brightness Correction Bottom Left to Right: Elongation, Shape, Raw Image

00S0120-3W - K9



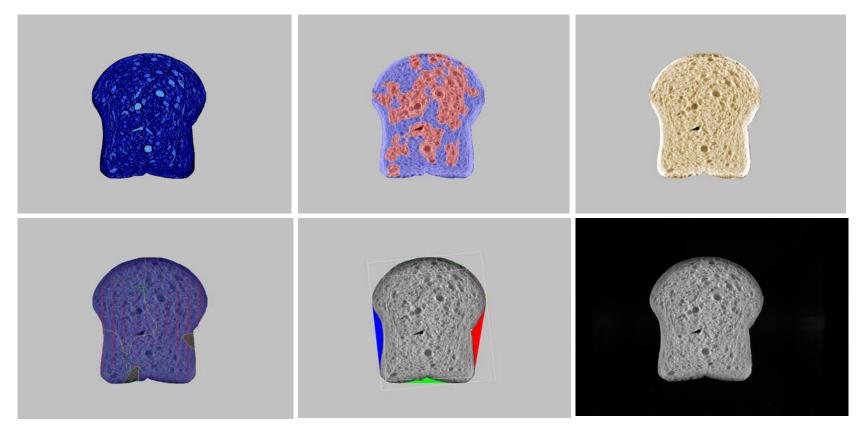
Top Left to Right: Cell, Volume Contours, Brightness Correction Bottom Left to Right: Elongation, Shape, Raw Image

ND809 - K12



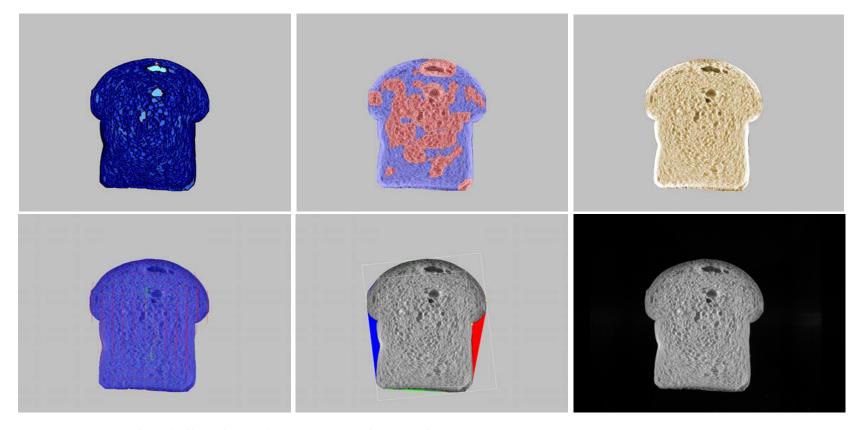
Top Left to Right: Cell, Volume Contours, Brightness Correction Bottom Left to Right: Elongation, Shape, Raw Image

Glenn Check - M8



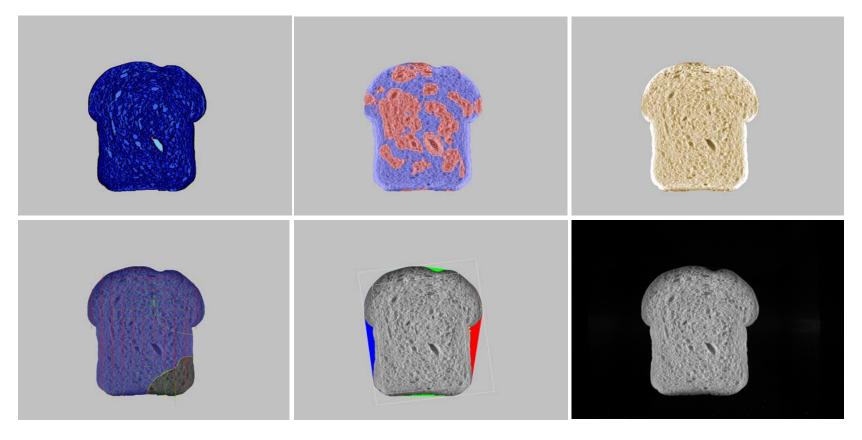
Top Left to Right: Cell, Volume Contours, Brightness Correction Bottom Left to Right: Elongation, Shape, Raw Image

CS 3100L - M1 91



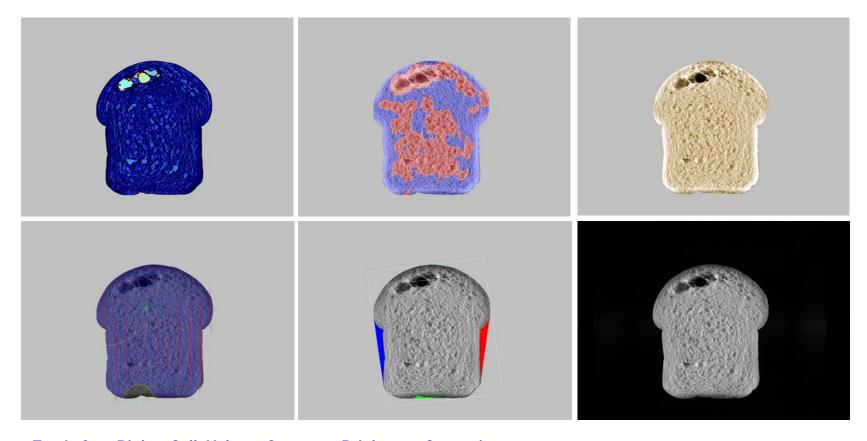
Top Left to Right: Cell, Volume Contours, Brightness Correction Bottom Left to Right: Elongation, Shape, Raw Image

NDSW0449 - M3



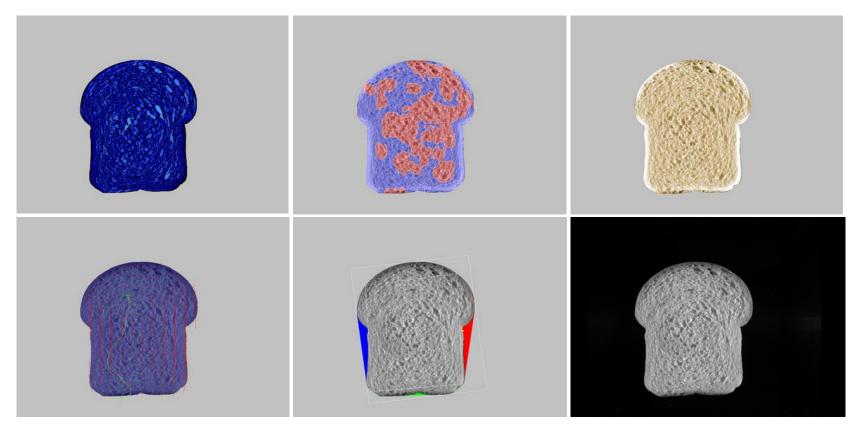
Top Left to Right: Cell, Volume Contours, Brightness Correction Bottom Left to Right: Elongation, Shape, Raw Image

CS 3100Q - M5



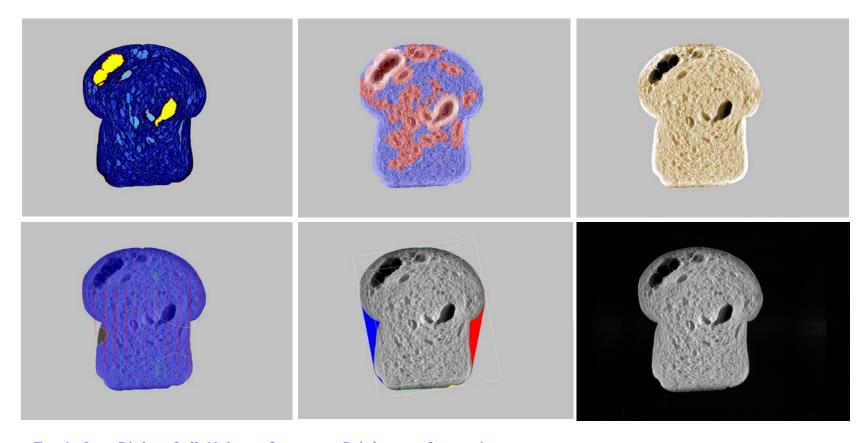
Top Left to Right: Cell, Volume Contours, Brightness Correction Bottom Left to Right: Elongation, Shape, Raw Image

CA905-749 - M6



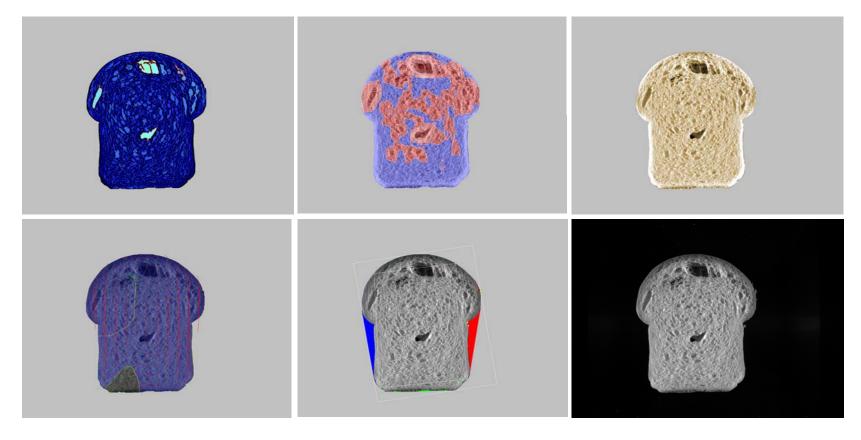
Top Left to Right: Cell, Volume Contours, Brightness Correction Bottom Left to Right: Elongation, Shape, Raw Image

ND901 - M10 95



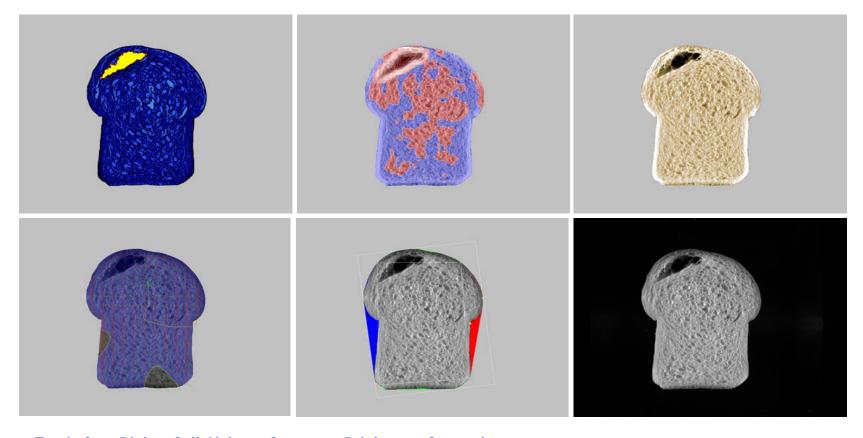
Top Left to Right: Cell, Volume Contours, Brightness Correction Bottom Left to Right: Elongation, Shape, Raw Image

CA905-750 - M11 96



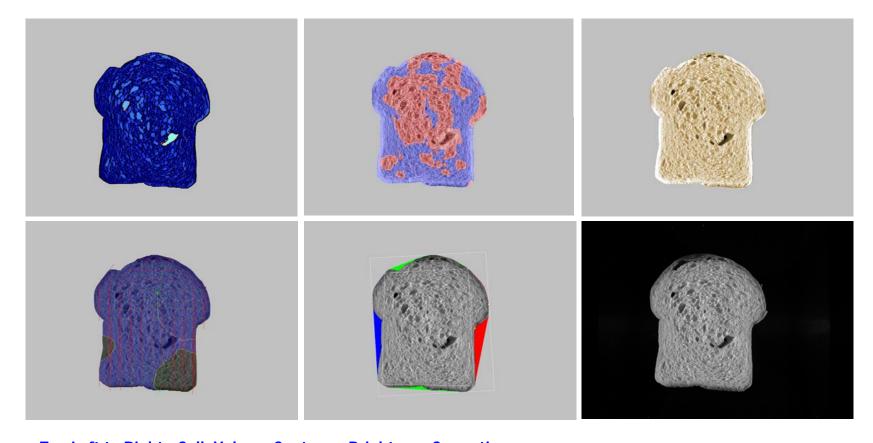
Top Left to Right: Cell, Volume Contours, Brightness Correction Bottom Left to Right: Elongation, Shape, Raw Image

ND809 - M12



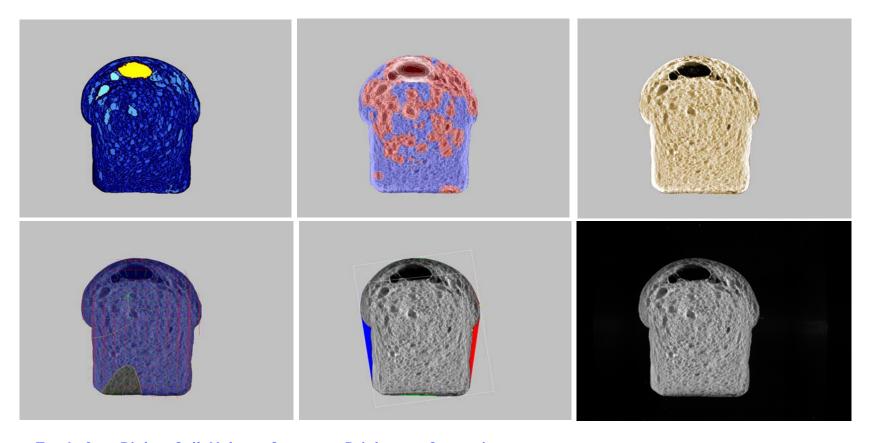
Top Left to Right: Cell, Volume Contours, Brightness Correction Bottom Left to Right: Elongation, Shape, Raw Image

Glenn Check - W8



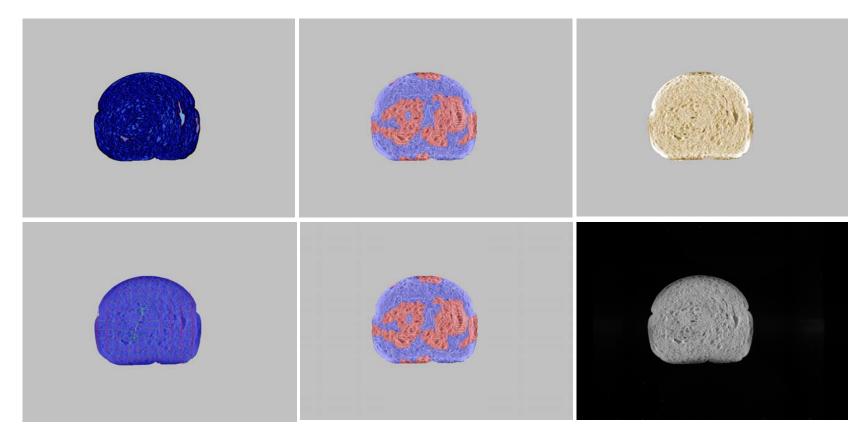
Top Left to Right: Cell, Volume Contours, Brightness Correction Bottom Left to Right: Elongation, Shape, Raw Image

NDSW0449 - W3



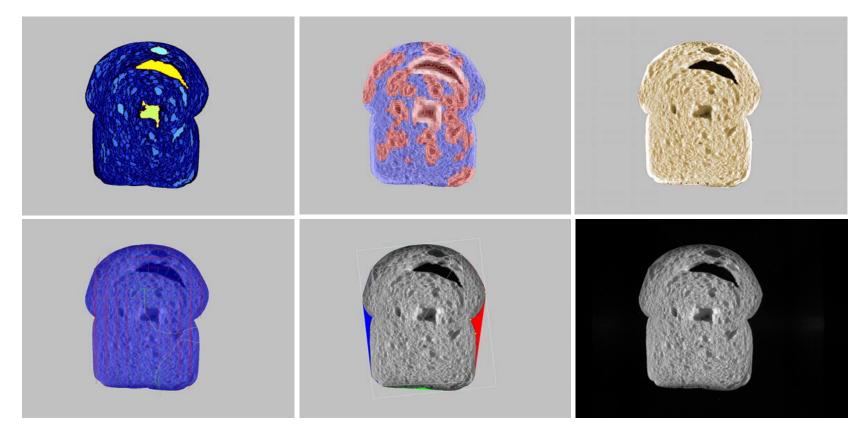
Top Left to Right: Cell, Volume Contours, Brightness Correction Bottom Left to Right: Elongation, Shape, Raw Image

06 Inc 2 - W7



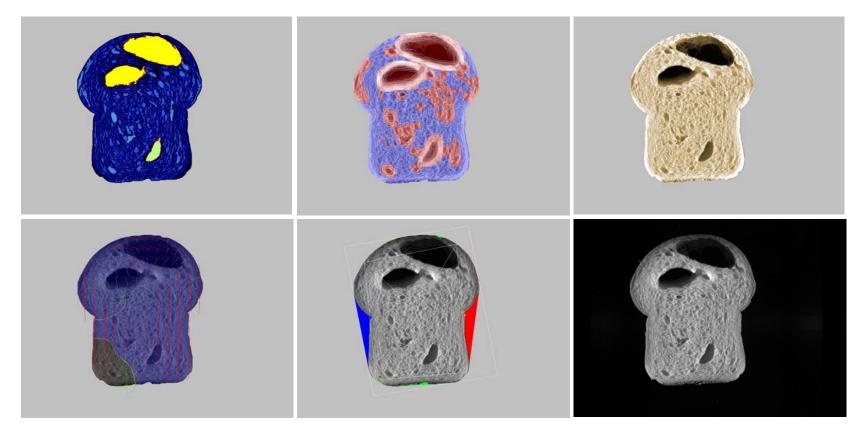
Top Left to Right: Cell, Volume Contours, Brightness Correction Bottom Left to Right: Elongation, Shape, Raw Image

ND905 - W10 101



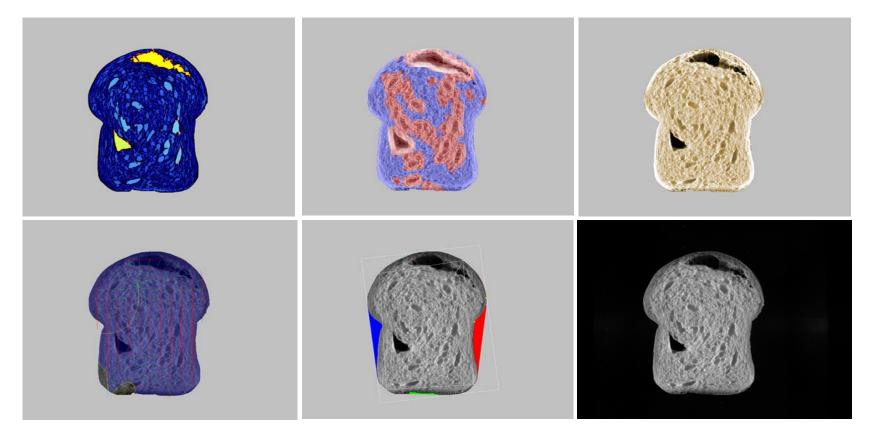
Top Left to Right: Cell, Volume Contours, Brightness Correction Bottom Left to Right: Elongation, Shape, Raw Image

ND809 - W12



Top Left to Right: Cell, Volume Contours, Brightness Correction Bottom Left to Right: Elongation, Shape, Raw Image

06 Inc 1 - W13



Top Left to Right: Cell, Volume Contours, Brightness Correction Bottom Left to Right: Elongation, Shape, Raw Image

B8		2	007 Hard	Spring Wheat	Cron	2	006 Hard	Spring Wheat	Cron
Brookings	Bake	Bake	Loaf	Mixing	Dough	Bake	Loaf	Mixing	Dough
Cooperator	Method	Absorption	Volume	•	Characteristic	Absorption	Volume	U	Characteristic
1	Sponge/Dough	58.0	2850	5	5	61.0	2850	3	3
2	Straight Dough -lb	60.7	2700	2	3	64.3	3050	3	2
3	Sponge/Dough	61.0	887	2	4	64.0	993	5	5
4	Sponge/Dough	63.0	3104	5	5	66.0	3015	5	5
5	Straight Dough	64.8	2925	2	3	69.7	2900	4	3
6	Straight Dough	62.0	2450	2	3	66.0	2800	4	3
7	Straight Dough	61.3	870	4	4	65.3	1070	4	5
8	Straight Dough	65.5	778	4	3	70.7	895	5	5
9	Straight Dough	65.8 62.5	725	3	5	67.9	800	3 3.9	3 3.7
Average ± 1 Std Dev from Mean		2.6		3.2 1.3	3.9 0.9	66.2 2.8		3. 9 0.9	3.7 1.2
C8		2.0		1.3	0.9	2.0		0.9	1.2
Casselton	Bake	Bake	Loaf	Mixing	Dough	Bake	Loaf	Mixing	Dough
Cooperator	Method	Absorption	Volume	•	Characteristic		Volume	Requirement	Characteristic
1	Sponge/Dough	62.0	2975	5	5	61.0	2700	4	5
2	, , ,	62.9	3400	3	2	63.6	2950	4	3
3	Sponge/Dough	64.0	998	4	4	64.0	993	4	4
4	Sponge/Dough	63.0	2986	5	5	66.0	2986	5	4
5	Straight Dough	66.0	3075	3	3	67.6	2950	3	3
6	Straight Dough	64.0	2850	3	3	64.0	2800	4	4
7	Straight Dough	62.5	1005	4	4	64.1	1060	3	5
8	Straight Dough	67.2	918	5	3	69.9	878	4	5
9	Straight Dough	66.7	800	3	4	66.6	845	3	3
Average		64.3		3.9	3.7	65.2		3.7	3.9
± 1 Std Dev from Mean		1.9		0.9	1.0	2.5		0.7	0.9
K8									
Crookston	Bake	Bake	Loaf	Mixing	Dough	Bake	Loaf	Mixing	Dough
Cooperator	Method	Absorption		Requirement		Absorption	Volume		Characteristic
1 2	Sponge/Dough	61.0 64.3	3000 3350	5 3	5 3	60.0 65.0	2700 3200	3 4	3
3	Straight Dough -lb Sponge/Dough	62.0	923	3	3 4	63.0	918	5	3 5
4	Sponge/Dough	66.0	2986	5 5	5	66.0	3045	5	5
5	Straight Dough	68.1	3300	3	4	69.0	3050	3	3
6	Straight Dough	64.0	2450	3 4	4	64.0	2700	3	4
7	Straight Dough	64.6	1045	3	4	65.5	980	4	5
8	Straight Dough	69.8	983	4	5	66.8	810	5	4
9	Straight Dough	68.0	880	3	4	66.7	775	3	3
Average	g g	65.3		3.7	4.2	65.3		3.8	3.8
± 1 Std Dev from Mean		2.9		0.9	0.7	2.5		0.9	0.9
M8									
Minot	Bake	Bake	Loaf	Mixing	Dough	Bake	Loaf	Mixing	Dough
Cooperator	Method	Absorption	Volume	Requirement	Characteristic	Absorption	Volume	Requirement	Characteristic
1	Sponge/Dough	64.0	2875	5	5	62.0	2800	4	5
2		60.7	3050	4	3	65.7	3000	4	2
3	Sponge/Dough	64.0	930	3	4	64.0	988	5	4
4	Sponge/Dough	61.0	3015	5	5	66.0	3074	5	5
5	Straight Dough	65.0	3275	2	4	68.7	2900	3	3
6	Straight Dough	63.0	2600	4	4	65.0	2700	3	3
7	Straight Dough	61.5	1050	3	3	66.1	1250	3	3
8 9	Straight Dough	65.5 64.0	1098	4 3	4 4	71.8 67.0	1043 960	4 3	4 3
Average	Straight Dough	63.2	780	3.7	4.0	66.5	900	3.7	3.5
± 1 Std Dev from Mean		1.7		1.0	0.7	2.7		0.8	1.0
W8		17		1.0	0.7	2.7		0.0	1.0
Williston	Bake	Bake	Loaf	Mixing	Dough				
Cooperator	Method	Absorption			Characteristic				
1	Sponge/Dough	65.0	2925	5	5				
2		65.2	3400	3	3				
3		64.0	1008	4	4				
4	Sponge/Dough	65.0	3045	5	5				
5	Straight Dough	67.2	3200	4	3				
6	Straight Dough	65.0	2600	5	5				
7	Straight Dough	63.7	1150	3	3				
8	Straight Dough	70.0	1073	4	3				
9	Straight Dough	65.6	890	3	4				
Average	5 5	65.6		4.0	3.9				
± 1 Std Dev from Mean		1.9		0.9	0.9				

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								Facto	ors Compa	ared to G	lenn Che	eck	
Crookston - K1	Bake	Bake	Loaf	LV	Mixing	Dough	Mix	Crumb	Grain &				,
Cooperator	Method	Absorption	Volume	% of CK	Requirement	Characteristic	Tolerance	Color	Texture	Protein	Milling	Baking	Overall
1	Sponge/Dough	58.0	3000	100.0	4	4	3	4	3	2	2	3	2
2	Straight Dough -lb	55.7	2950	88.1	3	2	3	4	4	1	1	2	2
3	Sponge/Dough	64.0	968	104.9	3	3	3	2	3	1	1	3	2
4	Sponge/Dough	59.0	3045	102.0	5	5	3	2	3	1	3	2	2
5	Straight Dough	59.4	3225	97.7	1	1	4	1	5	1	2	2	2
6	Straight Dough	58.0	2550	104.1	3	3	2	3	3	1	5	2	2
7	Straight Dough	55.9	995	95.2	3	2	2	2	2	1	1	1	1
8	Straight Dough	63.1	918	93.4	4	2	2	2	5	2	2	5	4
9	Straight Dough	59.7	665	75.6	3	3	3	1	2	1	2	1	1
Average		59.2		95.7	3.2	2.8	2.8	2.3	3.3	1.2	2.1	2.3	2.0
± 1 Std Dev from Mean		2.8		9.3	1.1	1.2	0.7	1.1	1.1	0.4	1.3	1.2	0.9
									ors Compa	ared to G	lenn Che	eck	
Minot - M1	Bake	Bake	Loaf	LV	Mixing	Dough	Mix	Crumb	Grain &				
Minot - M1 Cooperator	Method	Absorption	Volume	% of CK	Requirement	Characteristic	Tolerance	Crumb Color	Grain & Texture	Protein	Milling	Baking	
	Method Sponge/Dough	Absorption 63.0	Volume 2825	% of CK 98.3	Requirement 5		Tolerance 3	Crumb Color 3	Grain & Texture 3		Milling 3	Baking 3	3
	Method Sponge/Dough Straight Dough -lb	Absorption 63.0 59.3	Volume 2825 3000	% of CK 98.3 98.4	Requirement 5 4	Characteristic	Tolerance 3 3	Crumb Color 3 3	Grain & Texture 3 3	Protein 3 2	Milling	Baking 3 3	3 3
	Method Sponge/Dough Straight Dough -lb Sponge/Dough	Absorption 63.0 59.3 64.0	Volume 2825 3000 902	% of CK 98.3 98.4 97.0	Requirement 5 4 4	Characteristic	Tolerance 3 3 3	Crumb Color 3 3 3	Grain & Texture 3	Protein	Milling 3 2 4	Baking 3 3 3	3 3 3
Cooperator 1 2 3 4	Method Sponge/Dough Straight Dough -lb Sponge/Dough Sponge/Dough	Absorption 63.0 59.3 64.0 61.0	Volume 2825 3000 902 2986	% of CK 98.3 98.4 97.0 99.0	Requirement 5 4 4 5	Characteristic	Tolerance 3 3 3 3 3	Crumb Color 3 3 3 4	Grain & Texture 3 3 2 4	Protein 3 2 3 2	Milling 3	Baking 3 3 3 4	3 3 3 3
	Method Sponge/Dough Straight Dough -lb Sponge/Dough Sponge/Dough Straight Dough	Absorption 63.0 59.3 64.0 61.0 63.6	Volume 2825 3000 902 2986 3250	% of CK 98.3 98.4 97.0 99.0 99.2	Requirement 5 4 4 5 2	Characteristic	Tolerance 3 3 3 3 3 3 3	Crumb Color 3 3 4 2	Grain & Texture 3 3 2 4 4 3	Protein 3 2	Milling 3 2 4	Baking 3 3 3 4 4 3	3 3 3 3
Cooperator 1 2 3 4	Method Sponge/Dough Straight Dough -lb Sponge/Dough Sponge/Dough Straight Dough Straight Dough	Absorption 63.0 59.3 64.0 61.0 63.6 61.0	Volume 2825 3000 902 2986 3250 2750	% of CK 98.3 98.4 97.0 99.0 99.2 105.8	Requirement 5 4 5 2 4	Characteristic 5 3 4 5 4 4 4 4	Tolerance 3 3 3 3 3 3 3 3	Crumb Color 3 3 4 2 3	Grain & Texture 3 3 2 4 3 3 3	Protein 3 2 3 2 3 2 3 3	Milling 3 2 4 2 3 1	Baking 3 3 3 4 4 3 4	3 3 3 3 3
Cooperator 1 2 3 4	Method Sponge/Dough Straight Dough -lb Sponge/Dough Sponge/Dough Straight Dough Straight Dough Straight Dough	Absorption 63.0 59.3 64.0 61.0 63.6 61.0 60.1	Volume 2825 3000 902 2986 3250 2750 1135	% of CK 98.3 98.4 97.0 99.0 99.2 105.8 108.1	Requirement	Characteristic	Tolerance 3 3 3 3 3 3 3 3 3 3	Crumb Color 3 3 4 2 3 3	Grain & Texture 3 3 2 4 3 3 3 3	Protein 3 2 3 2 3 3 3 3	Milling 3 2 4	Baking 3 3 3 4 3 4 3 4 3 3	3 3 3 3 3 3
Cooperator 1 2 3 4 5 6 7	Method Sponge/Dough Straight Dough -lb Sponge/Dough Sponge/Dough Straight Dough Straight Dough Straight Dough Straight Dough Straight Dough	Absorption 63.0 59.3 64.0 61.0 63.6 61.0 60.1 68.7	Volume 2825 3000 902 2986 3250 2750 1135 1058	% of CK 98.3 98.4 97.0 99.0 99.2 105.8 108.1 96.4	Requirement	Characteristic	Tolerance 3 3 3 3 3 3 3 3 2	Crumb Color 3 3 4 2 3 3 2	Grain & Texture 3 3 2 4 3 3 3 3 3 3	Protein 3 2 3 2 3 3 2 3 2 3 2 3 3 2	Milling 3 2 4 2 3 1 2 4	Baking 3 3 4 3 4 3 4	3 3 3 3 3 3 3
Cooperator 1 2 3 4 5 6 7	Method Sponge/Dough Straight Dough -lb Sponge/Dough Sponge/Dough Straight Dough Straight Dough Straight Dough	Absorption 63.0 59.3 64.0 61.0 63.6 61.0 60.1 68.7 63.3	Volume 2825 3000 902 2986 3250 2750 1135	% of CK 98.3 98.4 97.0 99.0 99.2 105.8 108.1 96.4 111.5	Requirement	Characteristic	Tolerance 3 3 3 3 3 3 3 3 2 3	Crumb Color 3 3 4 2 3 3 4 4 2 4	Grain & Texture 3 3 2 4 3 3 3 3 3 3 3 3	Protein 3 2 3 2 3 3 2 3 3 3 3 3	Milling 3 2 4 2 3 1 2 4 3	Baking 3 3 4 3 4 3 4 4	3 3 3 3 3 3 3 3
Cooperator 1 2 3 4 5 6 7	Method Sponge/Dough Straight Dough -lb Sponge/Dough Sponge/Dough Straight Dough Straight Dough Straight Dough Straight Dough Straight Dough	Absorption 63.0 59.3 64.0 61.0 63.6 61.0 60.1 68.7	Volume 2825 3000 902 2986 3250 2750 1135 1058	% of CK 98.3 98.4 97.0 99.0 99.2 105.8 108.1 96.4	Requirement	Characteristic	Tolerance 3 3 3 3 3 3 3 3 2	Crumb Color 3 3 4 2 3 3 2	Grain & Texture 3 3 2 4 3 3 3 3 3 3	Protein 3 2 3 2 3 3 2 3 2 3 2 3 3 2	Milling 3 2 4 2 3 1 2 4	Baking 3 3 4 3 4 3 4	3 3 3 3 3 3 3

								Facto	ors Compa	ared to G	lenn Che	eck	
Casselton - C2	Bake	Bake	Loaf	LV	Mixing	Dough	Mix	Crumb	Grain &				
Cooperator	Method	Absorption	Volume	% of CK	Requirement	Characteristic	Tolerance	Color	Texture	Protein	Milling	Baking	Overall
1	Sponge/Dough	61.0	3000	100.8	5	5	3	2	2	2	3	3	3
2	Straight Dough -lb	59.3	3100	91.2	3	3	2	3	3	1	4	2	2
3	Sponge/Dough	64.0	953	95.5	3	4	2	3	4	2	3	2	2
4	Sponge/Dough	61.0	3162	105.9	5	5	3	1	2	2	3	2	2
5	Straight Dough	62.9	3100	100.8	3	1	3	3	5	3	2	2	2
6	Straight Dough	60.0	2700	94.7	3	3	3	3	3	2	3	3	3
7	Straight Dough	59.4	1005	100.0	3	4	3	2	3	2	4	2	2
8	Straight Dough	64.3	888	96.7	4	4	2	4	5	2	2	5	4
9	Straight Dough	62.4	775	96.9	3	4	3	2	2	3	3	3	3
Average		61.6		98.1	3.6	3.7	2.7	2.6	3.2	2.1	3.0	2.7	2.6
± 1 Std Dev from Mean		1.9		4.3	0.9	1.2	0.5	0.9	1.2	0.6	0.7	1.0	0.7
								Foot	ara Campa	arad ta C	lann Cha	ol.	
Creekston V2	Daka	Doko	Loof	11/	Missing	Dough	Mix		ors Compa	ared to G	lenn Che	eck	
Crookston - K2	Bake	Bake	Loaf	LV	Mixing	Dough	Mix	Crumb	Grain &				Ourmall
Crookston - K2 Cooperator	Method	Absorption	Volume	% of CK	Requirement	Characteristic	Tolerance	Crumb Color	Grain & Texture	Protein	Milling	Baking	Overall
	Method Sponge/Dough	Absorption 61.0	Volume 3100	% of CK 103.3	Requirement 5	Characteristic 5	Tolerance 3	Crumb Color 4	Grain & Texture 3	Protein 3		Baking 3	3
	Method Sponge/Dough Straight Dough -lb	Absorption 61.0 63.6	Volume 3100 3150	% of CK 103.3 94.0	Requirement 5 3	Characteristic 5 3	Tolerance 3 3	Crumb Color 4 4	Grain & Texture 3 3	Protein 3 3	Milling	Baking 3 4	3 4
	Method Sponge/Dough Straight Dough -lb Sponge/Dough	Absorption 61.0 63.6 63.0	Volume 3100 3150 932	% of CK 103.3 94.0 101.0	Requirement 5 3 3	Characteristic 5 3 4	Tolerance 3 3 3	Crumb Color 4 4 3	Grain & Texture 3 3 3	Protein 3 3 3	Milling	Baking 3 4 3	3 4 3
	Method Sponge/Dough Straight Dough -lb Sponge/Dough Sponge/Dough	Absorption 61.0 63.6 63.0 65.0	Volume 3100 3150 932 3045	% of CK 103.3 94.0 101.0 102.0	Requirement 5 3 3 5	Characteristic 5 3	Tolerance 3 3 3 3 3	Crumb Color 4 4 3 2	Grain & Texture 3 3 3 3 3	Protein 3 3 3 3	Milling	Baking 3 4 3 3	3 4 3 4
Cooperator 1 2 3 4 5	Method Sponge/Dough Straight Dough -lb Sponge/Dough Sponge/Dough Straight Dough	Absorption 61.0 63.6 63.0 65.0 67.5	Volume 3100 3150 932 3045 3075	% of CK 103.3 94.0 101.0 102.0 93.2	Requirement 5 3 3 5 1	Characteristic 5 3 4 5 1	Tolerance 3 3 3	Crumb Color 4 4 3 2 3	Grain & Texture 3 3 3 3 5	Protein 3 3 3 3 3	Milling 4 5 4 4 4	Baking 3 4 3	3 4 3
	Method Sponge/Dough Straight Dough -lb Sponge/Dough Sponge/Dough Straight Dough Straight Dough	Absorption 61.0 63.6 63.0 65.0 67.5 64.0	Volume 3100 3150 932 3045 3075 2550	% of CK 103.3 94.0 101.0 102.0 93.2 104.1	8 Requirement 5 3 3 5 1 2	Characteristic 5 3 4 5 1 2	Tolerance 3 3 3 4 1	Crumb Color 4 4 3 2 3 3	Grain & Texture 3 3 3 3 5 5 3	Protein 3 3 3 3 3 3 3 3	Milling 4 5 4 4 4 5	Baking 3 4 3 3 2 1	3 4 3 4 2 1
Cooperator 1 2 3 4 5 6 7 7	Method Sponge/Dough Straight Dough -lb Sponge/Dough Sponge/Dough Straight Dough Straight Dough Straight Dough	Absorption 61.0 63.6 63.0 65.0 67.5 64.0 64.0	Volume 3100 3150 932 3045 3075 2550 995	% of CK 103.3 94.0 101.0 102.0 93.2 104.1 95.2	Requirement 5 3 3 5 1 2 2 2	Characteristic 5 3 4 5 1 2 3	Tolerance 3 3 3 4 1 2	Crumb Color 4 4 3 2 3 3 2	Grain & Texture 3 3 3 5 3 3 5 3	Protein 3 3 3 3 3 2	Milling 4 5 4 4 4 5 3	Baking 3 4 3 3 2 1 2	3 4 3 4 2 1 2
Cooperator 1 2 3 3 4 5 6 6 7 8	Method Sponge/Dough Straight Dough -lb Sponge/Dough Sponge/Dough Straight Dough Straight Dough Straight Dough Straight Dough Straight Dough	Absorption 61.0 63.6 63.0 65.0 67.5 64.0 64.0 66.4	Volume 3100 3150 932 3045 3075 2550 995 960	% of CK 103.3 94.0 101.0 102.0 93.2 104.1 95.2 97.7	Requirement	Characteristic	Tolerance 3 3 3 4 1 2 2	Crumb Color 4 4 3 2 3 3 2 2	Grain & Texture 3 3 3 5 3 4	Protein 3 3 3 3 3 2 3	Milling 4 5 4 4 4 5 3 3	Baking 3 4 3 3 2 1 2 4	3 4 3 4 2 1 2 4
Cooperator 1 2 3 4 5 6 7 8 9	Method Sponge/Dough Straight Dough -lb Sponge/Dough Sponge/Dough Straight Dough Straight Dough Straight Dough	Absorption 61.0 63.6 63.0 65.0 67.5 64.0 64.0 66.4 66.3	Volume 3100 3150 932 3045 3075 2550 995	% of CK 103.3 94.0 101.0 102.0 93.2 104.1 95.2 97.7 94.9	Requirement	Characteristic	Tolerance 3 3 3 4 1 2 2 2	Crumb Color 4 4 3 2 3 3 2 2 2 2	Grain & Texture 3 3 3 5 3 4 3	Protein 3 3 3 3 3 2 3 3 3	Milling 4 5 4 4 4 5 3 3 3	Baking 3 4 3 2 1 2 4 3	3 4 3 4 2 1 2 4 3
Cooperator 1 2 3 3 4 5 6 6 7 8	Method Sponge/Dough Straight Dough -lb Sponge/Dough Sponge/Dough Straight Dough Straight Dough Straight Dough Straight Dough Straight Dough	Absorption 61.0 63.6 63.0 65.0 67.5 64.0 64.0 66.4	Volume 3100 3150 932 3045 3075 2550 995 960	% of CK 103.3 94.0 101.0 102.0 93.2 104.1 95.2 97.7	Requirement	Characteristic	Tolerance 3 3 3 4 1 2 2	Crumb Color 4 4 3 2 3 3 2 2	Grain & Texture 3 3 3 5 3 4	Protein 3 3 3 3 3 2 3	Milling 4 5 4 4 4 5 3 3	Baking 3 4 3 3 2 1 2 4	3 4 3 4 2 1 2 4

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								Facto	rs Compa	red to G	lenn Che	ck	
Casselton - C3	Bake	Bake	Loaf	LV	Mixing	Dough	Mix	Crumb	Grain &				
Cooperator	Method	Absorption	Volume	% of CK	Requirement	Characteristic	Tolerance	Color	Texture	Protein	Milling	Baking	Overall
1	Sponge/Dough	61.0	3000	100.8	5	4	3	3	3	3	2	3	3
2	Straight Dough -lb	58.6	3050	89.7	3	3	3	2	3	3	2	1	1
3	Sponge/Dough	64.0	953	95.5	3	4	2	3	3	3	2	2	2
4	Sponge/Dough	61.0	3045	102.0	5	5	2	2	2	3	3	2	2
5	Straight Dough	62.3	3125	101.6	3	4	4	4	5	2	2	2	2
6	Straight Dough	60.0	2900	101.8	3	2	2	2	2	3	2	2	2
7	Straight Dough	58.8	1040	103.5	3	4	3	2	3	3	1	2	2
8	Straight Dough	64.7	943	102.7	5	4	2	3	5	2	2	5	4
9	Straight Dough	62.3	750	93.8	3	4	3	2	3	3	2	3	3
Average		61.4		99.0	3.7	3.8	2.7	2.6	3.2	2.8	2.0	2.4	2.3
± 1 Std Dev from Mean		2.1		4.8	1.0	0.8	0.7	0.7	1.1	0.4	0.5	1.1	0.9
								Facto	rs Compa	red to G	lenn Che	eck	
Minot - M3	Bake	Bake	Loaf	LV	Mixing	Dough	Mix	Crumb	Grain &				
Cooperator	Method	Absorption	Volume	% of CK	Requirement	Characteristic	Tolerance	Color	Texture	Protein	Milling	Baking	Overall
1	Sponge/Dough	64.0	2800	97.4	5	5	3	2	3	3	3	3	2
2	Straight Dough -lb	60.0	2700	88.5	3	2	3	2	3	3	2	2	2
3	Sponge/Dough	64.0	885	95.2	3	4	2	2	3	3	3	2	2
4	Sponge/Dough	61.0	3045	101.0	5	5	3	3	4	3	3	4	4
5	Straight Dough	64.0	2800	85.5	1	1	4	3	5	3	3	1	1
6	Straight Dough	61.0	2550	98.1	1	2	1	2	2	3	2	2	1
7	Straight Dough	60.5	1035	98.6	3	2	2	3	3	3	2	2	2
8	Straight Dough	67.4	1025	93.4	4	4	2	2	3	4	3	3	3
9	Straight Dough	62.6	875	112.2	3	4	2	3	3	3	3	4	3
Average		62.7		96.6	3.1	3.2	2.4	2.4	3.2	3.1	2.7	2.6	2.2
± 1 Std Dev from Mean		2.4		7.7	1.5	1.5	0.9	0.5	0.8	0.3	0.5	1.0	1.0
								Facto	rs Compa	red to G	lenn Che	ck	
Williston - W3	Bake	Bake	Loaf	LV	Mixing	Dough	Mix	Crumb	Grain &				
Cooperator	Method	Absorption	Volume	% of CK	Requirement	Characteristic	Tolerance	Color	Texture	Protein	Milling	Baking	Overall
1	Sponge/Dough	66.0	2925	100.0	5	5	3	3	3	3	3	3	3
2	Straight Dough -lb	62.9	3450	101.5	3	3	3	3	3	5	1	3	3
3	Sponge/Dough	64.0	923	91.6	3	4	2	2	3	3	1	2	2
4	Sponge/Dough	65.0	3074	101.0	5	5	3	2	3	4	2	3	2
5	Straight Dough	66.9	3175	99.2	3	4	3	3	1	4	4	3	3
6	Straight Dough	65.0	2600	100.0	5	5	3	3	3	4	5	3	3
7	Straight Dough	63.4	1160	100.9	3	3	3	1	3	5	2	2	2
8	Straight Dough	68.7	1075	100.2	3	3	2	4	4	4	2	4	4
9	Straight Dough	65.0	900	101.1	3	4	3	2	2	4	2	3	2
Average		65.2		99.5	3.7	4.0	2.8	2.6	2.8	4.0	2.4	2.9	2.7
± 1 Std Dev from Mean		1.8		3.1	1.0	0.9	0.4	0.9	0.8	0.7	1.3	0.6	0.7
					- -				-			- · · -	

SD3868 - SWQAC #4

								Facto	ors Compa	ared to G	lenn Che	eck	
Brookings - B4	Bake	Bake	Loaf	LV	Mixing	Dough	Mix	Crumb	Grain &				
Cooperator	Method	Absorption	Volume	% of CK	Requirement	Characteristic	Tolerance	Color	Texture	Protein	Milling	Baking	Overall
1	Sponge/Dough	56.0	2700	95.0	2	2	1	2	3	2	3	2	2
2	Straight Dough -lb	59.2	2650	98.1	2	4	3	3	3	1	2	2	2
3	Sponge/Dough	60.0	795	89.6	1	2	2	3	2	2	2	2	2
4	Sponge/Dough	60.0	2927	94.3	2	3	1	1	4	2	3	2	2
5	Straight Dough	61.2	2500	85.5	2	4	3	3	2	1	2	1	2
6	Straight Dough	60.0	2600	106.1	2	3	4	3	3	1	2	3	4
7	Straight Dough	57.7	845	97.1	3	3	4	2	2	1	2	2	1
8	Straight Dough	63.0	773	99.4	3	3	2	4	4	2	2	4	4
9	Straight Dough	62.0	650	89.7	3	3	3	3	2	2	2	2	2
Average		59.9		95.0	2.2	3.0	2.6	2.7	2.8	1.6	2.2	2.2	2.3
± 1 Std Dev from Mean		2.1		6.2	0.7	0.7	1.1	0.9	8.0	0.5	0.4	8.0	1.0
									•				
		5.1							ors Compa	ared to G	lenn Che	eck	
Casselton - C4	Bake	Bake	Loaf	LV	Mixing	Dough	Mix	Crumb	Grain &				
Casselton - C4 Cooperator	Method	Absorption	Volume	% of CK	Requirement	Characteristic	Tolerance	Crumb Color	Grain & Texture	Protein	Milling	Baking	Overall
	Method Sponge/Dough	Absorption 61.0	Volume 2900	% of CK 97.5	Requirement 3	Characteristic 3	Tolerance 2	Crumb Color 3	Grain &	Protein 2		Baking 3	3
	Method Sponge/Dough Straight Dough -lb	Absorption 61.0 59.3	Volume 2900 3050	% of CK 97.5 89.7	Requirement 3 3	Characteristic 3 3	Tolerance 2 3	Crumb Color 3 3	Grain & Texture	Protein 2 2	Milling 2 2	Baking 3 2	3 2
	Method Sponge/Dough Straight Dough -lb Sponge/Dough	Absorption 61.0 59.3 64.0	Volume 2900 3050 972	% of CK 97.5 89.7 97.4	Requirement 3 3 3	Characteristic 3	Tolerance 2	Crumb Color 3 3 3	Grain & Texture	Protein 2 2 2	Milling	Baking 3	3
	Method Sponge/Dough Straight Dough -lb Sponge/Dough Sponge/Dough	Absorption 61.0 59.3 64.0 61.0	Volume 2900 3050 972 3045	% of CK 97.5 89.7 97.4 102.0	Requirement 3 3 3 4	Characteristic 3 3 3 4	Tolerance 2 3 3 1	Crumb Color 3 3 3 2	Grain & Texture	Protein 2 2 2 2 2	Milling 2 2	Baking 3 2 3 1	3 2 3 1
	Method Sponge/Dough Straight Dough -lb Sponge/Dough Sponge/Dough Straight Dough	Absorption 61.0 59.3 64.0 61.0 62.8	Volume 2900 3050 972 3045 3025	% of CK 97.5 89.7 97.4 102.0 98.4	Requirement 3 3 3 4 3	Characteristic 3 3	Tolerance 2 3 3 1 1 3	Crumb Color 3 3 3 2 3	Grain & Texture 3 3 4 1 4	Protein 2 2 2 2 2 2	Milling 2 2	Baking 3 2 3 1 2	3 2 3 1 2
	Method Sponge/Dough Straight Dough -lb Sponge/Dough Sponge/Dough Straight Dough Straight Dough	Absorption 61.0 59.3 64.0 61.0 62.8 60.0	Volume 2900 3050 972 3045 3025 2750	% of CK 97.5 89.7 97.4 102.0 98.4 96.5	Requirement 3 3 3 4 3 3 3	Characteristic 3 3 3 4	Tolerance 2 3 3 1 3 3	Crumb Color 3 3 3 2 3 3	Grain & Texture 3 3 4 1 4 3	Protein 2 2 2 2 2 2 2 2 2	Milling 2 2 3 3 2 3	Baking 3 2 3 1 2 3 3	3 2 3 1 2 3
	Method Sponge/Dough Straight Dough -lb Sponge/Dough Sponge/Dough Straight Dough Straight Dough Straight Dough	Absorption 61.0 59.3 64.0 61.0 62.8 60.0 59.3	Volume 2900 3050 972 3045 3025 2750 965	% of CK 97.5 89.7 97.4 102.0 98.4 96.5 96.0	Requirement 3 3 4 3 3 3 3 3 3 3 3	Characteristic 3 3 3 4 4 3 3 4 4	Tolerance 2 3 3 1 3 1 3 3 3 3	Crumb Color 3 3 2 3 2 3 2	Grain & Texture 3 3 4 1 4 3 2	Protein 2 2 2 2 2 2 2 2 2 2	Milling 2 2 3 3 2 3 3 3	Baking 3 2 3 1 2 3 2	3 2 3 1 2 3 2
	Method Sponge/Dough Straight Dough -lb Sponge/Dough Sponge/Dough Straight Dough Straight Dough Straight Dough Straight Dough Straight Dough	Absorption 61.0 59.3 64.0 61.0 62.8 60.0 59.3 65.3	Volume 2900 3050 972 3045 3025 2750 965 920.0	% of CK 97.5 89.7 97.4 102.0 98.4 96.5 96.0 100.2	Requirement 3 3 3 4 3 3 4 3 3 4 4 4 4 4 4 4 4 4 4	Characteristic	Tolerance 2 3 3 1 3 1 3 3 2	Crumb Color 3 3 2 3 2 3 2 4	Grain & Texture 3 3 4 1 4 3 2 5	Protein 2 2 2 2 2 2 2 2 2 2 2	Milling 2 2 3 3 2 3 2 3 2 2	Baking 3 2 3 1 2 3 2 5	3 2 3 1 2 3 2 4
Cooperator 1 2 3 4 5 6 7 8 9	Method Sponge/Dough Straight Dough -lb Sponge/Dough Sponge/Dough Straight Dough Straight Dough Straight Dough	Absorption 61.0 59.3 64.0 61.0 62.8 60.0 59.3 65.3 62.8	Volume 2900 3050 972 3045 3025 2750 965	% of CK 97.5 89.7 97.4 102.0 98.4 96.5 96.0 100.2 103.1	Requirement 3 3 4 3 3 4 3 4 3 4 3 3 4 3	Characteristic	Tolerance 2 3 3 1 3 1 3 3 2 3	Crumb Color 3 3 3 2 3 2 4 3	Grain & Texture 3 3 4 1 4 3 2 5 2	Protein 2 2 2 2 2 2 2 2 3	Milling 2 2 3 3 2 3 2 2 2 2	Baking 3 2 3 1 2 3 2 5 3	3 2 3 1 2 3 2 4 2
	Method Sponge/Dough Straight Dough -lb Sponge/Dough Sponge/Dough Straight Dough Straight Dough Straight Dough Straight Dough Straight Dough	Absorption 61.0 59.3 64.0 61.0 62.8 60.0 59.3 65.3	Volume 2900 3050 972 3045 3025 2750 965 920.0	% of CK 97.5 89.7 97.4 102.0 98.4 96.5 96.0 100.2	Requirement 3 3 3 4 3 3 4 3 3 4 4 4 4 4 4 4 4 4 4	Characteristic	Tolerance 2 3 3 1 3 1 3 3 2	Crumb Color 3 3 2 3 2 3 2 4	Grain & Texture 3 3 4 1 4 3 2 5	Protein 2 2 2 2 2 2 2 2 2 2 2	Milling 2 2 3 3 2 3 2 3 2 2	Baking 3 2 3 1 2 3 2 5	3 2 3 1 2 3 2 4

CS 3100Q - SWQAC #5

								Facto	ors Compa	ared to G	lenn Che	eck	
Crookston - K5	Bake	Bake	Loaf	LV	Mixing	Dough	Mix	Crumb	Grain &				
Cooperator	Method	Absorption	Volume	% of CK	Requirement	Characteristic	Tolerance	Color	Texture	Protein	Milling	Baking	Overall
1	Sponge/Dough	59.0	3100	103.3	5	5	3	4	2	2	3	3	3
2	Straight Dough -lb	57.9	3050	91.0	3	3	3	4	3	1	3	2	2
3	Sponge/Dough	64.0	1022	110.7	4	4	4	5	4	1	2	4	3
4	Sponge/Dough	60.0	3104	104.0	5	5	3	4	2	1	4	2	2
5	Straight Dough	61.8	3375	102.3	3	1	4	4	1	2	3	3	3
6	Straight Dough	59.0	2850	116.3	4	4	3	3	3	1	4	3	3
7	Straight Dough	58.3	930	89.0	3	3	2	4	2	1	2	2	2
8	Straight Dough	64.4	943	95.9	4	3	2	5	4	2	2	4	4
9	Straight Dough	62.1	775	88.1	3	4	3	3	2	1	2	2	2
Average		60.7		100.1	3.8	3.6	3.0	4.0	2.6	1.3	2.8	2.8	2.7
± 1 Std Dev from Mean		2.4		9.8	0.8	1.2	0.7	0.7	1.0	0.5	8.0	8.0	0.7
									_				
									ors Compa	ared to G	lenn Che	eck	
Minot - M5	Bake	Bake	Loaf	LV	Mixing	Dough	Mix	Crumb	Grain &				
Minot - M5 Cooperator	Method	Absorption	Volume	% of CK	Requirement	Characteristic	Tolerance	Crumb Color	Grain & Texture	Protein	Milling	Baking	Overall
	Method Sponge/Dough	Absorption 63.0	Volume 2900	% of CK 100.9	Requirement 5	Characteristic 5	Tolerance 3	Crumb Color 3	Grain & Texture 2	Protein 3	Milling 3	Baking 3	3
	Method Sponge/Dough Straight Dough -lb	Absorption 63.0 58.6	Volume 2900 2850	% of CK 100.9 93.4	Requirement 5 3	Characteristic 5 2	Tolerance 3 3	Crumb Color 3 4	Grain & Texture 2 4	Protein 3 3	Milling	Baking 3 2	3 2
	Method Sponge/Dough Straight Dough -lb Sponge/Dough	Absorption 63.0 58.6 64.0	Volume 2900 2850 955	% of CK 100.9 93.4 102.7	Requirement 5 3 2	Characteristic 5 2 4	Tolerance 3 3 2	Crumb Color 3 4 3	Grain & Texture 2 4 4	Protein 3 3 3	Milling 3	Baking 3 2 2	3 2 2
	Method Sponge/Dough Straight Dough -lb Sponge/Dough Sponge/Dough	Absorption 63.0 58.6 64.0 61.0	Volume 2900 2850 955 3104	% of CK 100.9 93.4 102.7 103.0	Requirement 5 3 2 5	Characteristic 5 2 4 5	Tolerance 3 3 2 3	Crumb Color 3 4 3 4	Grain & Texture 2 4 4 4 4	Protein 3 3 3 2	Milling 3 3 2 2	Baking 3 2 2 4	3 2 2 3
	Method Sponge/Dough Straight Dough -lb Sponge/Dough Sponge/Dough Straight Dough	Absorption 63.0 58.6 64.0 61.0 63.0	Volume 2900 2850 955 3104 3150	% of CK 100.9 93.4 102.7 103.0 96.2	Requirement 5 3 2 5 2 5	Characteristic 5 2 4 5 3	Tolerance 3 3 2 3 4	Crumb Color 3 4 3 4 3	Grain & Texture 2 4 4 4 4 2	Protein 3 3 3 2 3	Milling 3 3 2 2 3	Baking 3 2 2 4 4	3 2 2 3 4
	Method Sponge/Dough Straight Dough -lb Sponge/Dough Sponge/Dough Straight Dough Straight Dough	Absorption 63.0 58.6 64.0 61.0 63.0 61.0	Volume 2900 2850 955 3104 3150 2350	% of CK 100.9 93.4 102.7 103.0 96.2 90.4	Requirement 5 3 2 5 2 2 2	Characteristic 5 2 4 5 3 3	Tolerance 3 3 2 3 4 2	Crumb Color 3 4 3 4 3 3	Grain & Texture 2 4 4 4 4 2 3	Protein 3 3 3 2 3 3 3	Milling 3 3 2 2 3 2	Baking 3 2 2 4 4 4	3 2 2 3 4 3
	Method Sponge/Dough Straight Dough -lb Sponge/Dough Sponge/Dough Straight Dough Straight Dough Straight Dough	Absorption 63.0 58.6 64.0 61.0 63.0 61.0 59.5	Volume 2900 2850 955 3104 3150 2350 1150	% of CK 100.9 93.4 102.7 103.0 96.2 90.4 109.5	Requirement	Characteristic 5 2 4 5 3 3 2	Tolerance 3 3 2 3 4 2 2	Crumb Color 3 4 3 4 3 4 3	Grain & Texture 2 4 4 4 2 3 3	Protein 3 3 3 2 3 3 3 3 3 3	Milling 3 3 2 2 3 2 2 3	Baking 3 2 2 4 4 4 3	3 2 2 3 4 3 3
	Method Sponge/Dough Straight Dough -lb Sponge/Dough Sponge/Dough Straight Dough Straight Dough Straight Dough Straight Dough Straight Dough	Absorption 63.0 58.6 64.0 61.0 63.0 61.0 59.5 67.2	Volume 2900 2850 955 3104 3150 2350 1150 1050	% of CK 100.9 93.4 102.7 103.0 96.2 90.4 109.5 95.6	Requirement	Characteristic 5 2 4 5 3 3	Tolerance 3 3 2 3 4 2 2 3	Crumb Color 3 4 3 4 3 3	Grain & Texture 2 4 4 2 3 3 4	Protein 3 3 3 2 3 3 2 3 2 2	Milling 3 3 2 2 3 2 3 2 3 3	Baking 3 2 2 4 4 4 3 3	3 2 2 3 4 3 4
	Method Sponge/Dough Straight Dough -lb Sponge/Dough Sponge/Dough Straight Dough Straight Dough Straight Dough	Absorption 63.0 58.6 64.0 61.0 63.0 61.0 59.5 67.2 61.6	Volume 2900 2850 955 3104 3150 2350 1150	% of CK 100.9 93.4 102.7 103.0 96.2 90.4 109.5	Requirement	Characteristic	Tolerance 3 3 2 3 4 2 2 3 3	Crumb Color 3 4 3 4 3 4 5 4	Grain & Texture 2 4 4 2 3 3 4 3	Protein 3 3 3 2 3 3 2 3 3 3 3 2 3	Milling 3 3 2 2 3 2 2 3	Baking 3 2 2 4 4 4 3	3 2 2 3 4 3 3 4 3
	Method Sponge/Dough Straight Dough -lb Sponge/Dough Sponge/Dough Straight Dough Straight Dough Straight Dough Straight Dough Straight Dough	Absorption 63.0 58.6 64.0 61.0 63.0 61.0 59.5 67.2	Volume 2900 2850 955 3104 3150 2350 1150 1050	% of CK 100.9 93.4 102.7 103.0 96.2 90.4 109.5 95.6	Requirement	Characteristic	Tolerance 3 3 2 3 4 2 2 3	Crumb Color 3 4 3 4 3 4 5	Grain & Texture 2 4 4 2 3 3 4	Protein 3 3 3 2 3 3 2 3 2 2	Milling 3 3 2 2 3 2 3 2 3 3	Baking 3 2 2 4 4 4 3 3	3 2 2 3 4 3 4

								Facto	ors Compa	ared to G	lenn Che	eck	
Casselton - C6	Bake	Bake	Loaf	LV	Mixing	Dough	Mix	Crumb	Grain &				
Cooperator	Method	Absorption	Volume	% of CK	Requirement	Characteristic	Tolerance	Color	Texture	Protein	Milling	Baking	Overall
1	Sponge/Dough	62.0	2925	98.3	5	5	3	3	3	3	3	3	3
2	Straight Dough -lb	62.1	3050	89.7	3	3	3	3	4	3	5	3	3
3	Sponge/Dough	64.0	920	92.2	4	4	2	3	3	3	4	2	2
4	Sponge/Dough	63.0	3104	104.0	5	5	2	2	2	4	4	2	2
5	Straight Dough	65.9	3050	99.2	4	4	3	3	4	2	2	2	2
6	Straight Dough	63.0	2550	89.5	3	3	3	2	2	3	2	2	2
7	Straight Dough	62.4	1025	102.0	3	4	4	2	2	3	4	2	3
8	Straight Dough	66.8	928	101.1	4	3	3	4	5	2	4	5	4
9	Straight Dough	65.3	805	100.6	3	4	3	3	3	3	3	3	3
Average		63.8		97.4	3.8	3.9	2.9	2.8	3.1	2.9	3.4	2.7	2.7
± 1 Std Dev from Mean		1.8		5.5	8.0	8.0	0.6	0.7	1.1	0.6	1.0	1.0	0.7
								Foot	oro Comp	arad ta C	lann Cha	ماد	
Minot M/	Daka	Dako	Loof	11/	Miving	Dough	Mix		ors Compa	ared to G	lenn Che	eck	
Minot - M6	Bake	Bake	Loaf	LV % of CV	Mixing	Dough Characteristic	Mix	Crumb	Grain &				Overall
Minot - M6 Cooperator	Method	Absorption	Volume	% of CK	Requirement	Characteristic	Tolerance	Crumb Color	Grain & Texture	Protein	Milling	Baking	Overall
	Method Sponge/Dough	Absorption 64.0	Volume 2900	% of CK 100.9	Requirement 5	Characteristic 5	Tolerance 3	Crumb Color 4	Grain & Texture 4	Protein 3		Baking 3	4
	Method Sponge/Dough Straight Dough -lb	Absorption 64.0 60.0	Volume 2900 3350	% of CK 100.9 109.8	Requirement 5 4	Characteristic 5 3	Tolerance 3 3	Crumb Color 4 4	Grain & Texture 4 4	Protein 3 3	Milling	Baking 3 4	4 4
	Method Sponge/Dough Straight Dough -lb Sponge/Dough	Absorption 64.0 60.0 64.0	Volume 2900 3350 925	% of CK 100.9 109.8 99.5	Requirement 5 4 5	Characteristic 5 3 4	Tolerance 3 3 4	Crumb Color 4 4 3	Grain & Texture 4 4 2	Protein 3 3 3	Milling	Baking 3 4 2	4 4 3
	Method Sponge/Dough Straight Dough -lb Sponge/Dough Sponge/Dough	Absorption 64.0 60.0 64.0 63.0	Volume 2900 3350 925 3074	% of CK 100.9 109.8 99.5 102.0	Requirement 5 4 5 5 5	Characteristic 5 3 4 5	Tolerance 3 3 4 3	Crumb Color 4 4 3 4	Grain & Texture 4 4	Protein 3 3 3 3	Milling	Baking 3 4 2 4	4 4 3 4
Cooperator 1 2 3 4 5	Method Sponge/Dough Straight Dough -lb Sponge/Dough Sponge/Dough Straight Dough	Absorption 64.0 60.0 64.0 63.0 65.3	Volume 2900 3350 925 3074 3275	% of CK 100.9 109.8 99.5 102.0 100.0	Requirement 5 4 5 5 2	Characteristic 5 3 4 5 3	Tolerance 3 3 4 3 4	Crumb Color 4 4 3 4 2	Grain & Texture 4 4 2 4 1	Protein 3 3 3 3 3	Milling 3 4 4 3 3	Baking 3 4 2 4 2	4 4 3 4 3
	Method Sponge/Dough Straight Dough -lb Sponge/Dough Sponge/Dough Straight Dough Straight Dough	Absorption 64.0 60.0 64.0 63.0 65.3 62.0	Volume 2900 3350 925 3074 3275 2550	% of CK 100.9 109.8 99.5 102.0 100.0 98.1	Requirement 5 4 5 5 5 2 3 3	Characteristic 5 3 4 5 3 3 3	3 3 4 3 4 2	Crumb Color 4 4 3 4 2 3	Grain & Texture 4 4 2 4 1 3	Protein 3 3 3 3 3 3 3 3	Milling 3 4 4 3 3 2	Baking 3 4 2 4 2 4	4 4 3 4 3 2
Cooperator 1 2 3 4 5 6 7	Method Sponge/Dough Straight Dough -lb Sponge/Dough Sponge/Dough Straight Dough Straight Dough Straight Dough	Absorption 64.0 60.0 64.0 63.0 65.3 62.0 60.8	Volume 2900 3350 925 3074 3275 2550 1105	% of CK 100.9 109.8 99.5 102.0 100.0 98.1 105.2	Requirement	5 3 4 5 3 4 5 3 3 3 3 3 3	3 3 4 3 4 2 3	Crumb Color 4 4 3 4 2 3 3	Grain & Texture 4 4 2 4 1 3 3	Protein 3 3 3 3 3 3 3 3 3	Milling 3 4 4 3 3	Baking 3 4 2 4 2 4 3	4 4 3 4 3 2 3
Cooperator 1 2 3 4 5 6 7	Method Sponge/Dough Straight Dough -lb Sponge/Dough Sponge/Dough Straight Dough Straight Dough Straight Dough Straight Dough Straight Dough	Absorption 64.0 60.0 64.0 63.0 65.3 62.0 60.8 67.4	Volume 2900 3350 925 3074 3275 2550 1105 1018	% of CK 100.9 109.8 99.5 102.0 100.0 98.1 105.2 92.7	Requirement	5 3 4 5 3 4 5 3 3 3 3 3 3 3 3	Tolerance 3 3 4 3 4 2 3 2	Crumb Color 4 4 3 4 2 3 3 5	Grain & Texture 4 4 2 4 1 3 3 3	Protein 3 3 3 3 3 3 5	Milling 3 4 4 3 3 2 3 4	Baking 3 4 2 4 2 4 3 4	4 4 3 4 3 2 3 3
Cooperator 1 2 3 4 5 6 7 8 9	Method Sponge/Dough Straight Dough -lb Sponge/Dough Sponge/Dough Straight Dough Straight Dough Straight Dough	Absorption 64.0 60.0 64.0 63.0 65.3 62.0 60.8 67.4 62.8	Volume 2900 3350 925 3074 3275 2550 1105	% of CK 100.9 109.8 99.5 102.0 100.0 98.1 105.2 92.7 115.4	Requirement	5 3 4 5 3 4 5 3 3 3 3 3 4	Tolerance 3 3 4 3 4 2 3 2 3	Crumb Color 4 4 3 4 2 3 3 5 4	Grain & Texture 4 4 2 4 1 3 3 3 3 3 3 3	Protein 3 3 3 3 3 3 5 3 3	Milling 3 4 4 3 3 2 3 4 3	Baking 3 4 2 4 2 4 3 4 5	4 4 3 4 3 2 3 3 4
Cooperator 1 2 3 4 5 6 7	Method Sponge/Dough Straight Dough -lb Sponge/Dough Sponge/Dough Straight Dough Straight Dough Straight Dough Straight Dough Straight Dough	Absorption 64.0 60.0 64.0 63.0 65.3 62.0 60.8 67.4	Volume 2900 3350 925 3074 3275 2550 1105 1018	% of CK 100.9 109.8 99.5 102.0 100.0 98.1 105.2 92.7	Requirement	5 3 4 5 3 4 5 3 3 3 3 3 3 3 3	Tolerance 3 3 4 3 4 2 3 2	Crumb Color 4 4 3 4 2 3 3 5	Grain & Texture 4 4 2 4 1 3 3 3	Protein 3 3 3 3 3 3 5	Milling 3 4 4 3 3 2 3 4	Baking 3 4 2 4 2 4 3 4	4 4 3 4 3 2 3 3

06 Inc 2 - SWQAC #7

								Facto	ors Compa	ared to G	lenn Che	eck	
Casselton - C7	Bake	Bake	Loaf	LV	Mixing	Dough	Mix	Crumb	Grain &				
Cooperator	Method	Absorption	Volume	% of CK	Requirement	Characteristic	Tolerance	Color	Texture	Protein	Milling	Baking	Overall
1	Sponge/Dough	63.0	3000	100.8	5	5	3	3	2	4	2	3	2
2	Straight Dough -lb	58.6	2750	80.9	4	2	3	3	4	5	2	1	1
3	Sponge/Dough	64.0	918	92.0	5	5	4	3	4	4	3	2	3
4	Sponge/Dough	61.0	3104	104.0	5	5	3	2	3	5	3	3	3
5	Straight Dough	62.2	3250	105.7	5	5	1	3	4	2	2	2	1
6	Straight Dough	60.0	2550	89.5	5	4	4	3	3	5	3	3	3
7	Straight Dough	58.7	990	98.5	4	5	5	3	3	5	2	2	2
8	Straight Dough	67.7	923	100.5	5	5	5	4	5	4	2	5	4
9	Straight Dough	62.5	725	90.6	4	4	4	2	3	4	2	2	2
Average		62.0		95.8	4.7	4.4	3.6	2.9	3.4	4.2	2.3	2.6	2.3
± 1 Std Dev from Mean		2.9		8.1	0.5	1.0	1.2	0.6	0.9	1.0	0.5	1.1	1.0
								F4			la	بام	
MUUTAA AA MAARAA MAARAAA MAARAA MAARAA MAARAA MAARAA MAARAA MAARAA MAARAA MAARAA MAARAAA MAARAA MAARAAA MAARAA MAARAAA MAARAA MAARAA MAARAA MAARAA MA	Dalea	Daka	Loof	11/	Missioner	Davak	N.A.:		ors Compa	ared to G	lenn Che	eck	
Williston - W7	Bake	Bake	Loaf	LV	Mixing	Dough	Mix	Crumb	Grain &				0
Williston - W7 Cooperator	Method	Absorption	Volume	% of CK	Requirement	Characteristic	Tolerance	Crumb Color	Grain & Texture	Protein	Milling	Baking	Overall
	Method Sponge/Dough	Absorption 65.0	Volume 3025	% of CK 103.4	Requirement 5	Characteristic 5	Tolerance 3	Crumb Color 3	Grain & Texture 3				3
	Method Sponge/Dough Straight Dough -lb	Absorption 65.0 61.4	Volume 3025 2900	% of CK 103.4 85.3	Requirement 5 5	Characteristic 5 4	Tolerance 3 4	Crumb Color 3 2	Grain & Texture 3 3	Protein 3 5	Milling	Baking	3 2
	Method Sponge/Dough Straight Dough -lb Sponge/Dough	Absorption 65.0 61.4 64.0	Volume 3025 2900 940	% of CK 103.4 85.3 93.3	Requirement 5 5 5 5	Characteristic 5	Tolerance 3 4 4	Crumb Color 3	Grain & Texture 3 3 4	Protein	Milling	Baking	3 2 3
	Method Sponge/Dough Straight Dough -lb Sponge/Dough Sponge/Dough	Absorption 65.0 61.4 64.0 63.0	3025 2900 940 3104	% of CK 103.4 85.3 93.3 101.9	Requirement 5 5 5 5 5 5	Characteristic 5 4	Tolerance 3 4	Crumb Color 3 2 5 4	Grain & Texture 3 3 4 4 4	Protein 3 5	Milling	Baking 3 2 3 4	3 2 3 3
	Method Sponge/Dough Straight Dough -lb Sponge/Dough Sponge/Dough Straight Dough	Absorption 65.0 61.4 64.0 63.0 65.1	Volume 3025 2900 940 3104 2925	% of CK 103.4 85.3 93.3 101.9 91.4	Requirement 5 5 5 5 3	Characteristic 5 4	Tolerance 3 4 4 3 1	Crumb Color 3 2 5 4 3	Grain & Texture 3 3 4 4 4 2	Protein 3 5	Milling	Baking 3 2 3 4 2	3 2 3 3 2
	Method Sponge/Dough Straight Dough -lb Sponge/Dough Sponge/Dough Straight Dough Straight Dough	Absorption 65.0 61.4 64.0 63.0 65.1 63.0	Volume 3025 2900 940 3104 2925 2850	% of CK 103.4 85.3 93.3 101.9 91.4 109.6	Requirement 5 5 5 5 5 5 3 5 5 5 5 5 6 5 6 6 7 6 7 6 7 6 7 6 7 6 7	Characteristic 5 4 5 5 4 4 4 4	Tolerance	Crumb Color 3 2 5 4 3 2	Grain & Texture 3 3 4 4 4 2 2 2	Protein 3 5	Milling	Baking 3 2 3 4	3 2 3 3
Cooperator 1 2 3 4 5 6 7	Method Sponge/Dough Straight Dough -lb Sponge/Dough Sponge/Dough Straight Dough Straight Dough Straight Dough	Absorption 65.0 61.4 64.0 63.0 65.1 63.0 61.6	Volume 3025 2900 940 3104 2925 2850 965	% of CK 103.4 85.3 93.3 101.9 91.4 109.6 83.9	Requirement	Characteristic	Tolerance 3 4 4 3 1 3 3	Crumb Color 3 2 5 4 3 2 2	Grain & Texture 3 3 4 4 2 2 2	Protein 3 5	Milling	Baking 3 2 3 4 2	3 2 3 3 2 4 1
Cooperator 1 2 3 4 5 6 7	Method Sponge/Dough Straight Dough -lb Sponge/Dough Sponge/Dough Straight Dough Straight Dough Straight Dough Straight Dough Straight Dough	Absorption 65.0 61.4 64.0 63.0 65.1 63.0 61.6 67.5	Volume 3025 2900 940 3104 2925 2850 965 955	% of CK 103.4 85.3 93.3 101.9 91.4 109.6 83.9 89.0	Requirement	Characteristic	Tolerance 3 4 4 3 1 3 3 4	Crumb Color 3 2 5 4 3 2 2 2 4	Grain & Texture 3 3 4 4 4 2 2 2	Protein 3 5 3 4 4 4 4 4	Milling 3 2 2 2 4 5 1 3	Baking 3 2 3 4 2	3 2 3 3 2
Cooperator 1 2 3 4 5 6 7 8 9	Method Sponge/Dough Straight Dough -lb Sponge/Dough Sponge/Dough Straight Dough Straight Dough Straight Dough	Absorption 65.0 61.4 64.0 63.0 65.1 63.0 61.6 67.5 64.9	Volume 3025 2900 940 3104 2925 2850 965	% of CK 103.4 85.3 93.3 101.9 91.4 109.6 83.9 89.0 61.8	Requirement	Characteristic	Tolerance 3 4 4 3 1 3 3 4 3	Crumb Color 3 2 5 4 3 2 2 2 4 2	Grain & Texture 3 3 4 4 2 2 2 4 1	Protein 3 5 3 4 4 4 4 3	Milling 3 2 2 4 5 1 3 3	Baking 3 2 3 4 2 5 2 4 1	3 2 3 3 2 4 1 4
Cooperator 1 2 3 4 5 6 7	Method Sponge/Dough Straight Dough -lb Sponge/Dough Sponge/Dough Straight Dough Straight Dough Straight Dough Straight Dough Straight Dough	Absorption 65.0 61.4 64.0 63.0 65.1 63.0 61.6 67.5	Volume 3025 2900 940 3104 2925 2850 965 955	% of CK 103.4 85.3 93.3 101.9 91.4 109.6 83.9 89.0	Requirement	Characteristic	Tolerance 3 4 4 3 1 3 3 4	Crumb Color 3 2 5 4 3 2 2 2 4	Grain & Texture 3 3 4 4 2 2 2	Protein 3 5 3 4 4 4 4 4	Milling 3 2 2 2 4 5 1 3	Baking 3 2 3 4 2	3 2 3 3 2 4 1

								Facto	rs Compa	red to G	lenn Che	eck	
Brookings - B9	Bake	Bake	Loaf	LV	Mixing	Dough	Mix		Grain &				
Cooperator	Method	Absorption	Volume	% of CK			Tolerance	Color	Texture	Protein	Milling	Baking	Overall
1	Sponge/Dough	57.0	2775	97.0	5	5	3	2	3	2	3	3	3
2	Straight Dough -lb	60.0	2550	94.4	2	3	3	3	3	2	2	1	2
3	Sponge/Dough	60.0	888	100.1	2	4	3	2	4	3	2	4	3
4	Sponge/Dough	61.0	3104	100.0	5	5	3	2	3	2	3	3	3
5	Straight Dough	64.5	2775	94.9	2	4	4	2	2	2	2	2	2
6	Straight Dough	62.0	2450	100.0	2	3	3	3	3	2	2	3	3
7	Straight Dough	61.0	880	101.1	4	3	2	2	3	2	2	3	2
8	Straight Dough	64.5	855	109.9	5	4	3	3	3	2	2	3	3
9	Straight Dough	65.6	700	96.6	3	5	3	2	3	3	2	3	3
Average		61.7		99.3	3.3	4.0	3.0	2.3	3.0	2.2	2.2	2.8	2.7
± 1 Std Dev from Mean		2.7		4.7	1.4	0.9	0.5	0.5	0.5	0.4	0.4	8.0	0.5
								Facto	ors Compa	red to G	lenn Che	eck	
Casselton - C9	Bake	Bake	Loaf	LV	Mixing	Dough	Mix	Crumb	Grain &				
Cooperator	Method	Absorption	Volume			Characteristic		Color	Texture			Baking	Overall
1	Sponge/Dough	61.0	2950	99.2	5	5	3	3	2	3	3	3	3
2	3 3	60.7	3100	91.2	3	3	3	4	4	3	2	4	3
3	Sponge/Dough	64.0	998	100.0	4	4	3	3	4	3	2	4	4
4	Sponge/Dough	63.0	3104	104.0	5	5	2	1	2	2	3	2	2
5	Straight Dough	64.5	3150	102.4	2	4	3	4	5	4	2	2	2
6	Straight Dough	62.0	2450	86.0	3	3	3	3	3	3	3	3	3
7	Straight Dough	61.0	1040	103.5	3	3	3	3	2	3	1	3	2
8	Straight Dough	66.8	943	102.7	5	3	2	4	5	2	2	5	4
9	Straight Dough	64.7	840	105.0	3	4	3	2	2	3	2	3	2
Average		63.1		99.3	3.7	3.8	2.8	3.0	3.2	2.9	2.2	3.2	2.8
± 1 Std Dev from Mean		2.1		6.5	1.1	8.0	0.4	1.0	1.3	0.6	0.7	1.0	8.0
								Facto	ors Compa	red to G	lenn Che	eck	
Crookston - K9	Bake	Bake	Loaf	LV	Mixing	Dough	Mix	Crumb	Grain &				
Cooperator	Method	Absorption	Volume	% of CK	Requirement	Characteristic	Tolerance	Color	Texture	Protein	Milling	Baking	Overall
1	Sponge/Dough	59.0	2800	93.3	5	5	3	4	3	2	3	3	3
2	Straight Dough -lb	63.6	3100	92.5	2	2	3	3	4	1	3	3	3
3	Sponge/Dough	62.0	898	97.3	3	5	3	4	3	1	3	3	3
4	Sponge/Dough	66.0	3045	102.0	5	5	3	1	2	1	3	2	2
5	Straight Dough	67.9	3000	90.9	1	1	4	3	3	2	3	1	2
6	Straight Dough	64.0	2650	108.2	1	1	1	3	3	1	3	1	1
7	Straight Dough	64.4	975	93.3	3	3	1	2	3	1	2	2	1
8	Straight Dough	66.2	890	90.5	4	3	2	2	4	2	3	4	4
9	Straight Dough	68.2	850	96.6	3	4	2	2	3	1	3	3	2
Average	5 5	64.6		96.1	3.0	3.2	2.4	2.7	3.1	1.3	2.9	2.4	2.3
± 1 Std Dev from Mean		2.9		5.8	1.5	1.6	1.0	1.0	0.6	0.5	0.3	1.0	1.0

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									ors Compa	ared to G	<u>lenn Ch</u> e	ck	
Casselton - C10	Bake	Bake	Loaf	LV	Mixing	Dough	Mix	Crumb	Grain &				
Cooperator	Method	Absorption	Volume	% of CK	Requirement	Characteristic	Tolerance	Color	Texture	Protein	Milling	Baking	Overall
1	Sponge/Dough	63.0	3000	100.8	3	3	2	3	3	4	3	3	3
2	Straight Dough -lb	62.9	3550	104.4	3	2	3	2	2	5	3	3	3
3	Sponge/Dough	64.0	1052	105.4	4	4	3	3	3	4	3	4	5
4	Sponge/Dough	65.0	3162	105.9	5	5	2	3	1	5	4	2	2
5	Straight Dough	67.3	3100	100.8	3	4	2	4	5	2	2	2	2
6	Straight Dough	64.0	2950	103.5	3	3	3	3	3	5	3	3	3
7	Straight Dough	63.8	1030	102.5	3	3	4	2	2	5	3	2	2
8	Straight Dough	67.9	1058	115.3	3	4	2	3	5	4	3	5	4
9	Straight Dough	65.3	875	109.4	3	4	3	2	2	4	3	4	4
Average		64.8		105.3	3.3	3.6	2.7	2.8	2.9	4.2	3.0	3.1	3.1
± 1 Std Dev from Mean		1.8		4.6	0.7	0.9	0.7	0.7	1.4	1.0	0.5	1.1	1.1
									ors Compa	ared to G	lenn Che	ck	
Minot - M10	Bake	Bake	Loaf	LV	Mixing	Dough	Mix	Crumb					
Cooperator	Method	Absorption	Volume			Characteristic		Color	Texture			Baking	Overall
1	Sponge/Dough	64.0	2925	101.7	5	5	3	3	2	3	3	3	3
2	Straight Dough -lb	60.0	3450	113.115	5	2	4	3	3	3	1	4	4
3	Sponge/Dough	64.0	943	101.398	3	4	3	3	4	3	3	3	3
4	Sponge/Dough	61.0	3104	103.0	5	5	3	4	4	3	2	4	3
5	Straight Dough	64.2	3400	103.8	2	3	4	2	1	4	3	3	3
6	Straight Dough	62.0	2650	101.9	4	4	3	3	4	3	2	4	3
7	Straight Dough	60.7	1140	108.6	3	3	3	2	3	3	2	3	3
8	Straight Dough	67.0	1115	101.5	4	5	2	3	3	4	2	2	3
9	Straight Dough	63.1	1005	128.8	3	4	3	3	2	3	3	5	4
Average		62.9		107.1	3.8	3.9	3.1	2.9	2.9	3.2	2.3	3.4	3.2
± 1 Std Dev from Mean		2.2		9.1	1.1	1.1	0.6	0.6	1.1	0.4	0.7	0.9	0.4
									ors Compa	ared to G	lenn Che	:ck	
Williston - W10	Bake	Bake	Loaf	LV	Mixing	Dough	Mix	Crumb					
Cooperator	Method	Absorption	Volume		Requirement	Characteristic	Tolerance	Color	Texture	Protein	Milling	Baking	Overall
1	Sponge/Dough	66.0	3050	104.3	5	5	3	3	3	3	3	3	3
2	0 0	65.0	3350	98.5	3	3	3	2	3	5	2	3	3
3	Sponge/Dough	64.0	1010	100.2	3	4	2	4	4	3	3	3	3
4	Sponge/Dough	66.0	3104	101.9	5	5	3	2	2	4	3	3	3
5	Straight Dough	69.0	3225	100.8	4	4	2	3	3	4	4	4	4
6	Straight Dough	66.0	2950	113.5	5	4	3	3	3	4	5	5	4
7	Straight Dough	65.5	1150	100.0	3	4	3	1	2	4	3	2	3
8	Straight Dough	69.1	1103	102.8	3	4	3	4	5	4	3	4	4
9	Straight Dough	67.6	920	103.4	3	4	3	2	1	4	3	3	3
Average	- '	66.5		102.8	3.8	4.1	2.8	2.7	2.9	3.9	3.2	3.3	3.3
± 1 Std Dev from Mean		1.7		4.4	1.0	0.6	0.4	1.0	1.2	0.6	8.0	0.9	0.5

								Facto	ors Compa	ared to G	lenn Che	eck	
Casselton - C11	Bake	Bake	Loaf	LV	Mixing	Dough	Mix	Crumb	Grain &				
Cooperator	Method	Absorption	Volume	% of CK	Requirement	Characteristic	Tolerance	Color	Texture	Protein	Milling	Baking	Overall
1	Sponge/Dough	62.0	2600	87.4	4	4	2	2	2	3	2	1	1
2	Straight Dough -lb	62.9	3050	89.7	3	2	3	3	4	4	3	3	3
3	Sponge/Dough	64.0	917	91.9	3	4	2	3	4	4	4	1	2
4	Sponge/Dough	65.0	2839	95.1	5	5	1	1	2	4	3	2	2
5	Straight Dough	67.1	2900	94.3	3	1	2	3	5	4	2	2	2
6	Straight Dough	64.0	2550	89.5	4	4	4	3	3	4	3	3	3
7	Straight Dough	63.6	1120	111.4	3	3	4	2	2	3	3	2	2
8	Straight Dough	67.8	918	100.0	4	4	2	3	4	3	3	4	4
9	Straight Dough	66.8	805	100.6	3	4	4	2	3	3	3	3	3
Average		64.8		95.5	3.6	3.4	2.7	2.4	3.2	3.6	2.9	2.3	2.4
± 1 Std Dev from Mean		2.0		7.5	0.7	1.2	1.1	0.7	1.1	0.5	0.6	1.0	0.9
								Facto	ors Compa	ared to G	lenn Che	-ck	
Minot - 11	Bake	Bake	Loaf	IV	Mixina	Dough	Mix		ors Compa Grain &	ared to G	lenn Che	eck	
Minot - 11 Cooperator	Bake Method	Bake Absorption	Loaf Volume	LV % of CK	Mixing Requirement	Dough Characteristic	Mix Tolerance	Crumb	Grain &		lenn Che		Overall
	Method	Bake Absorption 64.0			3	Dough Characteristic 5			Grain &	ered to G Protein 3			Overall 3
		Absorption 64.0	Volume	% of CK	Requirement	Characteristic	Tolerance	Crumb Color	Grain & Texture	Protein	Milling	Baking	
	Method Sponge/Dough	Absorption 64.0	Volume 2900	% of CK 100.9	Requirement 5	Characteristic 5	Tolerance 3	Crumb Color 3	Grain & Texture 3	Protein	Milling	Baking	3
	Method Sponge/Dough Straight Dough -lb	Absorption 64.0 60.7	Volume 2900 3300	% of CK 100.9 108.2	Requirement 5	Characteristic 5	Tolerance 3 2	Crumb Color 3 3	Grain & Texture 3 3	Protein 3 3	Milling	Baking	3 4
	Method Sponge/Dough Straight Dough -lb Sponge/Dough	Absorption 64.0 60.7 64.0	Volume 2900 3300 923	% of CK 100.9 108.2 99.2	Requirement 5 3 3	Characteristic 5	Tolerance 3 2 2	Crumb Color 3 3 3	Grain & Texture 3 3 4	Protein 3 3 3	Milling	Baking	3 4 2
	Method Sponge/Dough Straight Dough -lb Sponge/Dough Sponge/Dough	Absorption 64.0 60.7 64.0 63.0	Volume 2900 3300 923 3104	% of CK 100.9 108.2 99.2 103.0	Requirement 5 3 5 5	Characteristic 5	Tolerance 3 2 2 3	Crumb Color 3 3 3 5	Grain & Texture 3 3 4 4 4	Protein 3 3 3 3	Milling	Baking	3 4 2 4
Cooperator 1 2 3 4	Method Sponge/Dough Straight Dough -lb Sponge/Dough Sponge/Dough Straight Dough	Absorption 64.0 60.7 64.0 63.0 64.8	Volume 2900 3300 923 3104 3350	% of CK 100.9 108.2 99.2 103.0 103.1	Requirement 5 3 3 5 2	Characteristic 5	Tolerance 3 2 2 3	Crumb Color 3 3 3 5 3	Grain & Texture 3 3 4 4 3	Protein 3 3 3 3 3	Milling	Baking 3 4 2 4 4	3 4 2 4
Cooperator 1 2 3 4	Method Sponge/Dough Straight Dough -lb Sponge/Dough Sponge/Dough Straight Dough Straight Dough	Absorption 64.0 60.7 64.0 63.0 64.8 63.0	Volume 2900 3300 923 3104 3350 2500	% of CK 100.9 108.2 99.2 103.0 103.1 96.2	Requirement 5 3 5 5 2 2	Characteristic 5	Tolerance 3 2 2 3 5 1	Crumb Color 3 3 3 5 3 3	Grain & Texture 3 3 4 4 4 3 3 3	Protein 3 3 3 3 3 3 3 3	Milling	Baking 3 4 2 4 4	3 4 2 4 3 1
Cooperator 1 2 3 4 5 6 7	Method Sponge/Dough Straight Dough -lb Sponge/Dough Sponge/Dough Straight Dough Straight Dough Straight Dough	Absorption 64.0 60.7 64.0 63.0 64.8 63.0 61.3	Volume 2900 3300 923 3104 3350 2500 1135	% of CK 100.9 108.2 99.2 103.0 103.1 96.2 108.1	5 3 3 5 2 2 2 3	5 2 4 5 4 1 4	Tolerance 3 2 2 3 5 1 2	Crumb Color 3 3 5 3 5 3 3 3 3 3 3 3	Grain & Texture 3 3 4 4 3 3 3 3	Protein 3 3 3 3 3 3 3 3	Milling	Baking 3 4 2 4 4	3 4 2 4 3 1 3
Cooperator 1 2 3 4 5 6 7 8	Method Sponge/Dough Straight Dough -lb Sponge/Dough Sponge/Dough Straight Dough Straight Dough Straight Dough Straight Dough Straight Dough	Absorption 64.0 60.7 64.0 63.0 64.8 63.0 61.3 67.1	Volume 2900 3300 923 3104 3350 2500 1135 1090	% of CK 100.9 108.2 99.2 103.0 103.1 96.2 108.1 99.3	5 3 3 5 2 2 2 3 4	5 2 4 5 4 1 4 4 4	Tolerance 3 2 2 3 5 1 2 2	Crumb Color 3 3 5 3 5 3 3 3	Grain & Texture 3 3 4 4 3 3 3 2	Protein 3 3 3 3 3 3 4	Milling 3 2 3 3 1 3 3 3	Baking 3 4 2 4 4 3 2 3	3 4 2 4 3 1 3 2

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								Facto	ors Compa	ared to G	lenn Che	eck	
Casselton - C12	Bake	Bake	Loaf	LV	Mixing	Dough	Mix	Crumb					
Cooperator	Method	Absorption	Volume		Requirement	Characteristic	Tolerance	Color	Texture			Baking	Overall
1	Sponge/Dough	62.0	2800	94.1	2	3	1 3	3	2	3 4	3	2	2
2 3	Straight Dough -lb Sponge/Dough	64.3 64.0	3350 1013	98.5 101.5	3 4	2 4	3	4 3	4 4	4	3 4	4 3	3
3 4	Sponge/Dough	66.0	3074	101.5	4 5	4	ა 1	2	2	4	4	3	3 4
5	Straight Dough	67.1	3250	102.7	3	1	1	4	5	3	2	2	2
6	Straight Dough	64.0	2750	96.5	4	4	4	3	3	4	3	3	3
7	Straight Dough	64.6	1050	104.5	3	4	4	3	3	3	3	3	3
8	Straight Dough	68.4	1008	109.8	3	4	2	4	2	3	3	3	3
9	Straight Dough	66.8	925	115.6	3	4	4	4	3	3	3	5	4
Average		65.2		103.2	3.3	3.3	2.6	3.3	3.1	3.4	3.1	3.1	3.0
± 1 Std Dev from Mean		2.0		6.7	0.9	1.1	1.3	0.7	1.1	0.5	0.6	0.9	0.7
0 1 1 1/40	D.1	D.I.	1 6			D			ors Compa	ared to G	lenn Che	eck	
Crookston - K12	Bake Method	Bake	Loaf Volume	LV % of CK	Mixing Requirement	Dough	Mix Tolerance	Crumb	Grain &	Drotoin	Milling	Dokina	Overall
Cooperator	Sponge/Dough	Absorption 59.0	2850	95.0	Requirement 3	Characteristic 3	2	Color 3	Texture 3	Protein 2	Milling 3	Baking 4	3
2	Straight Dough -lb	63.6	3050	91.0	2	3	3	3	3	1	3 4	3	3
3	Sponge/Dough	64.0	945	102.4	4	4	4	2	3	1	3	4	3
4	Sponge/Dough	66.0	3045	102.4	5	5	3	4	2	1	4	2	3
5	Straight Dough	67.5	3125	94.7	2	1	2	3	3	2	3	2	3
6	Straight Dough	64.0	2700	110.2	4	4	4	3	3	2	4	4	4
7	Straight Dough	64.0	915	87.6	3	3	2	4	3	1	3	2	2
8	Straight Dough	64.9	855	87.0	4	3	2	3	4	2	3	4	4
9	Straight Dough	67.8	785	89.2	3	4	3	3	3	1	3	2	2
Average		64.5		95.4	3.3	3.3	2.8	3.1	3.0	1.4	3.3	3.0	3.0
± 1 Std Dev from Mean		2.6		7.9	1.0	1.1	8.0	0.6	0.5	0.5	0.5	1.0	0.7
								F4-	0		l Ch	1-	
Minot - M12	Rake	Bake	Loaf	LV	Mixina	Dough	Mix		ors Compa	ared to G	lenn Che	eck	
Minot - M12 Cooperator	Bake Method	Bake Absorption	Loaf Volume	LV % of CK	Mixing Requirement	Dough Characteristic	Mix Tolerance	Crumb	Grain &				Overall
Minot - M12 Cooperator	Method	Bake Absorption 64.0	Loaf Volume 2900			Dough Characteristic 5	Mix Tolerance	Crumb Color		Protein			Overall 2
		Absorption	Volume	% of CK	Requirement	Characteristic	Tolerance	Crumb	Grain & Texture		Milling	Baking	
Cooperator 1	Method Sponge/Dough	Absorption 64.0	Volume 2900	% of CK 100.9	Requirement 5	Characteristic 5	Tolerance 3	Crumb Color 2	Grain & Texture 2	Protein 3	Milling 3	Baking 3	2
Cooperator 1 2	Method Sponge/Dough Straight Dough -lb	Absorption 64.0 62.9	Volume 2900 3050	% of CK 100.9 100.0	Requirement 5 4	Characteristic 5 2	Tolerance 3 3	Crumb Color 2 3	Grain & Texture 2 3	Protein 3 3 3 3	Milling 3 1 3 2	Baking 3 3	2 3
Cooperator 1 2 3	Method Sponge/Dough Straight Dough -lb Sponge/Dough	Absorption 64.0 62.9 64.0	Volume 2900 3050 945	% of CK 100.9 100.0 101.6	Requirement 5 4 3 5 2	Characteristic 5 2 4	Tolerance 3 3 4	Crumb Color 2 3 4 4 2	Grain & Texture 2 3 5	Protein 3 3 3 3 3 3	Milling 3 1 3 2 3	3 3 4 3 4	2 3 4 3 3
Cooperator 1 2 3 4 5 6	Method Sponge/Dough Straight Dough -lb Sponge/Dough Sponge/Dough Straight Dough Straight Dough	Absorption 64.0 62.9 64.0 65.0 66.9 63.0	Volume 2900 3050 945 2956 3175 2500	% of CK 100.9 100.0 101.6 98.0 113.4 96.2	Requirement 5 4 3 5 2 4	Characteristic 5 2 4 5 4 4 4	3 3 4 3 4 4 4	Crumb Color 2 3 4 4 2 3	Grain & Texture 2 3 5 3 2 4	Protein 3 3 3 3 3 3 3 3	Milling 3 1 3 2 3 1	Baking 3 3 4 3 4 4	2 3 4 3 3 2
Cooperator 1 2 3 4 5 6 6 7	Method Sponge/Dough Straight Dough -lb Sponge/Dough Sponge/Dough Straight Dough Straight Dough Straight Dough	Absorption 64.0 62.9 64.0 65.0 66.9 63.0 63.4	Volume 2900 3050 945 2956 3175 2500 1145	% of CK 100.9 100.0 101.6 98.0 113.4 96.2 109.0	Requirement 5 4 3 5 2 4 3 3 5 3 4 3 3 5 4 3 3 5 5 4 4 3 3 5 5 5 5	Characteristic 5 2 4 5 4 4 3	3 3 4 3 4 4 4 4 3	Crumb Color 2 3 4 4 2 3 3	Grain & Texture 2 3 5 3 2 4 3	Protein 3 3 3 3 3 3 3 3 3 3	Milling 3 1 3 2 3 1 2	Baking 3 3 4 3 4 4 4 3	2 3 4 3 3 2 3
Cooperator 1 2 3 4 5 6 6 7 8	Method Sponge/Dough Straight Dough -Ib Sponge/Dough Sponge/Dough Straight Dough Straight Dough Straight Dough Straight Dough	Absorption 64.0 62.9 64.0 65.0 66.9 63.0 63.4 67.7	Volume 2900 3050 945 2956 3175 2500 1145 1080	% of CK 100.9 100.0 101.6 98.0 113.4 96.2 109.0 98.4	Requirement 5 4 3 5 2 4 3 4 4 3 4	5 2 4 5 4 4 3 3 3	Tolerance 3 3 4 4 4 4 3 3 3 3	Crumb Color 2 3 4 4 2 3 3 3	Grain & Texture 2 3 5 3 2 4 3 2	Protein 3 3 3 3 3 3 3 4	Milling 3 1 3 2 3 1 2 3 1 2 3	Baking 3 3 4 3 4 4 3 3 3 3	2 3 4 3 3 2 3 2
Cooperator 1 2 3 4 5 6 6 7 8 9 9	Method Sponge/Dough Straight Dough -lb Sponge/Dough Sponge/Dough Straight Dough Straight Dough Straight Dough	Absorption 64.0 62.9 64.0 65.0 66.9 63.0 63.4 67.7 64.8	Volume 2900 3050 945 2956 3175 2500 1145	% of CK 100.9 100.0 101.6 98.0 113.4 96.2 109.0 98.4 121.8	Requirement 5 4 3 5 5 2 4 4 3 4 4 3 4 3	Characteristic 5 2 4 5 4 4 3 3 4	3 3 4 3 4 4 3 3 3 3 3 3 3	Crumb Color 2 3 4 4 2 3 3 3 4	Grain & Texture 2 3 5 3 2 4 3 2 3	Protein 3 3 3 3 3 3 4 3	Milling 3 1 3 2 3 1 2 3 1 2 3 3	Baking 3 3 4 3 4 4 3 5	2 3 4 3 3 2 3 2 4
Cooperator 1 2 3 4 5 6 7 8 9 Average	Method Sponge/Dough Straight Dough -Ib Sponge/Dough Sponge/Dough Straight Dough Straight Dough Straight Dough Straight Dough	Absorption 64.0 62.9 64.0 65.0 66.9 63.0 63.4 67.7 64.8 64.6	Volume 2900 3050 945 2956 3175 2500 1145 1080	% of CK 100.9 100.0 101.6 98.0 113.4 96.2 109.0 98.4 121.8	Requirement 5 4 3 5 5 2 4 4 3 3 4 4 3 3 3.7	Characteristic 5 2 4 5 4 4 3 3 4 3.8	Tolerance 3 3 4 4 3 4 4 3 3 3 3 3 3 3 3 3 3	Crumb Color 2 3 4 4 2 3 3 3 4 4 3.1	Grain & Texture 2 3 5 5 3 2 4 3 2 3 3 3.0	Protein 3 3 3 3 3 3 3 4 3 3 3 3 3 1 4 3 3 3 1 1	Milling 3 1 3 2 3 1 2 3 1 2 3 2 3 2 3 2 3	Baking 3 3 4 3 4 4 3 5 3.6	2 3 4 3 3 2 3 2 4 2.9
Cooperator 1 2 3 4 5 6 6 7 8 9 9	Method Sponge/Dough Straight Dough -Ib Sponge/Dough Sponge/Dough Straight Dough Straight Dough Straight Dough Straight Dough	Absorption 64.0 62.9 64.0 65.0 66.9 63.0 63.4 67.7 64.8	Volume 2900 3050 945 2956 3175 2500 1145 1080	% of CK 100.9 100.0 101.6 98.0 113.4 96.2 109.0 98.4 121.8	Requirement 5 4 3 5 5 2 4 4 3 4 4 3 4 3	Characteristic 5 2 4 5 4 4 3 3 4	3 3 4 3 4 4 3 3 3 3 3 3 3	Crumb Color 2 3 4 4 2 3 3 3 4	Grain & Texture 2 3 5 3 2 4 3 2 3	Protein 3 3 3 3 3 3 4 3	Milling 3 1 3 2 3 1 2 3 1 2 3 3	Baking 3 3 4 3 4 4 3 5	2 3 4 3 3 2 3 2 4
Cooperator 1 2 3 4 5 6 7 8 9 Average	Method Sponge/Dough Straight Dough -Ib Sponge/Dough Sponge/Dough Straight Dough Straight Dough Straight Dough Straight Dough	Absorption 64.0 62.9 64.0 65.0 66.9 63.0 63.4 67.7 64.8 64.6	Volume 2900 3050 945 2956 3175 2500 1145 1080	% of CK 100.9 100.0 101.6 98.0 113.4 96.2 109.0 98.4 121.8	Requirement 5 4 3 5 5 2 4 4 3 3 4 4 3 3 3.7	Characteristic 5 2 4 5 4 4 3 3 4 3.8	Tolerance 3 3 4 4 3 4 4 3 3 3 3 3 3 3 3 3 3	Crumb Color 2 3 4 4 2 3 3 3 4 3.1 0.8	Grain & Texture 2 3 5 5 3 2 4 4 3 2 2 3 3.0 1.0	Protein 3 3 3 3 3 3 4 3 3.1 0.3	Milling 3 1 3 2 3 1 2 3 1 2 3 0.9	Baking 3 4 3 4 4 3 5 3.6 0.7	2 3 4 3 3 2 3 2 4 2.9
Cooperator 1 2 3 4 5 6 7 8 9 Average ± 1 Std Dev from Mean	Method Sponge/Dough Straight Dough -Ib Sponge/Dough Sponge/Dough Straight Dough Straight Dough Straight Dough Straight Dough Straight Dough Straight Dough	Absorption 64.0 62.9 64.0 65.0 66.9 63.0 63.4 67.7 64.8 64.6 1.7	Volume 2900 3050 945 2956 3175 2500 1145 1080 950	% of CK 100.9 100.0 101.6 98.0 113.4 96.2 109.0 98.4 121.8 104.4 8.6	Requirement 5 4 3 5 2 4 3 4 3 3.7 1.0	Characteristic 5 2 4 4 5 5 4 4 4 3 3 3 4 4 3.8 1.0	3 3 4 3 4 4 3 3 3 3 0.5	Crumb Color 2 3 4 4 2 3 3 3 4 3.1 0.8	Grain & Texture 2 3 5 5 3 2 4 4 3 2 3 3.0 1.0 ors Compa	Protein 3 3 3 3 3 3 4 3 3.1 0.3	Milling 3 1 3 2 3 1 2 3 1 2 3 0.9	Baking 3 4 3 4 4 3 5 3.6 0.7	2 3 4 3 3 2 3 2 4 2.9
Cooperator 1 2 3 4 5 6 7 8 9 Average	Method Sponge/Dough Straight Dough -Ib Sponge/Dough Sponge/Dough Straight Dough Straight Dough Straight Dough Straight Dough	Absorption 64.0 62.9 64.0 65.0 66.9 63.0 63.4 67.7 64.8 64.6	Volume 2900 3050 945 2956 3175 2500 1145 1080	% of CK 100.9 100.0 101.6 98.0 113.4 96.2 109.0 98.4 121.8 104.4 8.6	8 Requirement 5 4 3 5 5 2 4 4 3 3 4 4 3 3 3.7 1.0 Mixing	Characteristic 5 2 4 5 4 4 3 3 4 3.8	Tolerance 3 3 4 4 3 4 4 3 3 3 3 3 3 3 3 3 3	Crumb Color 2 3 4 4 2 3 3 4 4 2 5 1 0.8	Grain & Texture 2 3 5 5 3 2 4 4 3 2 3 3.0 1.0 ors Compa	Protein 3 3 3 3 3 3 4 3 3.1 0.3	Milling 3 1 3 2 3 1 2 3 1 2 3 0.9	Baking 3 3 4 4 3 5 3.6 0.7	2 3 4 3 3 2 3 2 4 2.9 0.8
Cooperator 1 2 3 4 5 6 7 8 9 Average ± 1 Std Dev from Mean	Method Sponge/Dough Straight Dough -Ib Sponge/Dough Sponge/Dough Straight Dough	Absorption 64.0 62.9 64.0 65.0 66.9 63.0 63.4 67.7 64.8 64.6 1.7	2900 3050 945 2956 3175 2500 1145 1080 950	% of CK 100.9 100.0 101.6 98.0 113.4 96.2 109.0 98.4 121.8 104.4 8.6	8 Requirement 5 4 3 5 5 2 4 4 3 3 4 4 3 3 3.7 1.0 Mixing	Characteristic 5 2 4 5 4 4 3 3 4 3.8 1.0	3 3 4 4 3 3 3 3 3 3 3 3 3 Mix	Crumb Color 2 3 4 4 2 3 3 4 4 2 Crumb Crumb	Grain & Texture 2 3 5 3 2 4 3 2 3 3.0 1.0 ors Compa	Protein 3 3 3 3 3 3 4 3 3.1 0.3	Milling 3 1 3 2 3 1 2 3 1 2 3 0.9	Baking 3 3 4 4 3 5 3.6 0.7	2 3 4 3 3 2 3 2 4 2.9 0.8
Cooperator 1 2 3 4 5 6 7 8 9 Average ± 1 Std Dev from Mean	Method Sponge/Dough Straight Dough -lb Sponge/Dough Sponge/Dough Straight Dough Straight Dough Straight Dough Straight Dough Straight Dough Straight Dough Bake Method	Absorption 64.0 62.9 64.0 65.0 66.9 63.0 63.4 67.7 64.8 64.6 1.7 Bake Absorption	2900 3050 945 2956 3175 2500 1145 1080 950 Loaf Volume	% of CK 100.9 100.0 101.6 98.0 113.4 96.2 109.0 98.4 121.8 104.4 8.6	Sequirement S	Characteristic 5 2 4 4 5 4 4 3 3 4 3.8 1.0 Dough Characteristic	3 3 4 4 4 3 3 3 3 0.5	Crumb Color 2 3 4 4 2 3 3 4 4 0.8 Facto Crumb Color	Grain & Texture 2 3 5 3 2 4 3 2 3 3.0 1.0 ors Compa	Protein 3 3 3 3 3 3 4 3 3.1 0.3 ared to G	Milling 3 1 3 2 3 1 2 3 3 2.3 0.9 Ienn Che	Baking 3 3 4 3 4 4 3 3 5 0.7	2 3 4 3 2 3 2 4 2.9 0.8
Cooperator	Method Sponge/Dough Straight Dough -Ib Sponge/Dough Sponge/Dough Straight Dough	Absorption 64.0 62.9 64.0 65.0 66.9 63.0 63.4 67.7 64.8 64.6 1.7 Bake Absorption 65.0	Volume 2900 3050 945 2956 3175 2500 1145 1080 950 Loaf Volume 2875 3450 960	% of CK 100.9 100.0 101.6 98.0 113.4 96.2 109.0 98.4 121.8 104.4 8.6 LV % of CK 98.3 101.5 95.2	Requirement 5 4 3 5 2 4 3 4 3 3.7 1.0 Mixing Requirement 5 4 4	Characteristic 5 2 4 5 4 4 3 3 4 3.8 1.0 Dough Characteristic 5 2 4	3 3 4 4 3 3 3 3 3 3 3 3 5 Mix Tolerance 3 4 2	Crumb Color 2 3 4 4 2 3 3 4 3.1 0.8 Factc Crumb Color 3 4	Grain & Texture 2 3 5 3 2 4 3 2 3 3.0 1.0 ors Compa Grain & Texture 3	Protein 3 3 3 3 3 3 3 4 3 3.1 0.3 ared to G Protein 3 3 3 3	Milling 3 1 3 2 3 1 2 3 1 2 3 0.9 Ienn Che Milling 3 1 2	Baking 3 4 3 4 4 3 5 3.6 0.7 eck Baking 3 3 3	2 3 4 3 3 2 3 2 4 2.9 0.8
Cooperator	Method Sponge/Dough Straight Dough -Ib Sponge/Dough Sponge/Dough Straight Dough Bake Method Sponge/Dough Straight Dough -Ib Sponge/Dough Sponge/Dough	Absorption 64.0 62.9 64.0 65.0 66.9 63.0 63.4 67.7 64.8 64.6 1.7 Bake Absorption 65.0 65.0 64.0 66.0	Volume 2900 3050 945 2956 3175 2500 1145 1080 950 Loaf Volume 2875 3450 960 3074	% of CK 100.9 100.0 101.6 98.0 113.4 96.2 109.0 98.4 121.8 104.4 8.6 LV % of CK 98.3 101.0	Requirement	Characteristic 5 2 4 5 4 4 3 3 4 3.8 1.0 1.0 Dough Characteristic 5 2 4 5	Tolerance 3 3 4 4 3 3 3 3 3 3.3 0.5 Mix Tolerance 3 4 4 2 3	Crumb Color 2 3 4 4 2 3 3 4 3.1 0.8 Facto Crumb Color 3 3 4 5	Grain & Texture 2 3 5 3 5 4 3 2 4 3 2 3 3.0 1.0 Drs Compa Grain & Texture 3 3 4	Protein 3 3 3 3 3 3 3 3 4 3 3 3 4 7 0 7 Protein 3 3 4 4	Milling 3 1 3 2 3 1 2 3 3 2.3 0.9 Milling 3 1 2 3 3 3 2.3 0.9	Baking 3 3 4 3 4 4 3 5 5 3.6 0.7 eck Baking 3 3 4	2 3 4 3 3 2 3 2 4 2.9 0.8
Cooperator	Method Sponge/Dough Straight Dough -Ib Sponge/Dough Sponge/Dough Straight Dough Sponge/Dough Sponge/Dough Sponge/Dough Straight Dough	Absorption 64.0 62.9 64.0 65.0 66.9 63.0 63.4 67.7 64.8 64.6 1.7 Bake Absorption 65.0 65.0 64.0 66.0 69.3	Volume 2900 3050 945 2956 3175 2500 1145 1080 950 Loaf Volume 2875 3450 960 3074 3300	% of CK 100.9 100.0 101.6 98.0 113.4 96.2 109.0 98.4 121.8 104.4 8.6 LV % of CK 98.3 101.5 95.2 101.0 103.1	Requirement 5 4 3 5 2 4 3 4 3 3.7 1.0 Mixing Requirement 5 4 4 5 3 3	Characteristic 5 2 4 5 4 3 3 3 4 3.8 1.0 1.0 Dough Characteristic 5 2 4 5 1	3 3 4 4 3 3 4 4 3 3 3 0.5	Crumb Color 2 3 4 4 2 3 3 4 3.1 0.8 Factc Crumb Color 3 4 5 5	Grain & Texture 2 3 5 3 2 4 3 2 3 3.0 1.0 ors Compa Grain & Texture 3 3 4 5	Protein 3 3 3 3 3 3 3 4 3 3.1 0.3 ared to G Protein 3 3 4 3 4 3	Milling 3 1 3 2 3 1 2 3 3 2.3 0.9 lenn Cho Milling 3 1 2 3 3 3	Baking 3 4 3 4 4 3 5 3.6 0.7 eck Baking 3 4 4 4 4	2 3 4 3 2 3 2 4 2.9 0.8
Cooperator	Method Sponge/Dough Straight Dough -Ib Sponge/Dough Sponge/Dough Straight Dough Sponge/Dough Straight Dough -Ib Sponge/Dough Straight Dough Straight Dough Straight Dough	Absorption 64.0 62.9 64.0 65.0 66.9 63.0 63.4 67.7 64.8 64.6 1.7 Bake Absorption 65.0 64.0 66.0 69.3 66.0	Volume 2900 3050 945 2956 3175 2500 1145 1080 950 Loaf Volume 2875 3450 960 3074 3300 2550	% of CK 100.9 100.0 101.6 98.0 113.4 96.2 109.0 98.4 121.8 104.4 8.6 LV % of CK 98.3 101.5 95.2 101.0 103.1	Requirement 5 4 3 5 2 4 3 4 3 3.7 1.0 Mixing Requirement 5 4 4 5 3 4 5 3 4	Characteristic 5 2 4 5 4 4 3 3 4 3.8 1.0 1.0 Dough Characteristic 5 2 4 5 1 5 1 5	3 3 4 4 3 3 4 4 3 3 3 0.5	Crumb Color 2 3 4 4 2 3 3 3 4 3.1 0.8 Facte Crumb Color 3 3 4 4 5 5 5 5 5	Grain & Texture 2 3 3 5 3 2 4 4 3 2 3 3 4 5 5 3 3 4 5 5 3 4 5 5 3	Protein 3 3 3 3 3 3 3 4 3 3.1 0.3 ared to G Protein 3 3 4 4 3 3 3 4 4 3 3 3 4 4 3 3 3 4 4 3 3 3 4 4 3 3 3 4 4 3 3 3 4 4 3 3 3 4 4 3 3 3 4 4 3 3 3 4 4 3 3 3 4 4 3 3 3 4 4 3 3 3 4 4 3 3 3 4 4 3 3 3 4 4 3 3 3 4 4 3 3 3 4 4 3 3 3 4 4 4 3 3 3 4 4 4 8 4 8	Milling 3 1 3 2 3 1 2 3 3 2 3 0.9 lenn Che Milling 3 1 2 3 3 5	Baking 3 4 3 4 4 3 5 6 0.7 eck Baking 3 3 4 4 4 2	2 3 4 3 3 2 3 2 4 2.9 0.8
Cooperator	Method Sponge/Dough Straight Dough -Ib Sponge/Dough Sponge/Dough Straight Dough Sponge/Dough Sponge/Dough Sponge/Dough Straight Dough	Absorption 64.0 62.9 64.0 65.0 66.9 63.0 63.4 67.7 64.8 64.6 1.7 Bake Absorption 65.0 64.0 66.0 69.3 66.0 65.8	Volume 2900 3050 945 2956 3175 2500 1145 1080 950 Loaf Volume 2875 3450 960 3074 3300 2550 1090	% of CK 100.9 100.0 101.6 98.0 113.4 96.2 109.0 98.4 121.8 104.4 8.6 LV % of CK 98.3 101.0 103.1 95.2 101.0 103.1 98.1 94.8	Requirement 5 4 3 5 2 4 3 4 3 3.7 1.0 Mixing Requirement 5 4 4 5 3 4 3 4 3 4 3 4 5 3 4 3 6 6 6 7 7 8 7 8 8 8 8 8 8 8 8 8 8 8 8 8	Characteristic 5 2 4 5 4 4 3 3 4 3.8 1.0 1.0 Dough Characteristic 5 2 4 5 1 5 3 3	3 3 4 4 3 3 4 4 3 3 3 3 3 3 3 5 Mix Tolerance 3 4 2 3 4 3 1	Crumb Color 2 3 4 4 2 3 3 3 4 3.1 0.8 Facto Crumb Color 3 4 5 5 5 3 3 4 3 3 3 4 4 5 5 7 8 7 8 8 7 8 8 7 8 8 7 8 8 8 8 8 7 8	Grain & Texture 2 3 3 5 3 2 4 4 3 2 2 3 3 .0 1.0 ors Compa Grain & Texture 3 3 4 4 5 5 3 3 3	Protein 3 3 3 3 3 3 3 4 3 3.1 0.3 ared to G Protein 3 3 4 3 3 3 4 3 3 3 4 3 3 3 4 3 3 3 4 3 3 3 4 3 3 3 4 3 3 3 4 3 3 3 4 3 3 3 4 3 3 3 4 3 3 3 4 3 3 3 4 3 3 3 4 3 3 3 4 3 3 3 3 4 3 3 3 3 4 3 3 3 3 4 3 3 3 3 4 3 3 3 3 4 3 3 3 3 3 4 3 3 3 3 3 4 3 3 3 3 4 3 3 3 3 3 3 4 3	Milling 3 1 3 2 3 1 2 3 3 2.3 0.9 lenn Che Milling 3 1 2 3 3 5 3 5 3	Baking 3 3 4 3 4 4 3 5 3.6 0.7 eck Baking 3 3 4 4 2 2	2 3 4 4 3 3 2 4 4 2.9 0.8 Overall 3 3 3 4 4 4 2 2 2
Cooperator	Method Sponge/Dough Straight Dough -Ib Sponge/Dough Sponge/Dough Straight Dough Bake Method Sponge/Dough Straight Dough -Ib Sponge/Dough Straight Dough	Absorption 64.0 62.9 64.0 65.0 66.9 63.0 63.4 67.7 64.8 64.6 1.7 Bake Absorption 65.0 64.0 66.0 69.3 66.0 65.8 69.2	Volume 2900 3050 945 2956 3175 2500 1145 1080 950 Loaf Volume 2875 3450 960 3074 3300 2550 1090 1088	% of CK 100.9 100.0 101.6 98.0 113.4 96.2 109.0 98.4 121.8 104.4 8.6 LV % of CK 98.3 101.5 95.2 101.0 103.1 98.1	Requirement 5 4 3 5 2 4 3 3 4 3 3.7 1.0 Mixing Requirement 5 4 4 5 3 4 4 5 3 4 4 5 4 4 5 4 4 5 4 4 6 6 6 6 6 6 6 6 6	Characteristic 5 2 4 5 4 4 3 3 4 3.8 1.0 1.0 Dough Characteristic 5 2 4 5 1 5 3 3 3 3	Tolerance 3 3 4 4 3 4 4 3 3 3 3 3 3 5 5 Mix Tolerance 3 4 2 3 4 3 1 3	Crumb Color 2 3 4 4 2 3 3 3 4 3.1 0.8 Facto Crumb Color 3 4 5 5 5 3 4 4 4 7 7 8 7 8 8 8 8 9 8 9 8 9 8 9 8 9 8 9 8	Grain & Texture 2 3 5 3 5 3 2 4 3 2 3 3.0 1.0 ors Compa Grain & Texture 3 3 4 5 3 3 5 5	Protein 3 3 3 3 3 3 3 3 4 3 3 3 4 7 0 3 3 4 3 3 4 3 3 4 3 3 3 4 3 3 3 4 3 3 3 4 3 3 3 4 3 3 3 4 3 3 3 4 3 3 3 4 3 3 3 4 3 3 3 3 4 3 3 3 3 4 3 3 3 3 4 3 3 3 3 4 3 3 3 3 4 3 3 3 3 3 4 3 3 3 3 3 3 4 3	Milling 3 1 3 2 3 1 2 3 3 2 3 0.9 Ienn Che Milling 3 1 2 3 3 2 3 2 3 2 3 2 3 3 2 3 2	Baking 3 4 3 4 4 3 5 3.6 0.7 eck Baking 3 4 4 2 4	2 3 4 3 3 2 3 2 4 2.9 0.8
Cooperator	Method Sponge/Dough Straight Dough -Ib Sponge/Dough Sponge/Dough Straight Dough Sponge/Dough Sponge/Dough Sponge/Dough Straight Dough	Absorption 64.0 62.9 64.0 65.0 66.9 63.0 63.4 67.7 64.8 64.6 1.7 Bake Absorption 65.0 65.0 64.0 66.0 69.3 66.0 65.8 69.2 67.6	Volume 2900 3050 945 2956 3175 2500 1145 1080 950 Loaf Volume 2875 3450 960 3074 3300 2550 1090	% of CK 100.9 100.0 101.6 98.0 113.4 96.2 109.0 98.4 121.8 104.4 8.6 LV % of CK 98.3 101.5 95.2 101.0 103.1 98.1 94.8 101.4 112.4	Requirement 5 4 3 5 2 4 3 4 3 3.7 1.0 Mixing Requirement 5 4 4 5 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4	Characteristic 5 2 4 5 4 3 3 3 4 3.8 1.0 Dough Characteristic 5 2 4 5 1 5 3 3 4 4 4 4 4 4 4 4 5 6 6 7 7 8 7 8 8 7 8 8 7 8 8 8 8 8 8 8 8	Tolerance 3 3 4 4 3 3 3 3 3.3 0.5 Mix Tolerance 3 4 2 3 4 3 1 3 2	Crumb Color 2 3 4 4 2 3 3 3 4 3.1 0.8 Facto Color 3 3 4 5 5 5 3 4 4 5 7	Grain & Texture 2 3 5 3 5 3 2 4 3 2 3 3.0 1.0 Ors Compa Grain & Texture 3 3 4 5 3 3 5 3 3 5 3 3 3 3 3 3 3 3 3 3	Protein 3 3 3 3 3 3 3 4 3 3.1 0.3 Protein 3 3 4 3 3 4 3 3 3 4 3 3 3 3 4 3 3 3 3	Milling 3 1 3 2 3 1 2 3 3 2.3 0.9 lenn Che Milling 3 1 2 3 3 5 3 2 3 3 5 3 2 3	Baking 3 4 3 4 4 3 5 3.6 0.7 eck Baking 3 4 4 2 4 5	2 3 4 3 2 3 2 4 2.9 0.8 Overall 3 3 3 4 4 2 2
Cooperator	Method Sponge/Dough Straight Dough -Ib Sponge/Dough Sponge/Dough Straight Dough Bake Method Sponge/Dough Straight Dough -Ib Sponge/Dough Straight Dough	Absorption 64.0 62.9 64.0 65.0 66.9 63.0 63.4 67.7 64.8 64.6 1.7 Bake Absorption 65.0 64.0 66.0 69.3 66.0 65.8 69.2	Volume 2900 3050 945 2956 3175 2500 1145 1080 950 Loaf Volume 2875 3450 960 3074 3300 2550 1090 1088	% of CK 100.9 100.0 101.6 98.0 113.4 96.2 109.0 98.4 121.8 104.4 8.6 LV % of CK 98.3 101.5 95.2 101.0 103.1 98.1	Requirement 5 4 3 5 2 4 3 3 4 3 3.7 1.0 Mixing Requirement 5 4 4 5 3 4 4 5 3 4 4 5 4 4 5 4 4 5 4 4 6 6 6 6 6 6 6 6 6	Characteristic 5 2 4 5 4 4 3 3 4 3.8 1.0 1.0 Dough Characteristic 5 2 4 5 1 5 3 3 3 3	Tolerance 3 3 4 4 3 4 4 3 3 3 3 3 3 5 5 Mix Tolerance 3 4 2 3 4 3 1 3	Crumb Color 2 3 4 4 2 3 3 3 4 3.1 0.8 Facto Crumb Color 3 4 5 5 5 3 4 4 4 7 7 8 7 8 8 8 8 9 8 9 8 9 8 9 8 9 8 9 8	Grain & Texture 2 3 5 3 5 3 2 4 3 2 3 3.0 1.0 ors Compa Grain & Texture 3 3 4 5 3 3 5 5	Protein 3 3 3 3 3 3 3 3 4 3 3 3 4 7 0 3 3 4 3 3 4 3 3 4 3 3 3 4 3 3 3 4 3 3 3 4 3 3 3 4 3 3 3 4 3 3 3 4 3 3 3 4 3 3 3 4 3 3 3 3 4 3 3 3 3 4 3 3 3 3 4 3 3 3 3 4 3 3 3 3 4 3 3 3 3 3 4 3 3 3 3 3 3 4 3	Milling 3 1 3 2 3 1 2 3 3 2 3 0.9 Ienn Che Milling 3 1 2 3 3 2 3 2 3 2 3 2 3 3 2 3 2	Baking 3 4 3 4 4 3 5 3.6 0.7 eck Baking 3 4 4 2 4	2 3 4 3 3 2 3 2 4 2.9 0.8

06 Inc 1 - SWQAC #13

							Factors Compared to Glenn Check						
Casselton - 13	Bake	Bake	Loaf	LV	Mixing	Dough	Mix	Crumb	Grain &				
Cooperator	Method	Absorption	Volume	% of CK	Requirement	Characteristic	Tolerance	Color	Texture	Protein	Milling	Baking	Overall
1	Sponge/Dough	62.0	2900	97.5	2	3	1	2	2	3	3	2	2
2	Straight Dough -lb	57.9	3100	91.2	3	3	3	4	5	3	5	4	4
3	Sponge/Dough	64.0	975	97.7	4	4	3	3	4	3	4	3	3
4	Sponge/Dough	61.0	2897	97.0	4	3	1	2	2	3	4	2	2
5	Straight Dough	62.2	3275	106.5	3	4	4	5	4	3	2	2	2
6	Straight Dough	63.0	2950	103.5	3	3	3	2	2	3	2	2	2
7	Straight Dough	58.7	1065	106.0	3	3	4	2	3	4	4	2	3
8	Straight Dough	65.1	938	102.2	3	4	2	4	4	3	3	4	4
9	Straight Dough	64.0	860	107.5	3	4	3	2	2	3	3	4	3
Average		62.0		101.0	3.1	3.4	2.7	2.9	3.1	3.1	3.3	2.8	2.8
± 1 Std Dev from Mean		2.4		5.5	0.6	0.5	1.1	1.2	1.2	0.3	1.0	1.0	8.0
							Factors Compared to Glenn Check						
								F4	0		lauan Oba	بام	
Willioton W12	Daka	Doko	Loof	11/	Missing	Dough	Mix			ared to G	lenn Che	eck	
Williston - W13	Bake	Bake	Loaf	LV % of CV	Mixing	Dough Characteristic	Mix	Crumb	Grain &				Overall
Williston - W13 Cooperator	Method	Absorption	Volume	% of CK	Requirement	Characteristic	Tolerance	Crumb Color	Grain & Texture	Protein	Milling		Overall
	Method Sponge/Dough	Absorption 66.0	Volume 2825	% of CK 96.6	Requirement 5		Tolerance 3	Crumb Color 3	Grain & Texture 3				3
	Method Sponge/Dough Straight Dough -lb	Absorption 66.0 62.9	Volume 2825 3450	% of CK 96.6 101.5	Requirement 5 3	Characteristic 5 1	Tolerance	Crumb Color 3 3	Grain & Texture 3 3	Protein 3 5	Milling	Baking 3 3	
	Method Sponge/Dough Straight Dough -lb Sponge/Dough	Absorption 66.0 62.9 64.0	Volume 2825 3450 888	% of CK 96.6 101.5 88.1	Requirement 5 3 2	Characteristic 5 1 3	Tolerance 3 3 1	Crumb Color 3 3 2	Grain & Texture 3 3 2	Protein 3 5 3	Milling		3 3 1
	Method Sponge/Dough Straight Dough -lb Sponge/Dough Sponge/Dough	Absorption 66.0 62.9 64.0 65.0	Volume 2825 3450 888 3074	% of CK 96.6 101.5 88.1 101.0	Requirement 5 3 2 5	Characteristic 5 1 3 5	Tolerance 3 3 1 1 3	Crumb Color 3 3 2 2	Grain & Texture 3 3 2 2 2	Protein 3 5	Milling	Baking 3 3	3 3 1 2
Cooperator 1 2 3 4 5	Method Sponge/Dough Straight Dough -lb Sponge/Dough Sponge/Dough Straight Dough	Absorption 66.0 62.9 64.0 65.0 67.3	Volume 2825 3450 888 3074 3275	% of CK 96.6 101.5 88.1 101.0 102.3	Requirement 5 3 2 5 5 5	Characteristic 5 1 3 5 3 5 3	Tolerance 3 3 1 3 3 3 3	Crumb Color 3 3 2 2 4	Grain & Texture 3 3 2 2 2 5	Protein 3 5 3	Milling	Baking 3 3	3 3 1 2 4
	Method Sponge/Dough Straight Dough -lb Sponge/Dough Sponge/Dough Straight Dough Straight Dough	Absorption 66.0 62.9 64.0 65.0 67.3 65.0	Volume 2825 3450 888 3074 3275 2700	% of CK 96.6 101.5 88.1 101.0 102.3 103.8	Requirement 5 3 2 5 5 5 4	Characteristic 5 1 3 5 3 5 3 5	Tolerance 3 3 1 3 3 3 3 3	Crumb Color 3 3 2 2 4 3	Grain & Texture 3 3 2 2 5 3	Protein 3 5 3 5 4 4	Milling	Baking 3 3	3 3 1 2 4 4
Cooperator 1 2 3 4 5 6 7	Method Sponge/Dough Straight Dough -lb Sponge/Dough Sponge/Dough Straight Dough Straight Dough Straight Dough	Absorption 66.0 62.9 64.0 65.0 67.3 65.0 63.8	Volume 2825 3450 888 3074 3275 2700 1040	% of CK 96.6 101.5 88.1 101.0 102.3 103.8 90.4	Requirement	Characteristic	Tolerance 3 3 1 3 3 3 2	Crumb Color 3 3 2 2 4 3 2	Grain & Texture 3 3 2 2 5 3 4	Protein 3 5 3 5 4 4 5	Milling	Baking 3 3	3 3 1 2 4 4 2
Cooperator 1 2 3 4 5 6 7	Method Sponge/Dough Straight Dough -lb Sponge/Dough Sponge/Dough Straight Dough Straight Dough Straight Dough Straight Dough Straight Dough	Absorption 66.0 62.9 64.0 65.0 67.3 65.0 63.8 69.4	Volume 2825 3450 888 3074 3275 2700 1040 1053	% of CK 96.6 101.5 88.1 101.0 102.3 103.8 90.4 98.1	Requirement	Characteristic	Tolerance 3 3 1 3 3 3 2 2	Crumb Color 3 3 2 2 4 3 2 4	Grain & Texture 3 3 2 2 5 3 4 4	Protein 3 5 3 5 4 4 5 4	Milling 3 1 2 3 4 5 2 4	Baking 3 3 2 2 4 4 2 4	3 3 1 2 4 4 2 4
Cooperator 1 2 3 4 5 6 7 8 9	Method Sponge/Dough Straight Dough -lb Sponge/Dough Sponge/Dough Straight Dough Straight Dough Straight Dough	Absorption 66.0 62.9 64.0 65.0 67.3 65.0 63.8 69.4 65.7	Volume 2825 3450 888 3074 3275 2700 1040	% of CK 96.6 101.5 88.1 101.0 102.3 103.8 90.4 98.1 95.5	Requirement	Characteristic	Tolerance 3 3 1 3 3 3 2 2 2	Crumb Color 3 3 2 2 4 3 2 4 3	Grain & Texture 3 3 2 2 5 3 4 4 3	Protein 3 5 3 5 4 4 5 4 3	Milling 3 1 2 3 4 5 2 4 2	Baking 3 3 2 2 4 4 2 4 3	3 3 1 2 4 4 2 4 3
Cooperator 1 2 3 4 5 6 7	Method Sponge/Dough Straight Dough -lb Sponge/Dough Sponge/Dough Straight Dough Straight Dough Straight Dough Straight Dough Straight Dough	Absorption 66.0 62.9 64.0 65.0 67.3 65.0 63.8 69.4	Volume 2825 3450 888 3074 3275 2700 1040 1053	% of CK 96.6 101.5 88.1 101.0 102.3 103.8 90.4 98.1	Requirement	Characteristic	Tolerance 3 3 1 3 3 3 2 2	Crumb Color 3 3 2 2 4 3 2 4	Grain & Texture 3 3 2 2 5 3 4 4	Protein 3 5 3 5 4 4 5 4	Milling 3 1 2 3 4 5 2 4	Baking 3 3 2 2 4 4 2 4	3 3 1 2 4 4 2 4