

Overseas Varietal Analysis Crop Year 2012

Soft Red Winter Wheat

Program by



U.S. WHEAT
ASSOCIATES

Overseas Varietal Analysis

2012 Crop Soft Red Winter Wheat

Sponsored by:
U.S. Wheat Associates

**Assessments of Wheat and Flour Samples
Completed by:**

**China
Dominican Republic
Indonesia
Malaysia
Mexico
Peru
Philippines
Thailand**

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EXECUTIVE SUMMARY OF INTERNATIONAL COOPERATORS' RESULTS

Wheat Sources and Characteristics

The 2012 U.S. Wheat Associates Overseas Varietal Analysis project evaluated ten soft red winter wheat varieties: AGS 2056, AGS 2035 and AGS 2060 from Arkansas; USG 3251 and USG 3201 from Tennessee; Terral TV 8861 from Louisiana; SY 9978 from North Carolina; Ricochet from Arkansas; and Croplan 9101 from Illinois. RM1201 was an equal blend of four varieties, Kristy, Honey, 25R47 and Branson.

AGS 2056, AGS 2035, USG 3251, USG 3201, Terral TV 8861, Croplan 9101 and RM 1201 graded US #1. SY 9978 and Ricochet graded US #2. AGS 2060 graded US #3 due to contamination of white wheat kernels. SY 9978 was excluded from the cooperative product tests due to scab damage. The summary that follows is primarily based on the sample rankings in Table 3-1. The relative ranks of SRW varieties for baking cookies, cakes and sweet breads varied widely among cooperators, possibly due to differences in formulas, baking procedures and preferences. The average rankings of the SRW wheat varieties tested were mostly lower than those of the local flours.

Product Preferences

- 1) Across all cooperators that evaluated cookies, USG 3251 was ranked highest followed by AGS 2035, Ricochet and USG 3201. Terral TV 8861 showed the lowest average ranking for cookie baking. USG 3251, USG 3201 and Ricochet also exhibited greater sugar snap cookie diameter than others as measured by the SWQL.
- 2) AGS 2060 was the most preferred variety with average ranking of 3.5 for sponge cake baking, while AGS 2035 was least preferred, with average ranking of 7.0. USG 3251, USG 3201, Terral TV 8861 and Ricochet exhibited intermediate average rankings of 5.0-5.7.
- 3) AGS 2056 performed best for baking chiffon cake, with an average ranking of 2.3, which was the same rank as the local control.
- 4) The rankings of SRW wheat flours for baking cookies, sponge cakes and chiffon cakes were uncorrelated in this study as in previous years.
- 5) Terral TV 8861 ranked first and RM 1201 tenth for baking sweet bread.

Summary of Cultivars

USG 3251 had the best average rank of 4.5 (Table 3-1) across all cooperators and products, followed by USG 3201, Ricochet, AGS 2056 and AGS 2034 with average ranks of 5.3-5.8. The remaining four varieties, including Terral TV 8861, Croplan 9101, RM 1201 and AGS 2050, received relatively lower average rankings of 6.1 to 6.7.

USG 3251 was the most preferred variety for baking cookies and intermediately preferred for baking sponge and chiffon cakes. USG 3251 was highest in break flour yield, second-lowest in protein content, lowest in lactic solvent retention capacity (SRC) value and produced the largest diameter cookies baked by the SWQL. AGS 2060 was the highest ranked variety for baking sponge cake, while it ranked lowest for cookies and in overall average ranking, probably due to its lowest SKCS grain hardness, highest flour protein content, highest sucrose solvent retention capacity (SRC) value of 103 and second highest lactic SRC value of 99.3.

USG 3251 and USG 2060 represent the contrasting protein strengths for SRW wheat varieties produced in the eastern United States, possessing weak protein for the former and strong for the latter.

Recommendations for Class

Each internal end-user of SRW wheat has a preferred protein content range. As noted in the summary of SRW wheat varieties above, grain hardness and break flour yield (which are associated with flour particle size), water absorption capacity (sucrose SRC) and protein strength (lactic SRC) all showed significant variation among varieties, influences on product quality and overall flour preference rankings. Local preferences for end-use products of SRW wheat should be considered when selecting flours for overseas markets based on quality targets for protein content, flour particle size, flour absorption capacity and protein strength.

The preferred varieties for cake baking are often rated poorly in cookie baking as observed with AGS 2060, and vice versa with AGS 2035. This makes it difficult to set the universal quality profile of SRW wheat for baking both cookies and cakes. AGS 2060, the most preferred for baking sponge cake, failed to produce decent quality cookies, probably due to its high solvent absorption capacity and protein strength. On the other hand, USG 3251, the most preferred for baking cookies, was also rated pretty high in baking cake. Low grain hardness, high break flour yield, low protein content and low SRCs would ensure the satisfactory quality rating of SRW wheat for making both cookies and cakes. Appropriate protein strength of SRW wheat for overseas markets still needs to be defined in consideration of the specific end-products requiring relatively strong gluten.

CHAPTER 1. Introduction

Project Background

For over 50 years the Soft Wheat Quality Laboratory (SWQL) of the Agricultural Research Service, United States Department of Agriculture, has completed comparative physical, chemical, dough handling (rheological), and milling and end-product analyses of promising wheat lines prior to their release by state universities and private breeding programs. Based on those results and other agronomic trait analyses, wheat varieties are selected for commercial release. Since on average, 50% of United States grown wheat is exported, similar variety quality analyses are needed from international users of U.S. wheat so that those wheat breeders can design wheat varieties to satisfy both the U.S. and international markets.

Through the Overseas Varietal Analysis (OVA) program of U.S. Wheat Associates, information on wheat and flour quality from international users will be shared with the U.S. wheat industry on a variety basis. Wheat samples were submitted to the SWQL by variety name from respective wheat class regions of the United States. Samples of varieties were milled and distributed to international cooperators through arrangements made by U.S. Wheat Associates foreign offices (FOs). Cooperators analyzed flour samples for physical, chemical, dough-handling (rheological), and milling and end processing properties. The international cooperators rated the samples for “overall acceptability”, and the data were compiled for distribution to U.S. producers, breeders, wheat quality laboratories, the grain trade and participating international cooperators.

Project Purpose

The Overseas Varietal Analysis program evaluates the quality of soft red wheat varieties in cooperation with international millers and bakers. The specific purpose of the cooperative study is to enhance the milling and end-processing quality of soft red wheat to better meet the needs of international customers.

Project Approach

Ten soft red winter wheat samples were provided to overseas collaborators:

The Soft Wheat Quality Laboratory provided milling, baking and Alveograph information to cooperators with the flour samples. The methods used for milling and flour evaluation by the Soft Wheat Quality Laboratory were standard procedures of the laboratory and are described in the appendix to this report.

Cooperators were asked to evaluate the samples using their standard methods and compare the results to a local control flour. Cooperators were asked to provide: 1) results of their flour evaluations including proximate analysis, rheology and baking evaluations, 2) a numerical rating of each flour for dough properties, baked product quality and overall performance and 3) a ranking of the flours for suitability to the cooperator’s market. As part of the ranking, cooperators also provided comments about the likes and dislikes of the flour. Separate from the analysis of OVA flour samples, each cooperator also completed a preference survey describing their flour specifications and targeted end-uses for the flour.

Interpretation of the results was based on trends on the data using correlation analysis. Measured flour quality was correlated with individual cooperator rankings and overall rankings. The qualities of the most preferred varieties were also compared to the least preferred varieties. Rather than trying to recommend one variety over another, the summaries recommend directions for future improvement of varieties and for improved marketing of specific quality wheat to customers.

Sample selection and Soft Wheat Quality Laboratory Methods

The Soft Wheat Quality Laboratory contacted seed producers within soft red winter wheat member states of US Wheat Associates. Together with the seed producers the laboratory selected new varieties and established varieties that represent the range of quality present in the crop production areas supplying the export markets of the US. Grain is then obtained from commercial seed fields of the variety to insure identity of the grain purchased. In some cases, it is necessary to go to an adjacent state to obtain pure commercially grown seed of a targeted variety.

Grain is received in September, milled at the laboratory in December and January, and shipped to cooperators shortly thereafter. Included with the shipment is a preliminary quality evaluation. This year, that information included physical and chemical properties of the grain and flour, milling characteristics, Alveograph information, solvent retention capacity, and cookie bake data. The complete methods for the Soft Wheat Quality Laboratory are given in the first Appendix to this report.

Cooperator Evaluation

Cooperators evaluate the flour samples for quality as it is important to them in their market. This commonly includes baking tests, but also physical and chemical evaluations too. Based on those evaluations and the information provided by the Soft Wheat Quality Laboratory, cooperators are asked to evaluate and comment on the flour samples. The questions to which they respond are listed below. The cooperators provided comments. The cooperators rated the quality of the flour using a 1 to 9 scale (9 best). They also rank the varieties in comparison to each other and a local control flour. The numerical evaluations and ranks of the varietal flour samples are used for summarizing the performance of the variety.

The questions asked of the cooperators were:

Question 1 - Based on the flour data provided, or your analysis, please score the overall flour quality of these varieties.

Question 2– Based on your analysis or the rheology data provided, please score the overall dough or batter handling/processing performance of these varieties .

Question 3 - Based on your analysis please score the end product performance of these varietal samples.

Question 4 - Based on your review please score the overall acceptability of these varietal samples.

Overall Report Format

The results of the cooperators were compiled into summary tables of numerical scores. The physical, chemical, and baking evaluations of the varietal flours are presented in table format within the section for each cooperator. Supplemental materials such as baking templates were included in a MS Excel worksheet attached to the electronic copy of this report. Similarly, the comments from cooperators are summarized in the narrative descriptions, but the complete set of comments is available only in the electronic version of the report due to space constraints.

The appendices to the report are included in the printed form for review. They contain information on methods used by the Soft Wheat Quality Laboratory, the physical images of Alveograph and Mixograph of flour samples, and the baking formulas for products made during the US Wheat Associates' Singapore Workshop.

CHAPTER 2. USDA-ARS Soft Wheat Quality Laboratory Evaluation Results

Grain Characteristics and Milling Quality (Tables 2-1 & 2-2; Figures 2-1, 2-2 & 2-3)

Test weights of grain were greater than 60 in eight SRW wheat varieties and 59.4-59.6 in two varieties. All had greater test weights than the minimum requirement (58 lb/bu) for the US grade 2. AGS 2062 exhibited a notably lower SKCS kernel hardness value of 7.6 than other varieties, for which hardness ranged from 12.6 to 29.5. AGS 2035 was highest in thousand kernel weight and diameter, while the lowest thousand kernel weight and diameter were observed in RM 1201.

Considerable differences in break flour yield and straight grade flour yield of the SWQL Miag Multomat flour mill were observed in ten SRW wheat varieties. USG 3251 showed the highest break flour yield of 34.2%. Total flour yield was over 76.3% in AGS 2056 and AGS 2035, 75.1-75.6% in USG 3201 and Terral TV 8861 and lower than 74.5 in the rest of varieties.

Ash curves were used to measure the milling characteristics of the varieties in a long-flow mill. The mill stream analysis depicts the increase in flour ash as a function of flour recovery. Cumulative ash curves should have flat lines initially with the redust, first two break, grader and first two middlings flour streams, then increasing curves with the addition of 3rd break and remaining middling streams of flour. AGS 2056 showed the low cumulative ash content with the ideal curve shape. The cumulative ash curves of USG 3201, Terral TV 8861 and Ricochet also showed flat ash curves with the first six flour streams with relatively low ash content.

Flour Composition, Biochemical and Rheological Properties

Flour protein content of the 10 varieties ranged from 6.7% in Croplan 9101 to 9.0% in AGS 2060, falling into the typical protein content range of SRW wheat. Ash content of straight grade flour was lower than 0.46% in AGS 2056, Croplan 9101 and RM 1201. AGS 2035 was the only flour having ash content greater than 0.5%. Flour falling numbers of all 10 varieties were greater than 342 indicating little pre-harvest sprout damage.

Significant variation was present for water, sodium carbonate and sucrose SRC values. All varieties in this set exhibited higher values than the typical range for SRW wheat. Sodium carbonate SRC values were higher than 79.6 in AGS 2035, USG 3251, SY 9978, Croplan 9101 and RM 1201. AGS 2035, AGS 2060 and RM 1201 were also much higher in sucrose SRC value than others. AGS 2060 and RM 1201 had lactic SRC values greater than 99.3 and appeared to have much stronger protein than the others. These two wheat varieties also showed relatively high alveograph L scores compared to the rest of this set.

In the Alveograph analyses, all samples had small to moderate P values (< 69 mm) but a wide range in L and W values. Alveogram images are included in the appendix to this report. Similarly, Mixograph analysis of samples was completed and the mixograms are also provided in the appendix.

Sugar-Snap Cookie Baking Quality

For the sugar snap cookie test, the traditional preference is for larger diameters. Cookie diameter of this OVA sample set was relatively smaller than that of typical SRW wheat, which corresponds to their relatively higher water, sodium carbonate and sucrose SRC values.

Table 2-1. Grain Characteristics of SRW Wheat Varieties

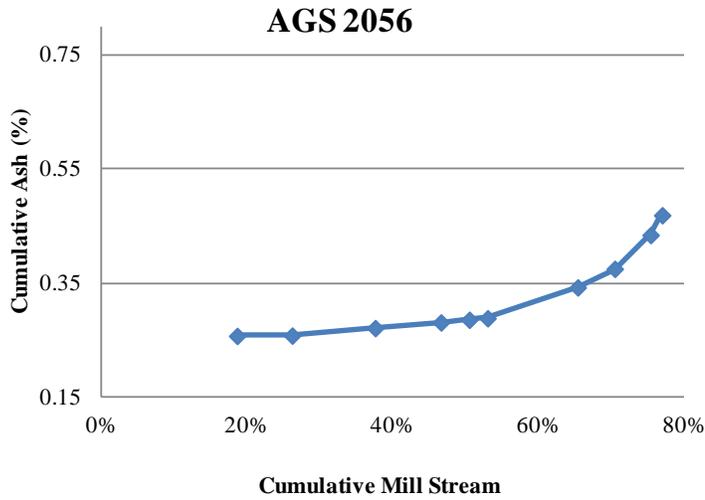
Variety	Test Weight (lb/bu)	Thousand Kernel Weight (g)	SKCS Kernel Hardness	Kernel Weight (mg)	Kernel Diameter (mm)
AGS 2056	60.0	30.1	23.4	30.6	2.2
AGS 2035	63.9	42.5	24.8	40.7	2.7
AGS 2060	61.4	35.2	7.6	34.4	2.6
USG 3251	60.7	36.2	19.4	35.2	2.2
USG 3201	62.8	37.8	21.6	37.4	2.4
Terral TV 8861	63.2	38.0	15.7	36.5	2.3
SY 9978	59.4	36.0	15.0	35.2	2.4
Ricochet	59.6	31.0	12.6	31.4	2.3
Croplan 9101	62.1	37.9	28.9	37.0	2.4
RM1201	60.0	28.4	29.5	27.7	2.0

Table 2-2. Milling Yield, Composition, Falling Number and Solvent Retention Capacities of SRW Wheat Flours

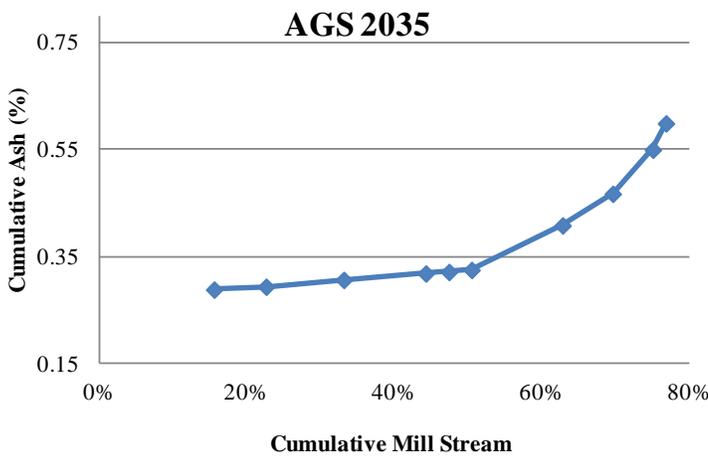
Variety	Miag Milling		Protein (%)	Moisture (%)	Ash (%)	Falling Number (sec)	Alpha-Amylase (CU/g)	Starch Damage (%)	Solvent Retention Capacity (%)			
	Break Flour Yield (%)	Straight Grade Flour Yield (%)							Water (%)	Sodium Carbonate (%)	Sucrose (%)	Lactic Acid (%)
AGS 2056	30.0	76.4	8.8	13.2	0.447	447	0.055	5.45		75.7	91.8	80.5
AGS 2035	29.5	76.3	8.8	13.4	0.531	404	0.073	5.11	62.3	79.7	98.0	81.1
AGS 2060	28.3	73.3	9.0	13.3	0.497	385	0.075	2.74	55.3	73.6	103.0	99.3
USG 3251	34.2	74.4	7.8	13.4	0.493	387	0.042	3.82	59.9	80.9	93.5	80.5
USG 3201	30.3	75.1	8.4	13.4	0.479	385	0.044	4.20	55.8	72.8	89.3	85.5
Terral TV												
8861	31.8	75.6	7.9	13.3	0.471	387	0.032	3.84	57.4	74.9	92.8	88.7
SY 9978	29.1	74.5	8.4	13.5	0.488	439	0.047	3.26	56.4	79.7	88.8	87.8
Ricochet	32.5	73.6	7.8	13.3	0.489	373	0.061	5.03	59.5	77.6	89.4	83.4
Croplan												
9101	28.6	73.7	6.7	13.5	0.458	343	0.029	4.65	60.7	79.6	92.1	82.2
RM1201	28.0	73.8	8.7	13.5	0.439	359	0.039	4.91	59.1	80.6	96.9	99.8

Table 2-3. Dough Rheological Characteristics and Sugar Snap cookie Diameter of SRW Wheat Flours

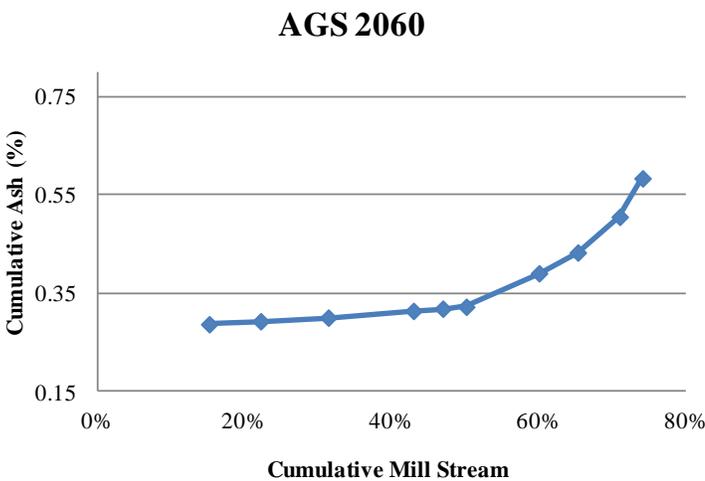
Variety	Mixograph					Farinograph:				Alveograph:				Sugar Snap Cookie Diameter (cm)
	Abs. (%)	Peak Time (min)	Peak Value (%)	Peak Width (%)	Peak Width @ 7 min (%)	Abs. (%)	Dev. Time (min)	Stability (min)	MTI (FU)	P (mm)	L (mm)	P/L	W (10 ⁴ joules)	
AGS 2056	58	2.2	36.1	11.5	6.7	53.0	1.7	2.1	75	42	94	0.45	96	16.9
AGS 2035	60	7.0	37.2	11.3	11.3	53.8	1.9	2.0	45	69	80	0.86	179	16.3
AGS 2060	57	3.8	41.0	15.1	7.4	52.6	1.5	4.1	56	46	160	0.29	177	16.6
USG 3251	58	3.9	32.6	11.1	6.2	50.9	1.2	0.8	98	40	87	0.46	80	17.7
USG 3201	56	3.1	39.2	17.8	6.4	50.2	1.4	1.5	71	33	162	0.20	118	17.7
Terral TV 8861	57	3.0	34.7	11.4	9.7	52.4	1.4	1.3	83	47	98	0.48	128	17.1
SY 9978	56	5.7	33.0	10.1	8.5	52.1	1.4	1.1	94	31	164	0.19	109	17.3
Ricochet	55	5.0	31.2	8.3	5.3	50.8	1.2	0.9	109	33	112	0.29	88	17.8
Croplan 9101	58	6.6	29.3	8.7	8.3	51.9	1.2	0.7	107	48	62	0.77	92	17.4
RM1201	58	3.2	39.3	12.9	9.7	52.5	1.8	3.2	71	37	170	0.22	104	17.0



Meal Stream	Cumulative Mill Stream (%)	Cumulative Ash (%)
1 Mids	19	0.26
ReDust	26	0.26
2 Mids	37	0.27
1 Brk	47	0.28
Grader	50	0.29
2 Brk	53	0.29
3 Brk	65	0.34
3 Mids	70	0.38
4 Mids	75	0.43
5 Mids	77	0.47
Red Dog	77	0.48
Tail Shorts	78	0.52
Brk Shorts	90	1.01
Bran	100	1.44

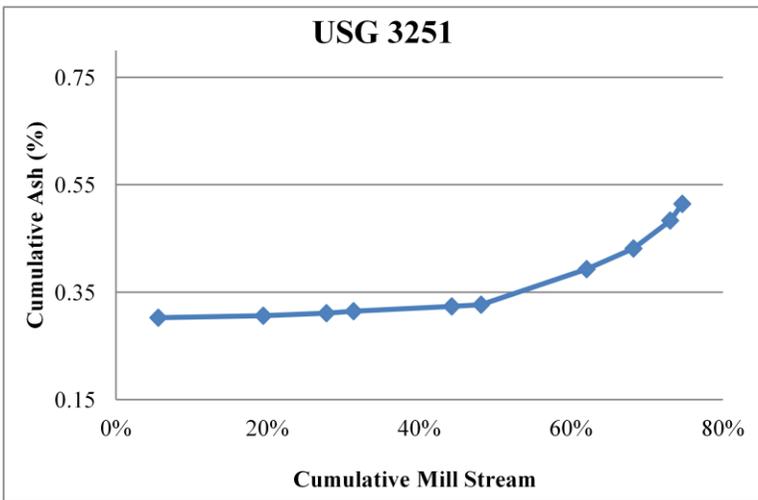


Meal Stream	Cumulative Mill Stream (%)	Cumulative Ash (%)
1 Mids	19	0.258
ReDust	26	0.258
2 Mids	37	0.271
1 Brk	47	0.281
Grader	50	0.286
2 Brk	53	0.289
3 Brk	65	0.343
3 Mids	70	0.375
4 Mids	75	0.434
5 Mids	77	0.469
Red Dog	77	0.483
Tail Shorts	78	0.520
Brk Shorts	90	1.009
Bran	100	1.444

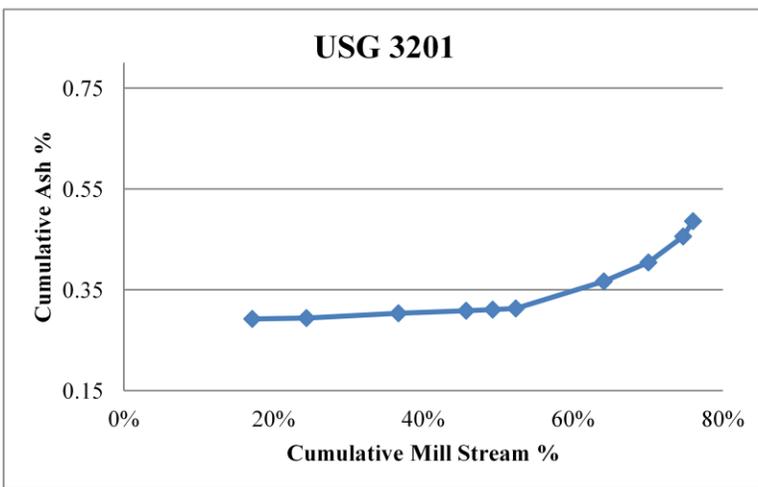


Meal Stream	Cumulative Mill Stream (%)	Cumulative Ash (%)
ReDust	15	0.29
1 Mids	22	0.29
2 Mids	31	0.30
Grader	43	0.31
1 Brk	47	0.32
2 Brk	50	0.32
3 Brk	60	0.39
3 Mids	65	0.43
4 Mids	71	0.51
5 Mids	74	0.58
Red Dog	75	0.61
Tail Shorts	77	0.69
Brk Shorts	91	1.29
Bran	100	1.72

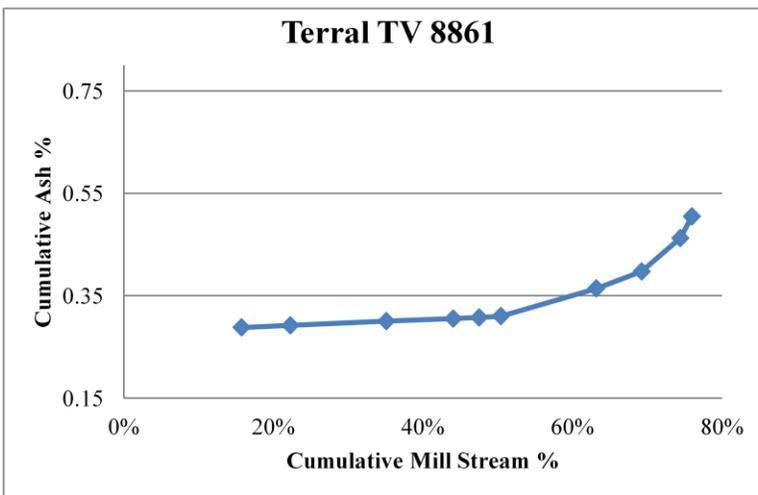
Figure 2-1. Milling ash curves for three SRW wheat Varieties.



Meal Stream	Cumulative Mill Stream(%)	Cumulative Ash (%)
ReDust	6	0.30
1 Mids	19	0.31
2 Mids	28	0.31
Grader	31	0.31
1 Brk	44	0.32
2 Brk	48	0.33
3 Brk	62	0.39
3 Mids	68	0.43
4 Mids	73	0.48
5 Mids	75	0.51
Red Dog	76	0.56
Tail Shorts	76	0.57
Brk Shorts	90	1.13
Bran	100	1.49

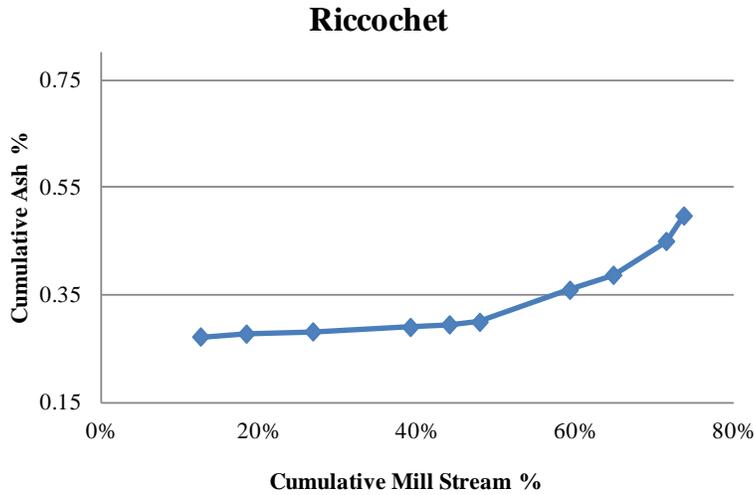


Meal Stream	Cumulative Mill Stream (%)	Cumulative Ash (%)
ReDust	17	0.29
1 Mids	24	0.29
2 Mids	37	0.30
Grader	46	0.31
1 Brk	49	0.31
2 Brk	52	0.31
3 Brk	64	0.37
3 Mids	70	0.40
4 Mids	75	0.46
5 Mids	76	0.49
Red Dog	77	0.53
Tail Shorts	78	0.54
Brk Shorts	91	1.11
Bran	100	1.48

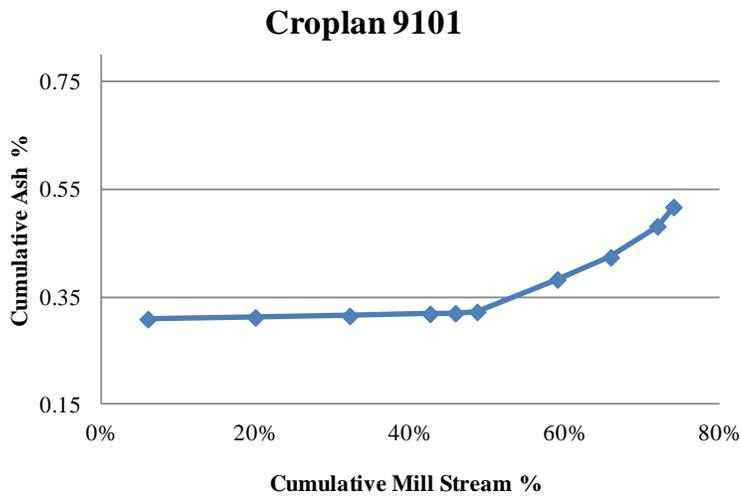


Meal Stream	Cumulative Mill Stream (%)	Cumulative Ash (%)
ReDust	16	0.29
1 Mids	22	0.29
2 Mids	35	0.30
Grader	44	0.31
1 Brk	48	0.31
2 Brk	50	0.31
3 Brk	63	0.36
3 Mids	69	0.40
4 Mids	74	0.46
5 Mids	76	0.50
Red Dog	77	0.54
Tail Shorts	78	0.56
Brk Shorts	91	1.08
Bran	100	1.45

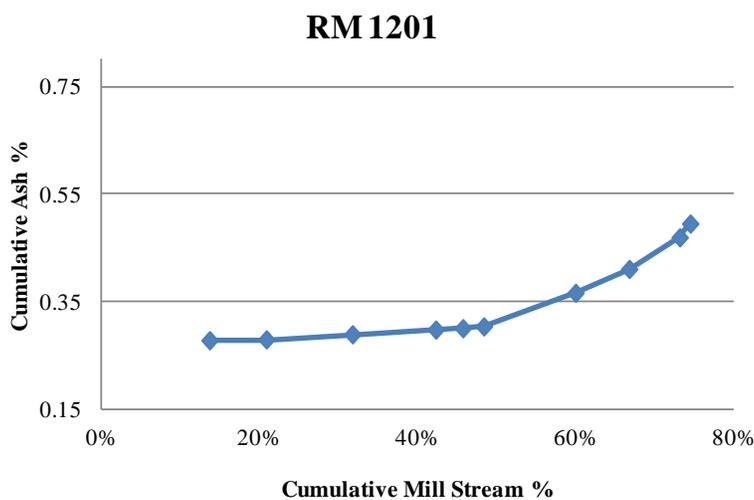
Figure 2-2. Milling ash curves for three SRW wheat Varieties.



Meal Stream	Cumulative Mill Stream (%)	Cumulative Ash (%)
ReDust	12	0.27
1 Mids	18	0.28
2 Mids	27	0.28
Grader	39	0.29
1 Brk	44	0.29
2 Brk	48	0.30
3 Brk	59	0.36
3 Mids	65	0.39
4 Mids	71	0.45
5 Mids	74	0.50
Red Dog	75	0.55
Tail Shorts	76	0.56
Brk Shorts	89	1.08
Bran	100	1.48



Meal Stream	Cumulative Mill Stream (%)	Cumulative Ash (%)
ReDust	6	0.31
1 Mids	20	0.31
2 Mids	32	0.31
Grader	42	0.32
1 Brk	46	0.32
2 Brk	49	0.32
3 Brk	59	0.38
3 Mids	66	0.42
4 Mids	72	0.48
5 Mids	74	0.52
Red Dog	76	0.57
Tail Shorts	76	0.59
Brk Shorts	91	1.12
Bran	100	1.44



Meal Stream	Cumulative Mill Stream (%)	Cumulative Ash (%)
ReDust	14	0.28
1 Mids	21	0.28
2 Mids	32	0.29
Grader	42	0.30
1 Brk	46	0.30
2 Brk	48	0.30
3 Brk	60	0.37
3 Mids	67	0.41
4 Mids	73	0.47
5 Mids	74	0.49
Red Dog	76	0.53
Tail Shorts	76	0.55
Brk Shorts	90	1.08
Bran	100	1.45

Figure 2-3. Milling ash curves for three SRW wheat Varieties.

CHAPTER 3. Cooperator Rankings and Scores by Product

Introduction

Cooperators compared flour samples for suitability to their own standards. Samples are ranked from 1 for most preferred to 9 for least preferred. Cooperators also evaluated the flour samples, assigning scores to the batters or doughs, scores for the baked products and a score for overall suitability of the flour to the customers' needs. The cooperators were asked to respond to four questions concerning the products. Scores were assigned to each sample in response to these questions and the scores are reported on a scale of 1 to 9, with the preferred varieties receiving the higher scores.

Cookies (Tables 3-1, 2, 3, 4 & 5)

Quality of the OVA flour samples for baking cookies was evaluated by ten cooperators. The preference ranking of each flour sample fluctuated largely among cooperators, indicating that there are large differences in cookie and consequent flour quality requirements among cooperators. Based on the averaged rankings, USG 3251 was the most preferred flour for baking cookies followed by AGS 2035 and Ricochet. USG 3251 was highest in break flour yield and water SRC, but lowest in lactic SRC, indicating that high break flour yield and wheat protein are desirable quality characteristics and preferred by the cooperators for baking cookies. AGS 2060 received the lowest average ranking for cookie baking, probably due to much higher sucrose SRC and lactic SRC than others. USG 3251 received a relatively low flour desirability score, but highest scores for dough property, cookie quality and overall desirability, whereas AGS 2060 received relatively low scores in all evaluation categories. The averaged rankings of the OVA flours show a negative correlation with water SRC and positive correlation with lactic SRC, but fail to show any relationship with sugar snap cookie diameter, indicating the complexity and diversity of flour quality preferred by the cooperators.

Cake (Tables 3-1, 2, 3, 4 & 5)

The quality ranking and desirability scores of the OVA flour samples for baking sponge cake were evaluated by six cooperators and those for chiffon cake by three. AGS 2060 was the most preferred variety and received the highest average ranking of 3.5. AGS 2060 was the lowest ranked for baking cookies with the highest sucrose SRC and second highest lactic SRC values, indicating that there are big differences in flour quality requirements for baking cookies and cakes, and high absorption capacity and strong flour protein are not critical for baking sponge cakes. AGS 2060 was lowest in SKCS kernel hardness, which signifies the importance of soft kernel texture and consequent fine flour particle size for baking sponge cake. AGS 2060 also received high desirability score for batter property, sponge cake quality and overall rating. The least preferred variety for baking sponge cake was AGS 2035, which was highest in flour ash content and also relatively high in kernel hardness and damaged starch content. Both AGS 2060 and AGS 2035, however, ranked second to the last for baking chiffon cake, suggesting that chiffon cakes require quite different quality flour from sponge cakes.

Steam Bun and Sweet Bread (Tables 3-1, 2, 3, 4 & 5)

The OVA flour samples were evaluated for baking steam buns and sweet bread each by a single cooperator. Terral TV 8861 was the most preferred flour for baking both products. The least preferred flour was USG 3251 for baking steam buns and USG 3201 for sweet bread. Flour characteristics of Terral TV 8861 showed intermediate flour quality characteristics including

protein content, absorption capacity and protein strength. The cooperator noted the excellent flour color, good dough extensibility, bright yellow color, upright shape and fine/uniform texture of steam buns prepared from Terral TV 8861. Terral TV 8861 received the highest desirability scores for flour, steam bun and overall quality. Croplan flour, with lowest protein content and relatively low lactic SRC (weak protein), was least preferred for baking steam buns followed by USG 3201, which was the most preferred for baking cookies.

Summary

USG 3251 had the highest average rank across all cooperators and all products followed by USG 3201 and Ricochet. The flour receiving the lowest average rank was AGS 2060, which was, interestingly, the highest ranked variety for baking sponge cake. USG 3251, however, was the most preferred for baking cookies and also ranked decently high for baking sponge and chiffon cakes, resulting in the highest average ranking in overall preferences. SRW wheat of high protein content, high absorption capacity (high sucrose SRC) and strong protein (high lactic SRC) may perform well for production of cakes and others requiring gluten strength, but poorly for production of cookies, receiving relatively low preference ratings. The OVA samples again show the diversity of the SRW wheat produced in the eastern United States in grain hardness, flour particle size, protein content, absorption capacity and protein strength.

Table 3-1. Rankings of 10 soft red winter wheat varieties for making cookie, sponge cake, chiffon cake and sweet bread*													
Product	Cooperator	Control 1**	Control 2**	AGS 2056	AGS 2035	AGS 2060	USG 3251	USG 3201	Terral TV 8861	SY 9978***	Ricochet	Croplan 9101	RM1201
Cookie	China I	1		2	4	3	7	5	8		9	10	6
Cookie	Indonesia I	4		8	1	10	2	5	9		6	7	3
Cookie	Indonesia II	1		8	3	6	5	4	9		2	7	10
Cookie	Malaysia	4		8	1	6	2	3	5		7	9	10
Cookie	Mexico	1		2	8	9	3	7	6		5	4	10
Cookie	Peru	6		6	10	9	3	3	6		1	5	2
Cookie	Philippines I	3		7	4	10	1	5	8		2	9	6
Cookie	Philippines II	1		8	6	10	2	7	3		5	9	4
Cookie	Philippines III	1		7	3	4	8	6	9		5	2	10
Cookie	Thailand	7		9	4	10	3	6	8		5	1	2
	Average	2.9		6.5	4.4	7.7	3.6	5.1	7.1		4.7	6.3	6.3
Sponge Cake	China II			6	5	7	8	4	1		2	9	3
Sponge Cake	China I	1		2	7	6	9	3	8		5	10	4
Sponge Cake	Indonesia I	4		10	9	2	3	8	7		5	1	6
Sponge Cake	Indonesia II	1		4	7	2	5	6	8		9	3	10
Sponge Cake	Malaysia	3		7	6	1	2	4	5		8	9	10
Sponge Cake	Thailand	2		10	8	3	7	9	4		1	5	6
	Average	2.2		6.5	7.0	3.5	5.7	5.7	5.5		5.0	6.2	6.5
Chiffon Cake	Philippines I	3	10	2	7	9	5	1	6		11	8	4
Chiffon Cake	Philippines II	2		1	9	6	5	4	8		10	7	3
Chiffon Cake	Philippines III	2	7	4	10	11	5	8	3		6	1	9
	Average	2.3	8.5	2.3	8.7	8.7	5.0	4.3	5.7		9.0	5.3	5.3
Steam Bun	China II			6	5	7	8	4	1		2	9	3
Sweet Bread	Dominican Republic	3		2	5	6	7	8	1		4	9	10
	Overall Average	2.6		5.6	5.8	6.7	4.5	5.3	6.1		5.4	6.3	6.4

*1 = highest/ 11 = lowest; **local flour; ***Eliminated due to scab damage.

Table 3-2. Desirability scores of 10 soft red winter wheat **flours** for making cookie, sponge cake, chiffon cake, steem bun and sweet bread*

Product	Cooperator	Control 1**	Control 2**	AGS 2056	AGS 2035	AGS 2060	USG 3251	USG 3201	Terral TV 8861	SY 9978***	Ricochet	Croplan 9101	RM1201
Cookie	China I	8.5		8.0	7.3	7.5	6.0	8.3	6.5		6.8	5.0	7.8
Cookie	Indonesia I	7.0		7.0	7.0	7.0	7.5	8.0	8.0		7.5	7.5	7.0
Cookie	Indonesia II	8.0		8.0	8.5	7.0	6.5	7.5	6.0		7.0	7.0	6.0
Cookie	Malaysia	7.0		7.0	8.5	7.5	7.5	8.0	8.0		7.0	6.0	5.0
Cookie	Mexico	8.7		8.6	7.8	7.7	7.6	7.7	8.4		7.4	7.0	7.3
Cookie	Peru	6.5		6.0	5.5	5.0	4.5	5.5	5.5		6.0	4.5	7.0
Cookie	Philippines I	7.0		7.0	7.0	6.0	5.0	7.0	6.5		5.0	6.0	6.0
Cookie	Philippines II	7.0		6.8	6.5	6.7	6.0	6.3	6.4		5.9	5.0	6.8
Cookie	Philippines III	7.0		6.5	6.5	6.5	6.0	6.0	6.0		6.0	6.0	6.5
Cookie	Thailand	7.0		6.0	7.0	6.5	6.5	7.0	6.0		6.0	5.5	6.5
	Average	7.4		7.1	7.2	6.7	6.3	7.1	6.7		6.5	6.0	6.6
Sponge Cake	China II	9.5	9.0	7.0	7.0	6.5	7.0	8.5	8.5		8.0	6.0	9.0
Sponge Cake	Indonesia I	7.0		6.5	7.0	6.0	7.0	7.0	7.0		7.0	7.0	7.0
Sponge Cake	Indonesia II	8.0		7.0	7.5	7.0	6.5	7.5	6.0		7.0	7.0	6.0
Sponge Cake	Malaysia	7.0		7.0	8.5	7.5	7.5	8.5	8.0		7.0	6.0	5.0
Sponge Cake	Thailand	7.0		6.0	7.0	6.5	6.5	7.0	6.0		6.0	5.5	6.5
	Average	7.7		6.7	7.4	6.7	6.9	7.7	7.1		7.0	6.3	6.7
Chiffon Cake	Philippines I	7.0	6.0	6.5	6.0	5.0	6.0	6.0	6.5		5.0	5.0	5.5
Chiffon Cake	Philippines II	7.0		6.8	6.5	6.7	6.0	6.3	6.4		5.9	5.0	6.8
Chiffon Cake	Philippines III	7.0	6.5	6.0	5.5	5.5	6.0	5.5	6.8		6.8	7.0	6.0
	Average	7.0	6.3	6.4	6.0	5.7	6.0	5.9	6.6		5.9	5.7	6.1
Steam Bun	China II	9.5	9.0	7.0	7.0	6.5	7.0	8.5	8.5		8.0	6.0	9.0
Sweet Bread	Dominican Republic			7.5	6.0	5.0	6.0	6.5	8.5		5.0	4.0	6.0
	Overall Average	7.5		6.9	7.0	6.5	6.4	7.1	7.0		6.5	5.9	6.6

* 1 = Very poor/ 9 = Excellent; **Local flour; ***Eliminated due to scab damage.

Table 3-3. Desirability scores of dough of 10 soft red winter wheat flours for making cookie, steem bun and sweet bread*													
Product	Cooperator	Control 1**	Control 2**	AGS 2056	AGS 2035	AGS 2060	USG 3251	USG 3201	Terral TV 8861	SY 9978***	Ricochet	Croplan 9101	RM1201
cookie	China I	8.5		7.8	7.5	8.0	7.0	6.5	6.0		5.5	5.0	6.3
Cookie	Indonesia I	7.0		6.0	8.0	5.5	7.0	6.0	5.0		5.5	5.5	7.0
cookie	Indonesia II	7.0		4.0	4.0	5.0	5.5	5.5	5.0		7.0	4.0	4.0
cookie	Malaysia	7.0		6.8	7.7	6.8	8.0	7.5	6.6		7.4	7.2	7.8
cookie	Mexico	8.7		8.4	8.3	8.7	8.4	8.7	8.5		8.2	8.4	8.4
cookie	Peru	6.0		5.0	4.5	4.5	5.5	5.5	6.0		7.5	5.5	7.0
cookie	Philippines I	7.0		5.0	6.0	5.0	9.0	6.0	5.0		9.0	5.0	6.0
cookie	Philippines II	7.0		5.5	5.3	5.0	8.0	6.8	7.3		7.4	6.5	6.7
cookie	Philippines III	7.0		5.0	6.5	6.8	6.8	6.8	6.8		8.0	6.5	7.0
cookie	Thailand	7.0		6.5	8.5	6.0	8.5	7.8	6.5		8.0	7.5	8.5
cookie	China I	9.0		9.0	8.5	8.8	9.0	8.5	8.5		9.0	9.0	8.0
Cookie	Indonesia I	7.0		6.5	7.0	6.5	6.5	6.5	6.5		6.5	6.5	6.5
cookie	Indonesia II	8.0		7.0	7.5	6.5	7.5	7.5	6.0		7.0	7.0	6.0
cookie	Malaysia	7.0		6.5	7.0	6.5	6.0	6.5	6.5		6.0	6.5	7.0
cookie	Mexico	8.5		8.5	7.6	7.4	7.6	7.8	8.3		7.8	7.9	7.4
cookie	Peru	5.5		6.5	4.5	4.5	5.5	6.5	5.5		6.5	5.0	6.0
cookie	Philippines I	7.0		6.0	7.0	6.0	6.0	6.0	6.0		6.0	6.0	6.0
cookie	Philippines II	7.0		6.0	7.0	6.0	6.0	6.2	6.2		6.0	6.2	6.2
cookie	Philippines III	7.0		6.5	7.0	6.5	5.0	6.3	5.0		5.0	5.0	6.5
cookie	Thailand	7.0		5.0	6.0	6.0	3.5	4.0	4.5		4.0	3.5	6.0
	Average	7.3		6.4	6.8	6.3	6.8	6.6	6.3		6.9	6.2	6.7
Steam Bun	China II	9.0	8.0	7.0	7.5	7.0	6.0	8.0	8.0		8.0	6.0	9.0
Sweet Bread	Dominmican Republic	6.0		7.0	5.0	4.5	5.0	5.5	8.5		6.0	6.0	6.0
	Overall Average	6.7		5.9	6.2	5.7	6.1	6.1	5.9		6.3	5.7	6.2

* 1 = Very poor/ 9 = Excellent; **Local flour; ***Eliminated due to scab damage.

Table 3-4. Desirability scores of batter of 10 soft red winter wheat flours for making sponge cake and Chiffon cake*													
Product	Cooperators	Control 1**	Control 2**	AGS 2056	AGS 2035	AGS 2060	USG 3251	USG 3201	Terral TV 8861	SY 9978***	Ricochet	Croplan 9101	RM1201
Sponge Cake	China II	9.0	8.0	7.0	7.5	7.0	6.0	8.0	8.0		8.0	6.0	9.0
Sponge Cake	Indonesia I	7.0		6.5	6.5	7.0	7.0	6.5	7.0		6.5	7.0	7.0
Sponge Cake	Indonesia II	8.0		8.5	8.5	8.0	8.0	8.5	8.0		8.5	8.0	8.0
Sponge Cake	Malaysia	7.0		6.0	6.0	8.0	8.0	6.0	8.0		5.5	8.0	7.0
Sponge Cake	Thailand	7.0		5.0	6.0	6.0	3.5	4.0	4.5		4.0	3.5	6.0
	Average	7.6	8.0	6.6	6.9	7.2	6.5	6.6	7.1		6.5	6.5	7.4
Chiffon Cake	Philippines I	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0		7.0	7.0	7.0
Chiffon Cake	Philippines II	7.0		7.0	7.0	7.0	7.0	7.0	7.0		7.0	7.0	7.0
Chiffon Cake	Philippines III	7.0	7.0	7.0	6.5	7.0	7.0	7.0	7.0		7.0	7.0	7.0
	Average	7.0	7.0	7.0	6.8	7.0	7.0	7.0	7.0		7.0	7.0	7.0
	Overall Average	7.4	7.3	6.8	6.9	7.1	6.7	6.8	7.1		6.7	6.7	7.3

* 1 = Very poor/ 9 = Excellent; **Local flour; ***Eliminated due to scab damage.

Table 3-5. Desirability scores for quality of cookie, sponge cake, chiffon cake, steam bun and sweet bread of 10 SRW wheat flours*													
Product	Cooperators	Control 1**	Control 2**	AGS 2056	AGS 2035	AGS 2060	USG 3251	USG 3201	Terral TV 8861	SY 9978***	Ricochet	Croplan 9101	RM1201
Cookie	China I	8.5		7.8	7.5	8.0	7.0	6.5	6.0		5.5	5.0	6.3
Cookie	Indonesia I	7.0		6.0	8.0	5.5	7.0	6.0	5.0		5.5	5.5	7.0
Cookie	Indonesia II	7.0		4.0	4.0	5.0	5.5	5.5	5.0		7.0	4.0	4.0
Cookie	Malaysia	7.0		6.8	7.7	6.8	8.0	7.5	6.6		7.4	7.2	7.8
Cookie	Mexico	8.7		8.4	8.3	8.7	8.4	8.7	8.5		8.2	8.4	8.4
Cookie	Peru	6.0		5.0	4.5	4.5	5.5	5.5	6.0		7.5	5.5	7.0
Cookie	Philippines I	7.0		5.0	6.0	5.0	9.0	6.0	5.0		9.0	5.0	6.0
Cookie	Philippines II	7.0		5.5	5.3	5.0	8.0	6.8	7.3		7.4	6.5	6.7
Cookie	Philippines III	7.0		5.0	6.5	6.8	6.8	6.8	6.8		8.0	6.5	7.0
Cookie	Thailand	7.0		6.5	8.5	6.0	8.5	7.8	6.5		8.0	7.5	8.5
	Average	7.2		6.0	6.6	6.1	7.4	6.7	6.3		7.4	6.1	6.9
Sponge Cake	China II	8.0		7.2	7.4	7.3	7.2	8.4	8.1		7.1	7.0	8.4
Sponge Cake	Indonesia I	7.0		6.5	6.0	8.0	7.5	6.5	6.5		7.5	7.5	7.0
Sponge Cake	Indonesia II	8.5		6.5	4.5	8.0	7.0	5.5	6.0		4.0	7.5	5.0
Sponge Cake	Malaysia	7.0		6.3	6.0	7.0	7.0	7.0	6.7		6.3	7.0	6.5
Sponge Cake	Thailand	7.0		4.0	5.5	6.8	5.5	5.0	6.5		7.5	6.0	6.0
	Average	7.5		6.1	5.9	7.4	6.8	6.5	6.8		6.5	7.0	6.6
Chiffon Cake	Philippines I	7.0	4.0	9.0	5.0	5.5	5.5	10.0	5.0		5.0	6.0	7.0
Chiffon Cake	Philippines II	7.0		7.3	5.0	6.3	7.5	7.5	5.5		5.4	6.5	7.3
Chiffon Cake	Philippines III	7.0	7.0	6.3	6.0	6.0	7.0	6.5	6.2		6.3	6.2	6.2
	Average	7.0	5.5	7.5	5.3	5.9	6.7	8.0	5.6		5.6	6.2	6.8
Steam Bun	China II	9.0	8.0	7.0	7.0	6.0	7.0	8.0	9.0		9.0	6.0	8.0
Sweet Bread	Dominmican Republic	8.0		8.5	7.5	8.5	8.0	5.5	8.0		8.0	7.0	5.0
	Overall Average	7.4	6.3	6.4	6.3	6.5	7.1	6.9	6.5		7.0	6.4	6.8

* 1 = Very poor/ 9 = Excellent; **Local flour; ***Eliminated due to scab damage.

Table 3-6. Overall desirability scores of 10 SRW wheat flours for making cookie, sponge cake, chiffon cake, steam bun and sweet bread *

Product	Cooperators	Control 1**	Control 2**	AGS 2056	AGS 2035	AGS 2060	USG 3251	USG 3201	Terral TV 8861	SY 9978***	Riccochet	Croplan 9101	RM1201
cookie	China I	8.5		8.0	7.5	7.8	6.5	7.0	6.0		5.5	5.0	6.8
Cookie	Indonesia I	7.0		6.5	8.5	6.0	7.5	7.0	6.5		7.0	7.0	7.5
cookie	Indonesia II	7.7		5.9	6.7	6.3	6.5	6.8	5.7		7.0	6.0	5.3
cookie	Malaysia	7.0		6.6	7.8	6.8	7.4	7.2	6.9		6.7	6.5	6.0
cookie	Mexico	8.7											
cookie	Peru	6.0		5.5	4.5	4.5	5.0	6.0	6.0		7.0	5.5	7.0
cookie	Philippines I	7.0		6.0	6.0	5.0	9.0	6.0	6.0		6.5	5.5	6.0
cookie	Philippines II	7.0		6.0	6.8	5.0	7.2	6.0	6.7		6.5	5.5	6.3
cookie	Philippines III	7.0		6.3	6.8	6.7	6.2	6.5	6.1		6.6	6.0	6.9
cookie	Thailand	7.0		6.5	8.5	6.0	8.5	7.8	6.5		8.0	7.5	8.5
	Average	7.3		6.4	7.0	6.0	7.1	6.7	6.3		6.8	6.1	6.7
Sponge Cake	China II	8.0		7.2	7.4	7.3	7.2	8.4	8.1		7.1	7.0	8.4
Sponge Cake	Indonesia I	7.0		6.5	6.5	7.5	7.0	6.5	7.0		7.0	8.0	7.0
Sponge Cake	Indonesia II	8.5		7.3	6.8	7.7	7.2	7.2	6.7		6.5	7.5	6.3
Sponge Cake	Malaysia	7.0		6.5	6.6	7.3	7.2	6.9	6.8		6.3	6.0	5.5
Sponge Cake	Thailand	7.0		4.0	5.5	6.8	5.5	5.0	6.5		7.5	6.0	6.0
	Average	7.5		6.3	6.6	7.3	6.8	6.8	7.0		6.9	6.9	6.6
Chiffon Cake	Philippines I	7.0	6.0	8.0	6.0	5.0	6.0	8.0	6.0		4.0	5.0	6.0
Chiffon Cake	Philippines II	7.0		7.2	5.0	5.5	5.7	6.3	5.0		5.0	6.0	6.2
Chiffon Cake	Philippines III	7.0	6.5	6.7	6.2	6.0	6.7	6.4	6.9		6.6	7.2	6.3
	Average	7.0	6.3	7.3	5.7	5.5	6.1	6.9	6.0		5.2	6.1	6.2
Steam Bun	China II	9.0	8.0	7.0	7.0	6.5	6.5	7.5	8.5		8.0	6.0	8.0
Sweet Bread	Dominmican Republic	7.0		5.5	7.5	7.5	6.0	6.0	8.0		7.5	5.5	4.0
	Overall Average	7.4	6.8	6.5	6.7	6.4	6.8	6.8	6.6		6.7	6.2	6.5

* 1 = Very poor/ 9 = Excellent; **Local flour; ***Eliminated due to scab damage.

Chapter 4. Singapore Overseas Varietal Analysis Cooperator Workshop

The cooperators from mills in Indonesia, Malaysia, the Philippines, and Thailand evaluated the SRW wheat OVA samples for quality of baking cookies, sponge cake and chiffon cake. The formulas and protocols for products are given in Appendix V. Discussions of cooperator preferences are summarized in the sections for each cooperator. A brief description of each product and preferences of the OVA flour samples for making each product are included below.

Cookies (Table 4-1 & 4-2; Figure 4-1, 4-4 & 4-5)

The cookie formulation used for the workshop is similar to the AACCI 10-52 sugar snap cookie method but at a lower sugar concentration. The results of the test for the OVA samples are similar to expectations of performance based on the sugar snap cookie and wire-cut cookie methods (AACCI 1054). The diameters of the cookies baked in the workshop were significantly correlated to the diameters of the sugar snap cookies baked by the SWQL ($r = 0.72, P < 0.05$). The cooperators noted the soft and sticky dough of USG 3251, USG 3201, Terral TV 8861, Ricochet, Croplan 9101 and RM 1201. The nine OVA flours tested showed relatively small differences in cookie diameter, ranging from 29.0 to 31.6 cm. USG 3251 baked the cookies with largest diameter, highest diameter increase, greatest diameter and height ratio, and highly crispy texture. All the OVA flours baked cookies of comparable diameters to those baked from local control flours.

Sponge Cake (Table 4-3; Figure 4-2, 4-6 & 4-7)

The sponge cake is baked using equal amounts of flour and sugar with fresh eggs but without the use of baking powder. Leavening for the sponge cake is achieved by the foam from whipped eggs. Volume and firmness of the cake are important measures of quality. All the OVA test flours baked smaller cakes than 10 local control flours. The local control flours were obtained from the commercial milling process and selected specifically for baking cake or cookies, while the OVA samples were straight grade flour milled using a pilot scale Miag mill. This could result in their differences in flour particle size. Among the OVA samples, AGS 2060 baked the largest volume of sponge cake followed by USG 3251 and Croplan 9101. AGS 2035 and Ricochet baked the smallest volume sponge cakes. The volume of cake showed no relationship with crumb firmness. The softest crumb texture was observed in Croplan 9101 and the firmest in AGS 2056.

Chiffon Cake (Table 4-4; Figure 4-3, 4-8 & 4-9)

Chiffon cake is a high ratio sugar-to-flour cake. However, volume and texture of the Chiffon cake derives from foamed egg whites with chemical leavening. Volume and uniformity of the cake are important measures of cake quality. The chiffon cake volume indexes of the OVA flours were comparable to those of the local control flours. The OVA flours showed relatively small differences in volume index of chiffon cake, ranging from 195 to 225. Of the experimental flour samples, Ricochet and Croplan 9101 performed better than others for baking chiffon cakes in terms of cake volume. Croplan also showed the softest crumb texture. AGS 2035 baked the cake with the smallest volume index.

Table 4-1. Dough and Cookie Characteristics of Singapore Bake Workshop Control Flours and SRW Wheat Flours

Control/SRW Wheat Flour	Dough Characteristics	Weight Loss (%)	Diameter* (cm)	Diameter Increase (%)	Height* (cm)	Diameter/Height
Indonesia I Cookie FL	Soft, sticky	11.24	29.3	31.74	5.8	5.05
Indonesia II Cookie FL	Soft, good handling	16.30	28.6	30.07	5.6	5.11
Malaysia GP FL	Soft, good handling	8.51	27.6	27.54	5.7	4.84
Philippines I Cookie FL	Soft, good handling	13.83	31.3	36.10	5.2	6.02
Philippines II Cookie FL	Soft, good handling	11.00	31.3	36.10	5.4	5.80
Philippines III Cookie FL	Soft, good handling	11.46	30.1	33.55	5.5	5.47
Thailand Cookie FL	Soft, good handling	5.68	28.7	30.31	5.9	4.86
AGS 2050	Sl. Crumbly	9.90	29.4	31.97	6.3	4.67
AGS 2035	Soft, good handling	11.34	29.0	31.03	6.7	4.33
AGS 2060	Sl. Crumbly	9.71	30.5	34.43	6.1	5.00
USG 3251	Soft, sticky	12.24	31.6	36.71	5.5	5.75
USG 3201	Soft, sl. sticky	11.00	30.3	33.99	5.7	5.32
Terral TV 8861	Soft, sl. sticky	11.22	30.1	33.55	5.8	5.19
SY 9978**						
Ricochet	Soft, sticky	11.88	30.9	35.28	5.7	5.42
Croplan 9101	Soft, sl. sticky	11.46	30.0	33.33	6.0	5.00
RM1201	Soft, sl. sticky	11.00	30.2	33.77	5.8	5.21

*Diameter and Height of 4 cookies.

**Removed due to scab damage.

Table 4-2. Textural Characteristics of Cookies Prepared from Singapore Bake Workshop Control Flours and SRW Wheat Flours.

Control/SRW Wheat Flour	Hardness (g)	Brittleness (time difference 1:2)	Crispness (number of peaks)
Indonesia I Cookie FL	9669	0.04	30
Indonesia II Cookie FL	7149	0.02	13
Malaysia GP FL	9744	0.13	5
Philippines I cookie FL	6337	0.25	33
Philippines II Cookie FL	9424	0.03	15
Philippines III Cookie FL	11400	0.02	4
Thailand Cookie FL	11777	0.34	25
AGS 2050	10901	0.33	15
AGS 2035	9011	0.16	40
AGS 2060	13233	0.03	4
USG 3251	10879	0.02	38
USG 3201	7636	0.13	13
Terral TV 8861	11364	0.15	7
SY 9978**			0
Ricochet	10087	0.05	17
Croplan 9101	12035	0.04	22
RM1201	10242	0.02	38

*Removed due to scab damage.

Table 4-3. Sponge Cake Characteristics of Singapore Bake Workshop Control Flours and SRW Wheat Flours

Control/SRW Wheat Flour	Shrinkage Value (cm)	Volume Index	Symmetry Index	Uniformity Index	Firmness (g)
Indonesia I Cake FL	0.17	390	20.0	-3.0	253
Indonesia II Cake FL	0.20	430	19.0	1.0	169
Malaysia GP FL	0.20	402	17.0	1.5	254
Philippines I Cake FL	0.13	424	55.0	-3.0	331
Philippines I Cookie FL	-0.03	428	38.0	4.0	199
Philippines II Cake FL	0.17	379	14.0	-2.0	470
Philippines II Cookie FL	0.13	340	17.0	-1.5	492
Philippines III Cake FL	0.13	439	-7.0	0.0	162
Philippines III Cookie FL	0.17	401	-5.0	0.5	172
Thailand Cake FL	0.20	393	18.0	5.0	236
AGS 2056	0.07	378	23.0	4.0	232
AGS 2035	0.50	347	5.0	-3.5	241
AGS 2060	0.13	389	9.0	-0.5	191
USG 3251	0.27	385	9.0	1.0	209
USG 3201	0.13	371	10.0	2.0	231
Terral TV 8861	0.17	374	18.0	1.0	201
SY 9978**					
Ricochet	0.27	347	5.0	1.5	192
Croplan 9101	0.17	385	18.0	6.5	182
RM1201	0.10	362	-1.0	5.0	203

*Eliminated due to scab damage.

Table 4-4. Chiffon Cake Characteristics of Singapore Bake Workshop Control Flours and SRW Wheat Flours

Control/SRW Wheat Flour	Shrinkage Value (cm)	Volume Index	Symmetry Index	Uniformity Index	Firmness (g)
Indonesia I Cake FL	0.97	217	-2.9	1.7	189
Indonesia II Cake FL	1.13	182	-6.0	18.7	168
Malaysia GP FL	0.90	205	-8.7	2.0	217
Philippines I Cake FL	0.77	244	7.6	-1.5	197
Philippines I Cookie FL	1.13	189	-25.5	2.9	220
Philippines II Cake FL	1.13	219	10.6	-3.6	275
Philippines II Cookie FL	0.77	188	-10.5	0.7	183
Philippines III Cake FL	0.87	216	-21.3	-1.2	172
Philippines III Cookie FL	0.67	201	-13.6	0.3	205
Thailand Cake FL	0.93	226	3.7	-0.7	181
AGS 2056	1.10	219	-11.9	-0.2	177
AGS 2035	1.17	195	-29.0	2.4	179
AGS 2060	0.93	205	-11.3	0.7	238
USG 3251	0.90	223	-2.7	2.3	210
USG 3201	0.83	219	-17.4	0.0	171
Terral TV 8861	0.97	216	-19.4	0.4	223
SY 9978**					
Ricochet	1.00	225	-20.5	-0.5	163
Croplan 9101	0.93	221	-21.8	0.9	148
RM1201	0.80	216	-16.4	1.1	179

*Eliminated due to scab damage.

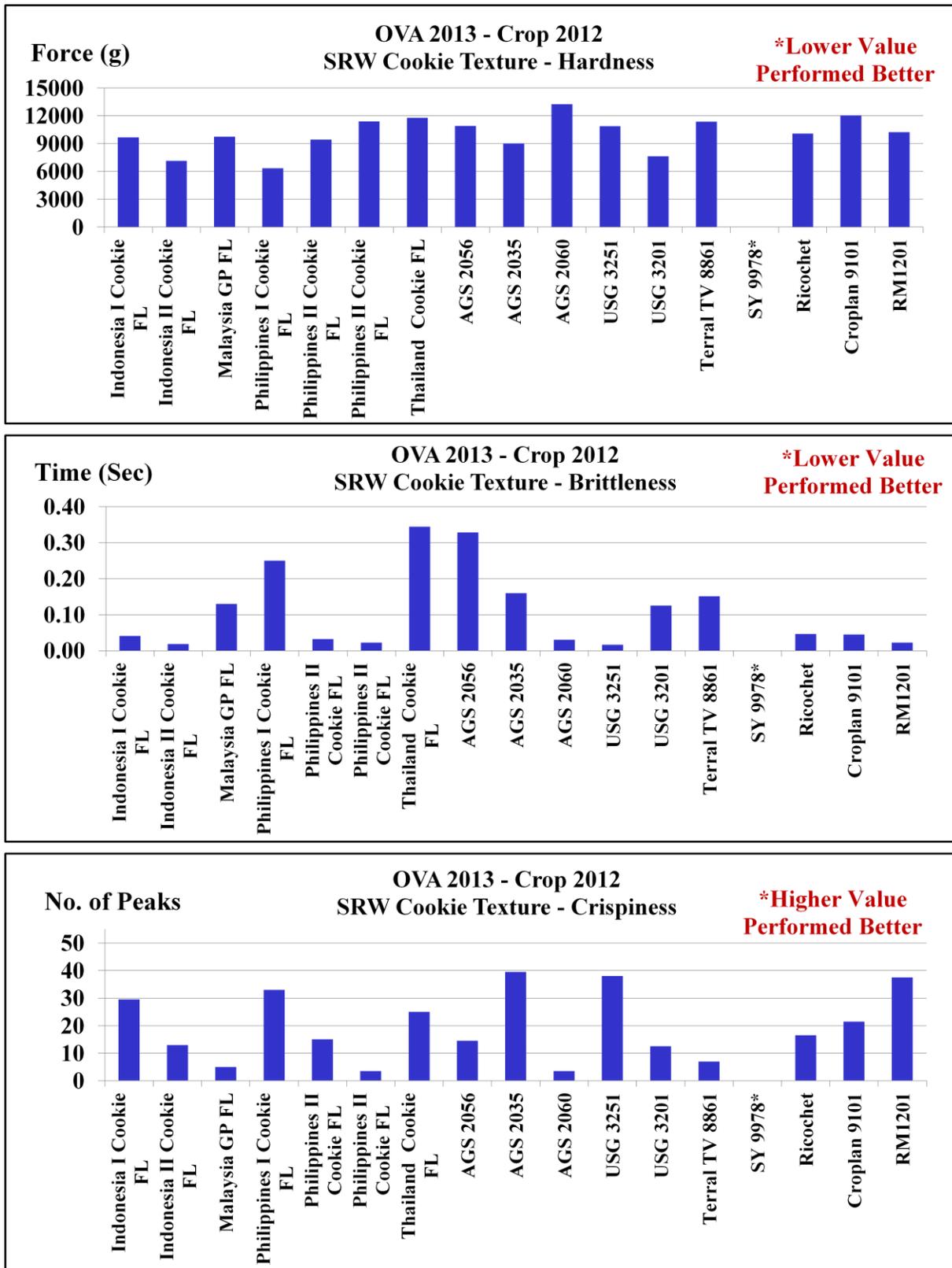


Figure 4-1. Textural characteristics of cookie baked from Singapore Bake Workshop control and SRW wheat flours. *Removed due to scab damage.

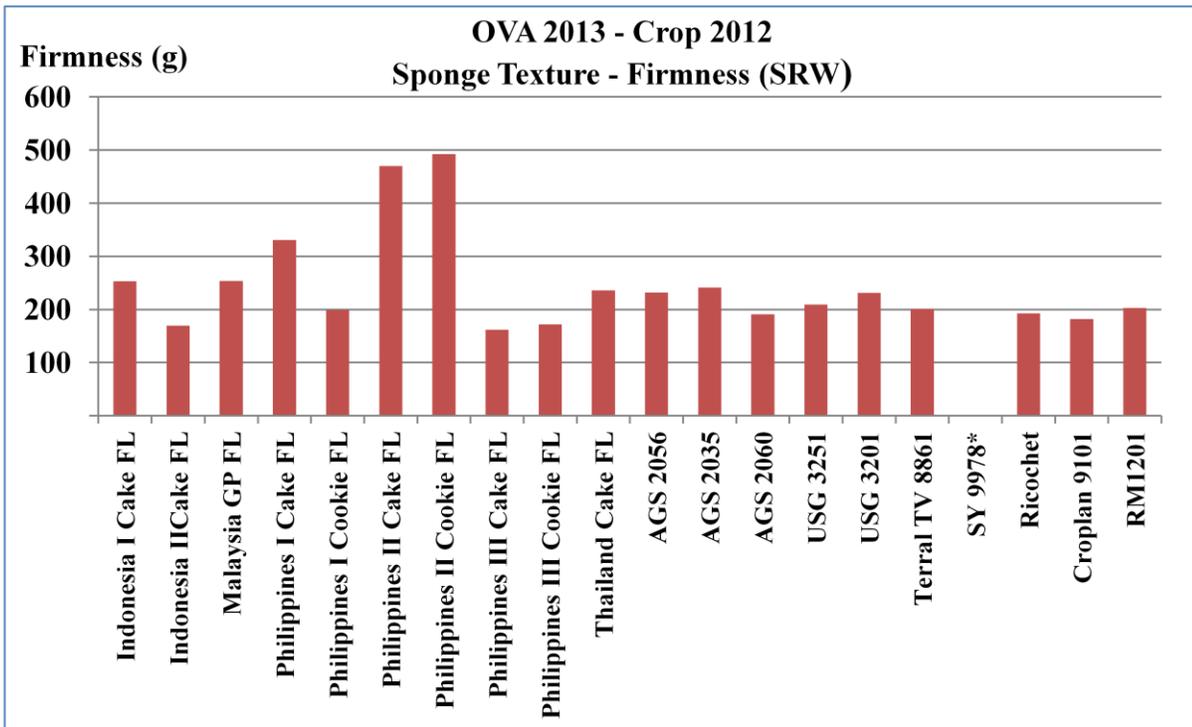


Figure 4-2. Firmness of Sponge cake baked from Singapore Bake Workshop control and SRW wheat flours. *Removed due to scab damage.

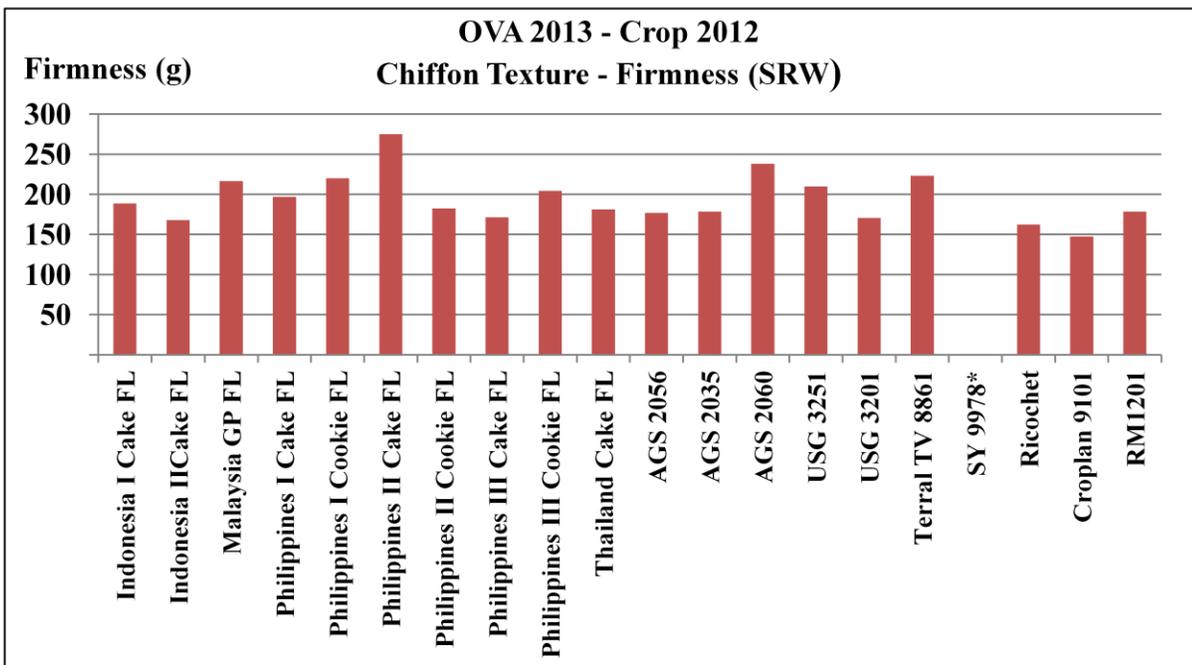
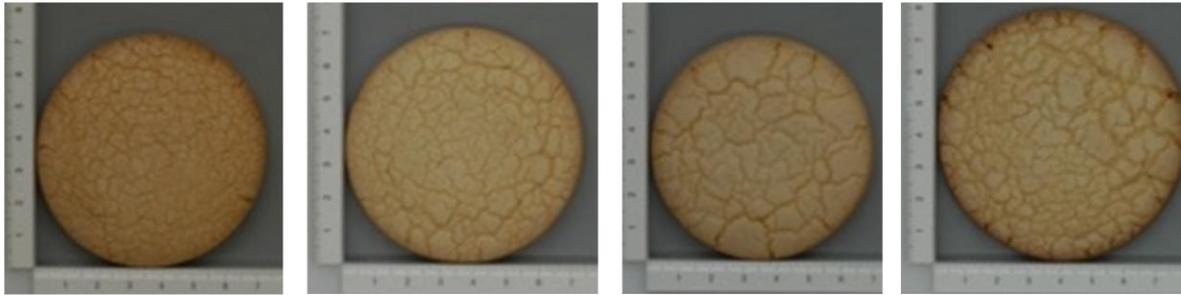
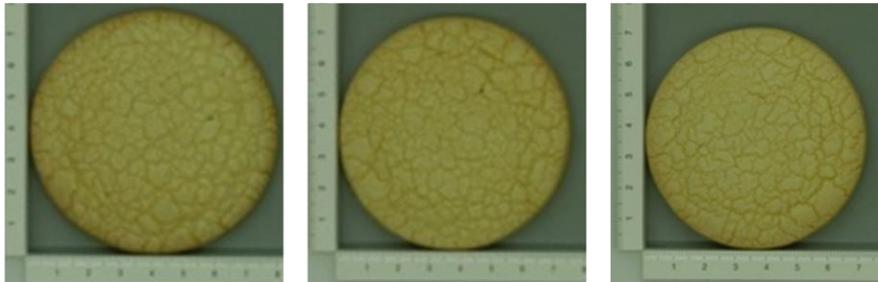


Figure 4-3. Firmness of chiffon cake baked from Singapore Bake Workshop control and SRW wheat flours. *Removed due to scab damage.



Indonesia I Cookie FL Indonesia II Cookie FL Malaysia GP FL Philippines I Cookie FL



Philippines II Cookie FL Philippines II Cookie FL Thailand Cookie FL

Figure 4-4. Sugar snap cookies baked from the local control flours in the Singapore baking workshop.

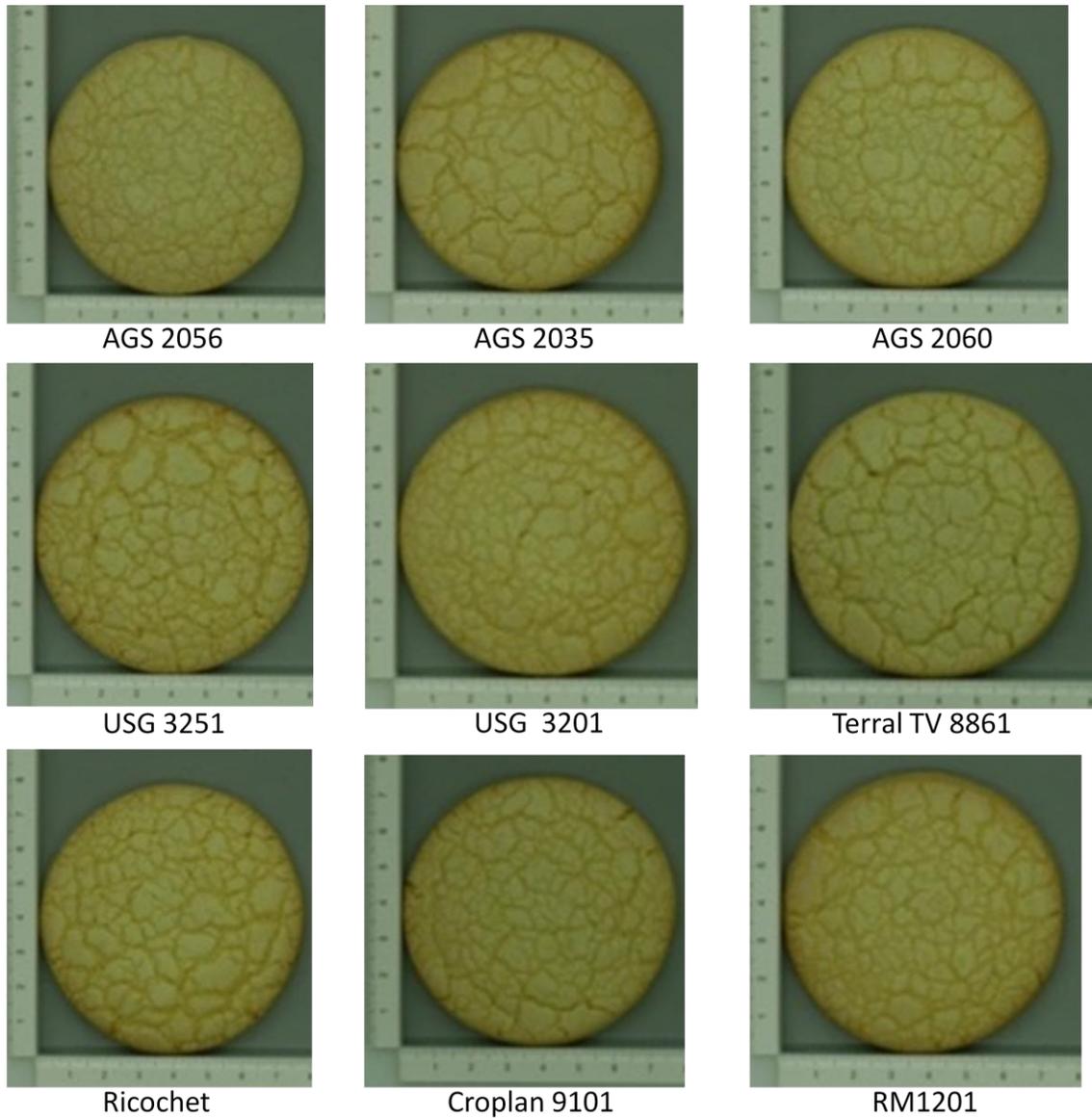
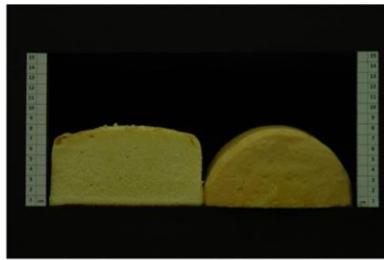


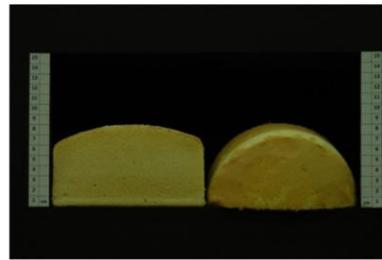
Figure 4-5. Sugar snap cookies baked from the OVA SRW wheat flours in the Singapore baking workshop.



Indonesia I Cake FL



Indonesia II Cake FL



Malaysia GP FL



Philippines I Cake FL



Philippines I Cookie FL



Philippines II Cake FL



Philippines II Cookie FL



Philippines III Cake FL



Philippines III Cookie FL



Thailand Cake FL

Figure 4-6. Sponge cakes baked from the local control flours in the Singapore baking workshop.

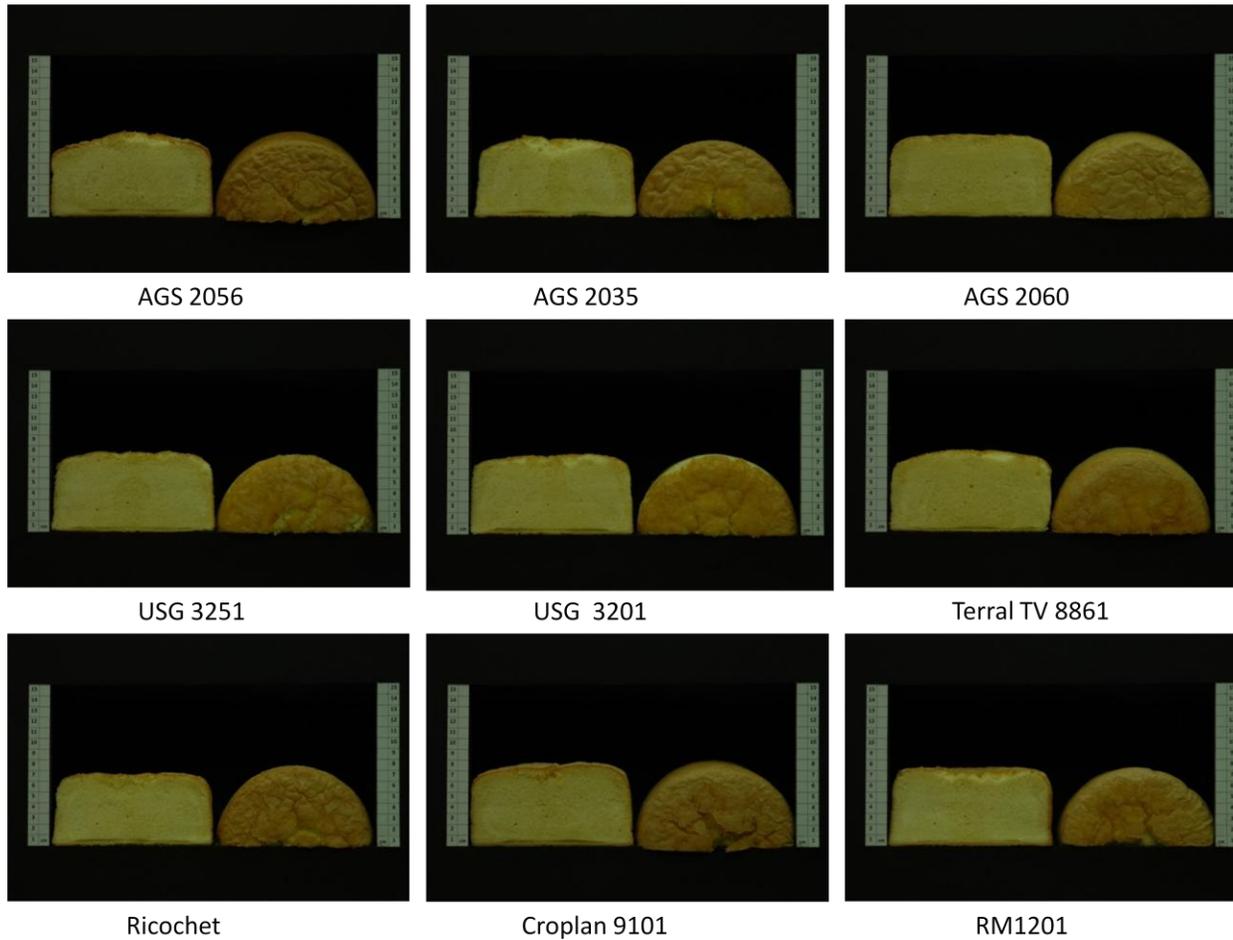


Figure 4-7. Sponge cakes baked from the OVA SRW wheat flours in the Singapore baking workshop.



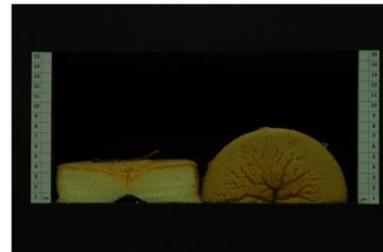
Indonesia I Cake FL



Indonesia II Cake FL



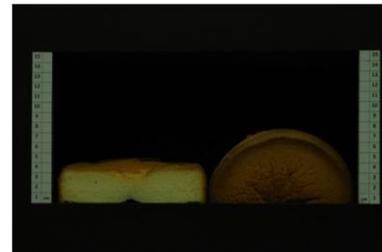
Malaysia GP FL



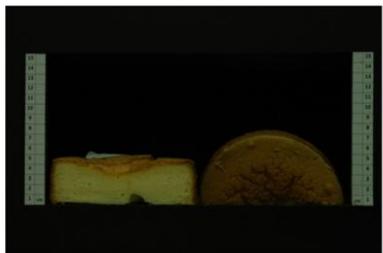
Philippines I Cake FL



Philippines I Cookie FL



Philippines II Cake FL



Philippines II Cookie FL



Philippines III Cake FL



Philippines III Cookie FL



Thailand Cake FL

Figure 4-8. Chiffon cakes baked from the local control flours in the Singapore baking workshop.

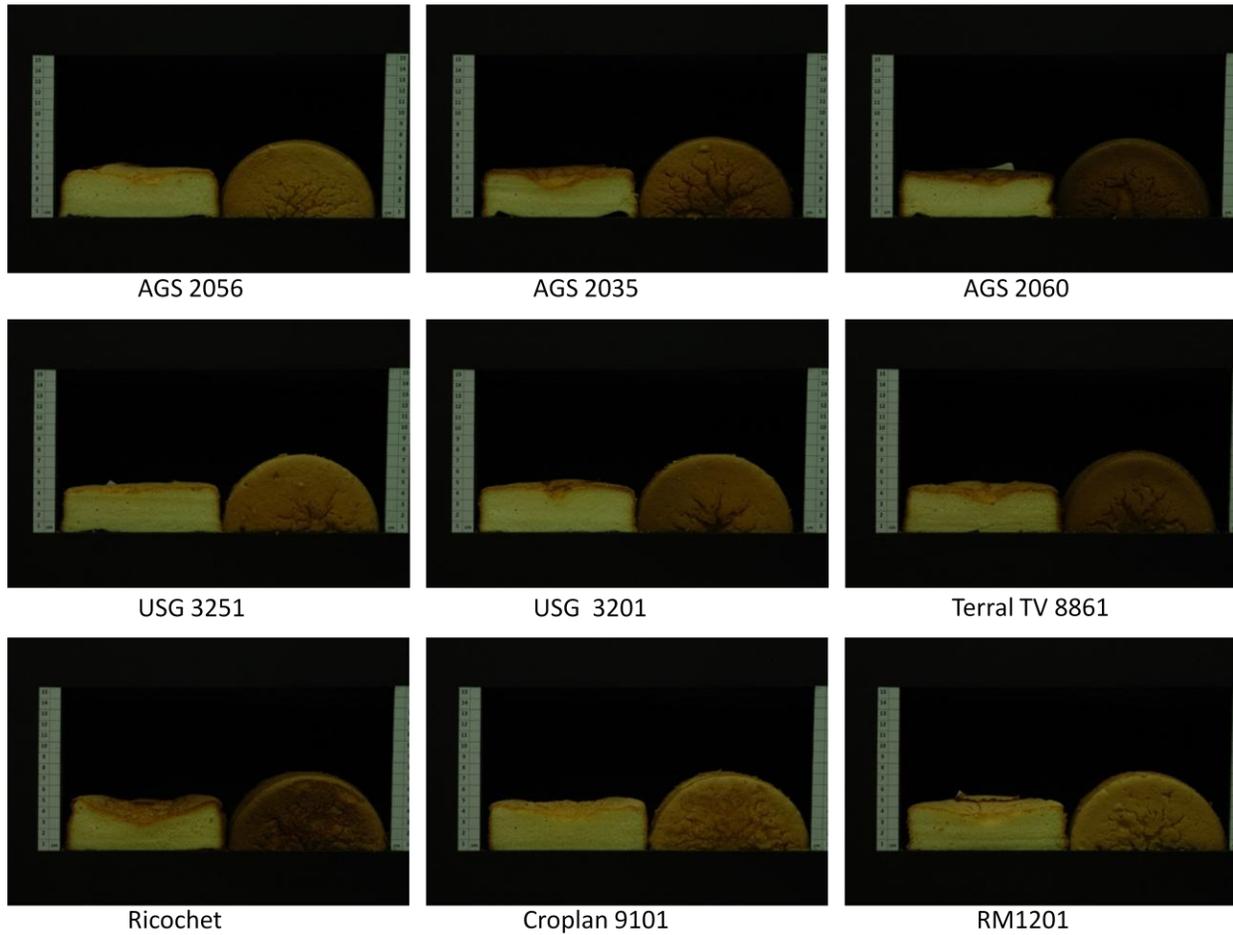


Figure 4-9. Chiffon cakes baked from the OVA SRW wheat flours in the Singapore baking workshop.

Chapter 5. Flour, Dough and Product Evaluations by Cooperators

Table 5-1. Target End Products and Quality Preferences in China I

Primary End Product Uses for SRW	Primary Flour Used	Used Only in blend with Other Flours
Cake	x	
Cookie	x	

Quality Preferences	Acceptable Quality (Minimum Quality)	Preferred Quality (High Quality)
Wet Gluten (%)	minimum 20.0	21.0 - 23.5
Absorption (%)	minimum 50.0	more than 53

Table 5-2. Overall Flour Quality and Cookie Dough Properties of SRW Wheat Evaluated in China I

SRW Flour	Overall Flour Quality			Dough/Batter Properties		
	Score*	Qualities Liked	Quality Disliked	Score*	Qualities Liked	Quality Disliked
Control	8.5	low ash, higher water absorption		9.0	Handles well	
AGS 2056	8.0	low ash, higher water absorption	poorer color	9.0	Handles well	
AGS 2035	7.3	higher water absorption	higher ash & gluten	8.5		A little sticky
AGS 2060	7.5	Good flour color	poorer water absorption	8.8	Handles well	
USG 3251	6.0		low gluten & water absorption	9.0	Handles well	
USG 3201	8.3	low ash, good gluten quality,		8.5		A little sticky
Terral TV 8861	6.5		low gluten & poorer gluten quality	8.5		A little sticky
SY 9978**						
Ricochet	6.8		low gluten & water absorption	9.0	Handles well	
Croplan 9101	5.0		low gluten ,poorer water absorption & gluten quality	9.0	Handles well	
RM1201	7.8	low ash, Good flour color		8.0		A little sticky

* 1 = Very poor/ 9 = Excellent

** Removed due to scab damage

Table 5-3. Overall Cookie Baking Performance of SRW Wheat Evaluated in China I

SRW Flour	Cookie Baking Performance			Overall Acceptability for Cookie Baking		
	Score*	Qualities Liked	Quality Disliked	Score*	Qualities Liked	Quality Disliked
Control	8.5	higher Volume, Acceptable texture		8.5	Good end product performance	
AGS 2056	7.8	higher volume, Acceptable texture		8.0	Good end product performance	
AGS 2035	7.5	higher volume, Acceptable texture		7.5	Good end product performance	
AGS 2060	8.0	higher Volume, Acceptable texture		7.8	Good end product performance	
USG 3251	7.0	Average		6.5	Average	
USG 3201	6.5		Un-uniform crumb, sticky, poor texture	7.0	Average	
Terral TV 8861	6.0		Un-uniform crumb, sticky, poor texture	6.0		Poor end product performance Lower volume
SY 9978**						
Ricochet	5.5		Un-uniform crumb, sticky, poor texture	5.5		Poor end product performance Lower volume
Croplan 9101	5.0		Un-uniform crumb, sticky, poor texture	5.0		Poor end product performance Lower volume
RM1201	6.3		Un-uniform crumb, sticky, poor texture	6.8	Average	

* 1 = Very poor/ 9 = Excellent

** Removed due to scab damage

Table 5-4. Target End Products and Quality Preferences in China II Kerry

Primary End Product Uses for SRW	Primary Flour Used	Used Only in blend with Other Flours
Southern Steam Bun	x	
Sponge Cake	x	

Quality Preferences	Acceptable Quality (Minimum Quality)	Preferred Quality (High Quality)
ash content	around 0.45	< 0.44
moisture	< 13	around 12.5
P/L ratio	< 0.45	0.4-0.45
stability	< 5	< 3
extensibility	< 300	around 250
amylograph temperature	>70	70-80
final viscosity	< 3500	3000-3500
protein	< 8	around 7.5
falling number	below 450	420-440
peak time	< 2	1-1.5

Table 5-5. Flour Quality and Dough/Batter Properties for Steam Bun/Sponge Cake Evaluated in China/Yihai Kerry						
SRW Flour	Overall Flour Quality			Dough/Batter Properties		
	Score*	Qualities Liked	Quality Disliked	Score*	Qualities Liked	Quality Disliked
Control 1	9.5	medium extensibility and		9.0	slightly high water absorption	
Control 2	9.0	medium extensibility and		8.0	slightly high water absorption	too long mixing time
AGS 2056	7.0		high starch damage and high falling number	7.0	easy to take shape, slightly dense	dough color is yellow and dull
AGS 2035	7.0		too strong spring, difficult to take shape; high ash	7.5	batter is slightly dense	difficult to take shape
AGS 2060	6.5	very good extensibility	high protein level	7.0	very good extensibility, easy to take shape	
USG 3251	7.0			6.0		dough color is dull and yellowish
USG 3201	8.5	very good extensibility	low water absorption	8.0	very good extensibility, easy to take shape	
Terral TV 8861	8.5	very good flour color		8.0	very good extensibility, easy to take shape	
SY 9978**						
Ricochet	8.0		low water absorption	8.0	handles well	dough color is yellowish
Croplan 9101	6.0		low protein level	6.0	handles well	dough is non durable in mixing / short mixing
RM1201	9.0	very good extensibility		9.0	very good extensibility, easy to take shape, slightly dense	
* 1 = Very poor/ 9 = Excellent						
** Removed due to scab damage						

Table 5-6. Southern Steam Bun Baking Performance of SRW Wheat Evaluated in China/Yihai Kerry						
SRW Flour	Southern Steam Bun Baking Performance			Overall Acceptability for Steam Bun Baking		
	Score*	Qualities Liked	Quality Disliked	Score*	Qualities Liked	Quality Disliked
Control 1	9.0	fast fermentation		9.0	high water absorption, fast fermentation, steambun has bright yellow color, texture is fine and uniform	
Control 2	8.0		slightly thin skin, has iron stain / scald stain	8.0		slightly thin skin, has iron stain / scald stain
AGS 2056	7.0		medium texture, strong spring	7.0	fast in developing dough	flour color is slightly yellowish
AGS 2035	7.0	good texture	strong spring, coarse taste	7.0	fine grain and texture	too strong spring, high ash content, coarse taste
AGS 2060	6.0		broken surface, too strong spring	6.5		high protein, broken surface
USG 3251	7.0	very good outlook and shape	medium texture, taste dry	6.5	very good outlook and shape	steambun color is dull yellow
USG 3201	8.0	good grain and texture	medium chewiness	7.5	good extensibility, good texture	low water absorption, medium chewiness
Terral TV 8861	9.0	very good upright shape, fine and uniform texture/grain		8.5	flour has bright yellow color, steambun has good upright shape, texture is fine and uniform	
SY 9978**						
Ricochet	9.0	very good upright shape, fine and uniform texture/grain		8.0	flour has bright yellow color, steambun has good upright shape, texture is fine and uniform	steam bun color is too yellowish
Croplan 9101	6.0		slightly wrinkle surface. Taste sticky	6.0		low protein, short mixing time, wrinkle surface
RM1201	8.0	good grain and texture	medium chewiness, taste slightly dry	8.0	good extensibility, easy to develop shape, fine texture	medium spring, taste dry
* 1 = Very poor/ 9 = Excellent; ** Removed due to scab damage						

Table 5-7. Sponge Cake Baking Performance of SRW Wheat Evaluated in China/Yihai Kerry						
SRW Flour	Sponge Cake Baking Performance			Overall Acceptability for Sponge Cake Baking		
	Score*	Qualities Liked	Quality Disliked	Score*	Qualities Liked	Quality Disliked
Control 1	8.0	nice golden color, fluffy and uniform texture, taste tender and soft		8.0	thin skin, bright color, fluffy texture, good taste	
Control 2						
AGS 2056	7.2	fine texture	thick batter, poor fermentation	7.2	fine texture	thick batter, poor fermentation, too chewy
AGS 2035	7.4	smooth surface		7.4	smooth skin	
AGS 2060	7.3		thick skin, dark color, poor fermentation	7.3		dense batter, taste hard, bubble surface
USG 3251	7.2	large volume	coarse texture, crumby	7.2	good volume	dull color, taste dry, crumby
USG 3201	8.4	thin and smooth skin, golden color, taste good		8.4	golden color, uniform texture, taste smooth	
Terral TV 8861	8.1	fine texture, uniform color		8.1	fine texture, smooth skin, taste tender and smooth	
SY 9978**						
Ricochet	7.1	good volume	bubble surface, coarse texture	7.1		bubble surface, coarse texture
Croplan 9101	7.0	uniform texture	poor taste, crumby	7.0	uniform texture	poor taste, crumby
RM1201	8.4	thin and smooth skin, golden color, taste good		8.4	golden color, good volume, thin skin, taste smooth	

* 1 = Very poor/ 9 = Excellent; ** Removed due to scab damage.

Table 5-8. Target End Products and Quality Preferences in Dominican Republic

Primary End Product Uses for SRW	Primary Flour Used	Used Only in blend with Other Flours
Sweet Dough	x	
Cookie	x	
Johnny Cake (fried dough)	x	

Quality Preferences	Acceptable Quality (Minimum Quality)	Preferred Quality (High Quality)
Farinograph Stability	Max. 5.0 minutes	1.5-3.0 minutes
P/L	max 0.8	0.35-0.65
Water absorption	max. 55%	50-54
W 10E-4J	Max. 180	90-130
Protein 12% mb (wheat)	max. 10.5	9.8-10.5

SRW Flour	Overall Flour Quality			Dough/Batter Properties		
	Score*	Qualities Liked	Quality Disliked	Score*	Qualities Liked	Quality Disliked
Control 1				6.0	good handling	low w, low water absorption
AGS 2056	7.5	very good protein		7.0	good handle	water absorption very high
AGS 2035	6.0	high specific weight	very high weight of 1000 grains, too high w	5.0		water absorption very high, p/l very high
AGS 2060	5.0		w too high, stability too high, protein too high	4.5		water absorption slightly high, w slightly high, stability very high
USG 3251	6.0	good water absorption	w very low, stability very low	5.0	good water absorption	w very low
USG 3201	6.5	good specific weight, good w	p/l very low	5.5		p/l very low
Terral TV 8861	8.5	very good rheology		8.5	good rheology, good handling	
SY 9978**						
Ricochet	5.0		low specific weight, low p/l	6.0		p/l very low, stability very low
Croplan 9101	4.0		very low stability, very low protein	6.0		stability very low, p/l very high
RM1201	6.0	good water absorption	very low p/l	6.0		p/l very low, stability very high
* 1 = Very poor/ 9 = Excellent; ** Removed due to scab damage.						

Table 5-10. Sweet Bread Baking Performance of SRW Wheat Evaluated in Dominican Republic						
SRW Flour	Sweet Bread Baking Performance			Overall Acceptability for Sweet Bread Baking		
	Score*	Qualities Liked	Quality Disliked	Score*	Qualities Liked	Quality Disliked
Control 1	8.0	good volume, good texture		7.0		prefer slightly higher w
AGS 2056	8.5	very good volume		5.5		prefer lower absorption, prefer weaker gluten, prefer higher gluten
AGS 2035	7.5	good texture		7.5	good wheat quality	prefer lower p/l
AGS 2060	8.5	excellent volume, good texture		7.5	good wheat quality, excellent volume	prefer lower stability
USG 3251	8.0	good volume, good texture		6.0		prefer higher gluten index, prefer higher w
USG 3201	5.5		slightly compacted dough	6.0		prefer lower gluten, prefer higher gluten index, prefer higher p/l
Terral TV 8861	8.0	good texture		8.0		prefer slightly higher gluten index
SY 9978**						
Ricochet	8.0	good volume		7.5	good wheat quality	prefer higher p/l, prefer slightly higher w
Croplan 9101	7.0			5.5		prefer much higher wet gluten, prefer higher stability, prefer lower p/l
RM1201	5.0	good texture	very low volume, dough with little development	4.0		prefer lower stability, prefer much higher volume, prefer higher p/l
* 1 = Very poor/ 9 = Excellent; ** Removed due to scab damage.						

Table 5-11. Target End Products and Quality Preferences in Indonesia I

Primary End Product Uses for SRW	Primary Flour Used	Used Only in blend with Other Flours
cake		x
Cookie		x
Wafer	x	

Quality Preferences	Acceptable Quality (Minimum Quality)	Preferred Quality (High Quality)
Test weight	79 - 81 kg/hl	80 - 83kg/hl
Wheat moisture	maximum 12.5%	10 - 11.5%
Wheat ash (dry basis)	maximum 1.60%	1.45 - 1,55%
Wheat falling number (sec)	375 - 420 sec	350 - 400 sec
Flour protein (dry basis)	maximum 10.5%	9.5 - 10.5%
Water absorption	maximum 58%	56 - 58%
Cake volume		
Cake texture		
SRC - Water	50 - 70%	
SRC - Pentosan (50% Sucrose)	85 - 125%	
SRC - Glutenin (5% Lactic Acid)	80 - 115%	
SRC - Damaged starch (5% Na ₂ CO ₃)	75 - 100%	

Table 5-12. Flour Quality and Batter Properties for Baking Sponge Cake in Indonesia/Bogasari						
SRW Flour	Overall Flour Quality			Batter Properties		
	Score*	Qualities Liked	Quality Disliked	Score*	Qualities Liked	Quality Disliked
Control 1	7.0	Good flour protein, Good water absorption, Good SRC	N/A	7.0	Handless well	N/A
AGS 2056	6.5	Good flour protein	Slightly high falling number	6.5	N/A	Flowly batter
AGS 2035	7.0	Good flour protein, Good water absorption, Good SRC	N/A	6.5	N/A	Flowly batter
AGS 2060	6.0	Good water absorption, Good SRC	Low flour extraction, Slightly high protein	7.0	Handless well	N/A
USG 3251	7.0	Good flour protein, Good water absorption, Good SRC	N/A	7.0	Handless well	N/A
USG 3201	7.0	Good flour protein	N/A	6.5	N/A	Flowly batter
Terral TV 8861	7.0	Good flour protein, Good water absorption, Good SRC	N/A	7.0	Handless well	N/A
SY 9978**						
Ricochet	7.0	Good flour protein, Good water absorption, Good SRC	N/A	6.5	N/A	Slightly flowly batter
Croplan 9101	7.0	Good flour protein	N/A	7.0	Handless well	N/A
RM1201	7.0	Good flour protein, Good water absorption, Good SRC	N/A	7.0	Handless well	N/A
* 1 = Very poor/ 9 = Excellent; ** Removed due to scab damage.						

Table 5-13. Sponge Cake Baking Performance of SRW Wheat Evaluated in Indonesia/Bogasari						
SRW Flour	Sponge Cake Baking Performance			Overall Acceptability for Sponge Cake Baking		
	Score*	Qualities Liked	Quality Disliked	Score*	Qualities Liked	Quality Disliked
Control 1	7.0	Acceptable cake character, Good volume	Poor symmetry, Hard crumb texture	7.0	Good flour quality, Acceptable character, Good volume	Prefer cake crumb softness
AGS 2056	6.5	Acceptable cake character	Poor symmetry, Hard crumb texture	6.5	Good flour quality, Acceptable character	Prefer cake crumb softness
AGS 2035	6.0	Acceptable cake character	Small volume, Hard crumb texture	6.5	Good flour quality, Acceptable character	Prefer bigger cake volume
AGS 2060	8.0	Acceptable cake character, Good volume, Good crumb softness	N/A	7.5	Good flour quality, Acceptable character, Good volume, Good crumb	Prefer lower protein
USG 3251	7.5	Acceptable cake character, Good volume	Harder cake crumb texture	7.0	Good flour quality, Acceptable character, Good volume	Prefer cake crumb softness
USG 3201	6.5	Acceptable cake character	Harder cake crumb texture	6.5	Good flour quality, Acceptable character	Prefer cake crumb softness
Terral TV 8861	6.5	Acceptable cake character	Poor symmetry	7.0	Good flour quality, Acceptable character	
SY 9978**						
Ricochet	7.5	Acceptable cake character	Small volume	7.0	Good flour quality, Acceptable character, Good volume	Prefer bigger cake volume
Croplan 9101	7.5	Acceptable cake character, Good volume, Good crumb softness	Poor symmetry	8.0	Good flour quality, Acceptable character, Good volume & crumb softness	N/A
RM1201	7.0	Acceptable cake character	N/A	7.0	Good flour quality, Acceptable character	N/A
* 1 = Very poor/ 9 = Excellent; ** Removed due to scab damage.						

Table 5-14. Target End Products and Quality Preferences in Indonesia/Pundi Kencana

Primary End Product Uses for SRW	Primary Flour Used	Used Only in blend with Other Flours
cake		x
Biscuit and Cookie		x
Fried product		x
Wafer		x

Quality Preferences	Acceptable Quality (Minimum Quality)	Preferred Quality (High Quality)
Test weight	min 80 kg/hl	82 kg/hl
Flour protein	max 9,0 % (as is)	8,5 % (as is)

Table 5-15. Flour Quality and Batter Properties for Baking Sponge Cake in Indonesia/Pundi Kencana						
SRW Flour	Overall Flour Quality			Batter Properties		
	Score*	Qualities Liked	Quality Disliked	Score*	Qualities Liked	Quality Disliked
Control 1	8.0	Low protein, Low lactic acid, Low water absorption	N/A	8.0	Handles well, Slight flowy	N/A
AGS 2056	7.0	Low protein, Low lactic acid, Low water absorption	Low test weight, Low TKW	8.5	Handles well, Flowy	N/A
AGS 2035	7.5	Low protein, Low lactic acid, Low water absorption, High TKW, High test weight	High moisture	8.5	Handles well, Flowy	N/A
AGS 2060	7.0	Low water absorption	Low test weight, Low TKW, High protein & lactic	8.0	Handles well, Slight flowy	N/A
USG 3251	6.5	Low Protein, Low lactic acid, Low water absorption	Low test weight, Low TKW, High moisture	8.0	Handles well, Slight flowy	N/A
USG 3201	7.5	High test weight, Low lactic acid, Low water absorption, High TKW, Low protein	High moisture	8.5	Handles well, Flowy	N/A
Terral TV 8861	6.0	High test weight, High TKW, Low protein	High moisture, High lactic acid	8.0	Handles well, Slight flowy	N/A
SY 9978**						
Ricochet	7.0	Low protein, Low lactic acid	Low Test weight, Low TKW	8.5	Handles well, Flowy	N/A
Croplan 9101	7.0	Low protein, Low lactic acid	Low test weight, Low TKW	8.0	Handles well, Slight flowy	N/A
RM1201	6.0	Low protein	Low test weight, Low TKW, Very high moisture & lactic acid	8.0	Handles well, Slight flowy	N/A

* 1 = Very poor/ 9 = Excellent; ** Removed due to scab damage.

Table 5-16. Sponge Cake Baking Performance of SRW Wheat Evaluated in Indonesia/Pundi Kencana						
SRW Flour	Sponge Cake Baking Performance			Overall Acceptability for Sponge Cake Baking		
	Score*	Qualities Liked	Quality Disliked	Score*	Qualities Liked	Quality Disliked
Control 1	8.5	Good symetry index, very goo volume, less shrinkage, good softness	N/A	8.5	Nice wheat and flour quality, good product	N/A
AGS 2056	6.5	Less shrinkage	Low cake volume, a bit firm texture	7.3	Low protein, less shrinkage	Low test weight
AGS 2035	4.5	N/A	Low cake volume, a bit shrinkage & firm texture	6.8	Low protein	High moisture
AGS 2060	8.0	Good cake volume, less shrinkage, good softness	N/A	7.7	Low water absorption, less shrinkage & good softness	Low test weight
USG 3251	7.0	Good cake volume	A bit shrinkage, a bit firm texture	7.2	Low Protein, good cake volume	Low test weight
USG 3201	5.5	Less shrinkage	Low cake volume, a bit firm texture	7.2	High test weight, less shrinkage	High moisture
Terral TV 8861	6.0	Less shrinkage	Low cake volume, a bit firm texture	6.7	High test weight	High moisture
SY 9978**						
Ricochet	4.0	Good softness	A bit shrinkage, low cake volume	6.5	Low protein, good softness	Low Test weight
Croplan 9101	7.5	Good cake volume, less shrinkage, good softness	N/A	7.5	Low protein, less shrinkage & good softness	Low test weight
RM1201	5.0	Less Shrinkage	A bit firm texture, low cake volume	6.3	Low protein, less shrinkage	Low test weight

* 1 = Very poor/ 9 = Excellent; ** Removed due to scab damage.

Table 5-17. Target End Products and Quality Preferences in Indonesia I

Primary End Product Uses for SRW	Primary Flour Used	Used Only in blend with Other Flours
cake		x
Cookie		x
Wafer	x	

Quality Preferences	Acceptable Quality (Minimum Quality)	Preferred Quality (High Quality)
Test weight	79 - 81 kg/hl	80 - 83kg/hl
Wheat moisture	maximum 12.5%	10 - 11.5%
Wheat ash (dry basis)	maximum 1.60%	1.45 - 1,55%
Wheat Falling number	375 - 420 sec	350 - 400 sec
Flour protein (dry basis)	maximum 10%	9.5 - 10.0%
Water absorption	maximum 58%	56 - 58%
SRC - Water	45 - 65%	
SRC - Pentosan (50% Sucrose)	75 - 115%	
SRC - Damaged starch (5% Na ₂ CO ₃)	80 - 110%	
SRC - Glutenin (5% Lactic Acid)	55 - 95%	

Table 5-18. Flour Quality and Dough Properties for Baking Cookie in Indonesia/Bogasari							
SRW Flour	Overall Flour Quality			Dough Properties			
	Score*	Qualities Liked	Quality Disliked	Score*	Qualities Liked	Quality Disliked	
Control 1	7.0	Good SRC	N/A	7.0	Soft dough	Sticky dough	
AGS 2056	7.0	Good water absorption, high flour yield, good SRC	Slightly high protein, slightly high falling number	6.5	N/A	Slightly crumbly	
AGS 2035	7.0	Good water absorption, high flour yield, good SRC	Slightly high protein	7.0	Soft and Good handling	N/A	
AGS 2060	7.0	Good water absorption, good SRC	High protein	6.5	N/A	Slightly crumbly	
USG 3251	7.5	Good water absorption, good SRC	N/A	6.5	Soft dough	Sticky dough	
USG 3201	8.0	Good water absorption, high flour yield, good SRC	N/A	6.5	Soft dough	Slightly sticky dough	
Terral TV 8861	8.0	Good water absorption, high flour yield, good SRC	N/A	6.5	Soft dough	Slightly sticky dough	
SY 9978**							
Ricochet	7.5	Good water absorption, good SRC	N/A	6.5	Soft dough	Sticky dough	
Croplan 9101	7.5	Good water absorption, good SRC	N/A	6.5	Soft dough	Slightly sticky dough	
RM1201	7.0	Good water absorption, good SRC	Slightly high protein	6.5	Soft dough	Slightly sticky dough	
* 1 = Very poor/ 9 = Excellent; ** Removed due to scab damage.							

Table 5-19. Cookie Baking Performance of SRW Wheat Evaluated in Indonesia/Bogasari						
SRW Flour	Cookie Baking Performance			Overall Acceptability for Cookie Baking		
	Score*	Qualities Liked	Quality Disliked	Score*	Qualities Liked	Quality Disliked
Control 1	7.0	Acceptable texture	N/A	7.0	Acceptable texture	N/A
AGS 2056	6.0	High percent weight loss	Harder texture, less crispy	6.5	Good flour quality	Prefer more softness, prefer more crispy
AGS 2035	8.0	High percent weight loss, good texture & crispiness	N/A	8.5	Good flour quality,	N/A
AGS 2060	5.5	Good flour quality	Low percent weigh loss, harder texture and less crispy	6.0	N/A	Prefer less hard texture, prefer more crispy
USG 3251	7.0	High percent weight loss, acceptable texture, good crispiness	Harder texture	7.5	Good flour quality	Prefer more softness
USG 3201	6.0	Good softness	Low percent weigh loss, less crispy	7.0	Good flour quality	Prefer more crispiness
Terral TV 8861	5.0	N/A	Low percent weigh loss, harder texture and less crispy	6.5	Good flour quality	Prefer less hard texture, prefer more crispy
SY 9978**						
Ricochet	5.5	High percent weight loss, acceptable texture	Harder texture, less crispy	7.0	Good flour quality	Prefer less hard texture, prefer more crispy
Croplan 9101	5.5	Acceptable texture	Low percent weigh loss, harder texture, less crispy	7.0	Good flour quality	Prefer less hard texture, prefer more crispy
RM1201	7.0	High percent weight loss, acceptable texture and good crispiness	Harder texture	7.5	Good flour quality	Prefer less hard texture
* 1 = Very poor/ 9 = Excellent; ** Removed due to scab damage.						

Table 5-20. Target End Products and Quality Preferences in Indonesia/Pundi Kencana

Primary End Product Uses for SRW	Primary Flour Used	Used Only in blend with Other Flours
cake		x
Biscuit and Cookie		x
Fried product		x
Wafer		x

Quality Preferences	Acceptable Quality (Minimum Quality)	Preferred Quality (High Quality)
Test weight	min 80 kg/hl	82 kg/hl
Flour protein	max 9,0 % (as is)	8,5 % (as is)

Table 5-21. Flour Quality and Dough Properties for Baking Cookie in Indonesia/Pundi Kencana						
SRW Flour	Overall Flour Quality			Dough Properties		
	Score*	Qualities Liked	Quality Disliked	Score*	Qualities Liked	Quality Disliked
Control 1	8.0	Low protein, low lactic SRC & water absorption	N/A	8.0	Soft and good handling	N/A
AGS 2056	8.0	Low protein, low lactic SRC & water absorption	Low test weight, low TKW	7.0	Soft and good handling	N/A
AGS 2035	8.5	Low protein, low lactic SRC & water absorption	High moisture	7.5	N/A	Slight crumbly
AGS 2060	7.0	Low water absorption	Low test weight, low TKW, high protein & lactic SRC	6.5	Soft dough	Sticky dough
USG 3251	6.5	Low Protein, low lactic SRC & water absorption	Low test weight, low TKW & high moisture	7.5	Soft dough	Sticky dough
USG 3201	7.5	High test weight, high TKW, low protein, low lactic SRC & water absorption,	High moisture	7.5	Soft dough	Sticky dough
Terral TV 8861	6.0	High test weight, high TKW & low protein	High moisture, high lactic SRC	6.0	Soft dough	Sticky dough
SY 9978**						
Ricochet	7.0	Low protein, low lactic SRC	Low Test weight & TKW	7.0	Soft dough	Sticky dough
Croplan 9101	7.0	Low protein, low lactic SRC	Low test weight & TKW	7.0	Soft dough	Sticky dough
RM1201	6.0	Low protein	Low test weight & TKW, very high moisture & lactic SRC	6.0	Soft dough	Sticky dough
* 1 = Very poor/ 9 = Excellent; ** Removed due to scab damage.						

Table 5-22. Cookie Baking Performance of SRW Wheat Evaluated in Indonesia/Pundi Kencana						
SRW Flour	Cookie Baking Performance			Overall Acceptability for Cookie Baking		
	Score*	Qualities Liked	Quality Disliked	Score*	Qualities Liked	Quality Disliked
Control 1	7.0	Good baking loss, good texture, more crispy	Less spread and height	7.7	Good texture - Not too hard	Less spread and height
AGS 2056	4.0	Good crispiness	Poor baking loss, spread, height & texture	5.9	Soft and good handling, good crispiness	Poor baking loss, spread, height & texture
AGS 2035	4.0	Good baking loss	Not so good spread & height, harder texture, not crispy	6.7	Good baking loss	Poor spread, height, texture & texture
AGS 2060	5.0	Very good on crispiness, good cookie spread	Poor baking loss & height, very hard texture	6.3	Crispy & good spread	sticky dough, poor baking loss, height & texture
USG 3251	5.5	Good bake loss, spread & height	Harder cookie texture, not crispy	6.5	good bake loss, spread & height	Sticky dough, harder texture & not crispy
USG 3201	5.5	Very good on crispiness, spread & height	Poor bake loss, slightly harder texture	6.8	Good spread, height, crispiness	Sticky dough, poor bake loss & slightly harder
Terral TV 8861	5.0	Good cookie spread & crispiness	Poor bake loss & height, very hard	5.7	Good spread and very good crispiness	Poor bake loss, height & vary hard texture
SY 9978**						
Riccochet	7.0	Good bake loss, spread, height & crispiness	Harder cookie texture	7.0	Good bake loss, spread, height & crispiness	sticky dough, harder cookie texture
Croplan 9101	4.0	Good bake loss	Poor cookie spread & height, very hard	6.0	Good bake loss	Poor spread, height, very hard texture, not so
RM1201	4.0	Good cookie height	Poor spread & bake loss, harder cookie texture, poor	5.3	Good height	sticky dough, poor spread, bake loss & crispiness, harder

* 1 = Very poor/ 9 = Excellent; ** Removed due to scab damage.

Table 5-23. Target End Products and Quality Preferences in Malaysia

Primary End Product Uses for SRW	Primary Flour Used	Used Only in blend with Other Flours
Cookie & sweet Biscuit	X	X
Sponge & Pound Cake	X	X
Frying batter	X	X
Waffles	X	X

Quality Preferences	Acceptable Quality (Minimum Quality)	Preferred Quality (High Quality)
Flour Yield (Base on Commercial Extraction)	78% (min)	> 80%
Falling Number	300 (min)	350 - 450
Test Weight	73 (min)	> 78
Flour Protein (as - is)	9.5 (max)	7.5 - 9.0
Flour Wet Gluten	26.0 (max)	18- 23
Farinograph water absorption	60 (max)	55- 58
Farinograph Dough Development time	5 (max)	1 - 4minutes
Farinograph Stability	8 (max)	3 - 6 minutes
Extensograph energy (area)	90 cm2 (max)	50 - 80 cm2

Table 5-24. Flour Quality and Batter Properties for Baking Sponge Cake in Malaysia						
SRW Flour	Overall Flour Quality			Batter Properties		
	Score*	Qualities Liked	Quality Disliked	Score*	Qualities Liked	Quality Disliked
Control 1	7.0	Ideal flour quality for local	N/A	7.0	Ideal batter characteristics	Prefer lower Specific Gravity
AGS 2056	7.0	Low flour ash	Low test weight, low 1000 kernel	6.0	N/A	Rather flowy batter
AGS 2035	8.5	Good test weight & flour yield	Rather high flour ash	6.0	N/A	Rather flowy batter
AGS 2060	7.5	N/A	Low flour yield	8.0	Ideal batter characteristics, low specific gravity	N/A
USG 3251	7.5	N/A	Low test weight	8.0	Ideal batter characteristics, low specific gravity	N/A
USG 3201	8.5	Good test weight & flour yield	Prefer lower wheat moisture	6.0	N/A	Rather flowy batter
Terral TV 8861	8.0	Good test weight & flour yield	Prefer lower wheat moisture	8.0	Ideal batter characteristics, low specific gravity	N/A
SY 9978**						
Ricochet	7.0	N/A	Low test weight, low 1000 kernel	5.5	N/A	Rather flowy batter, high specific gravity
Croplan 9101	6.0	N/A	Very high wheat moisture	8.0	Ideal batter characteristics, low specific gravity	N/A
RM1201	5.0	N/A	Too high wheat moisture	7.0	Ideal batter characteristics	Prefer lower Specific Gravity

* 1 = Very poor/ 9 = Excellent; ** Removed due to scab damage.

Table 5-25. Sponge Cake Baking Performance of SRW Wheat Evaluated in Malaysia						
SRW Flour	Sponge Cake Baking Performance			Overall Acceptability for Sponge Cake Baking		
	Score*	Qualities Liked	Quality Disliked	Score*	Qualities Liked	Quality Disliked
Control 1	7.0	Acceptable texture	Slight dome shape	7.0	Local market accepted quality	Prefer weaker gluten
AGS 2056	6.3	N/A	Lack of volume, coarser & open texture	6.5	N/A	Product lack of volume, coarser & open texture
AGS 2035	6.0	N/A	Lack of volume & symmetry	6.6	N/A	Product lack of volume
AGS 2060	7.0	Reasonable texture	Lack of volume	7.3	Reasonable texture	Low flour yield
USG 3251	7.0	Reasonable texture	Lack of volume	7.2	Reasonable texture	Product lack of volume
USG 3201	7.0	Reasonable texture	Lack of volume	6.9	N/A	Product lack of volume
Terral TV 8861	6.7	N/A	Lack of volume	6.8	N/A	Product lack of volume
SY 9978**						
Ricochet	6.3	N/A	Lack of volume, coarser & open texture	6.3	N/A	Product lack of volume, coarser & open texture
Croplan 9101	7.0	Reasonable texture	Lack of volume	6.0	N/A	Very high wheat moisture
RM1201	6.5	N/A	Lack of volume, coarser & open texture	5.5	N/A	Too high wheat moisture

* 1 = Very poor/ 9 = Excellent; ** Removed due to scab damage.

Table 5-26. Target End Products and Quality Preferences in Malaysia

Primary End Product Uses for SRW	Primary Flour Used	Used Only in blend with Other Flours
Cookie & sweet Biscuit	X	X
Sponge & Pound Cake	X	X
Frying batter	X	X
Waffles	X	X

Quality Preferences	Acceptable Quality (Minimum Quality)	Preferred Quality (High Quality)
Flour Yield (Base on Commercial Extraction)	78% (min)	> 80%
Falling Number	300 (min)	350 - 450
Test Weight	73 (min)	> 78
Flour Protein (as - is)	9.5 (max)	7.5 - 9.0
Flour Wet Gluten	26.0 (max)	18- 23
Farinograph water absorption	60 (max)	55- 58
Farinograph Dough Development time	5 (max)	1 - 4minutes
Farinograph Stability	8 (max)	3 - 6 minutes
Extensograph energy (area)	90 cm2 (max)	50 - 80 cm2

Table 5-27. Flour Quality and Dough Properties for Baking Cookie in Malaysia						
SRW Flour	Overall Flour Quality			Dough Properties		
	Score*	Qualities Liked	Quality Disliked	Score*	Qualities Liked	Quality Disliked
Control 1	7.0	Ideal flour quality for local market spec	N/A	7.0	Handles well	N/A
AGS 2056	7.0	Low flour ash	Low test weight, low 1000 kernel	6.5	N/A	Drier dough
AGS 2035	8.5	Good test weight & flour yield	Normal flour yield, high ash	7.0	Handles well	N/A
AGS 2060	7.5	N/A	Low flour yield	6.5	N/A	Drier dough
USG 3251	7.5	N/A	Low test weight, high moisture	6.0	N/A	Soft & sticky dough
USG 3201	8.0	Good test weight & flour yield	Prefer lower wheat moisture	6.5	N/A	Soft & slightly sticky dough
Terral TV 8861	8.0	Good test weight & flour yield	Prefer lower wheat moisture	6.5	N/A	Soft & slightly sticky dough
SY 9978**						
Ricochet	7.0	N/A	Low test weight, low 1000 kernel	6.0	N/A	Soft & sticky dough
Croplan 9101	6.0	N/A	Very high wheat moisture	6.5	N/A	Soft & slightly sticky dough
RM1201	5.0	N/A	Too high wheat moisture	7.0	Handles well	N/A

* 1 = Very poor/ 9 = Excellent; ** Removed due to scab damage.

Table 5-28. Cookie Baking Performance of SRW Wheat Evaluated in Malaysia						
SRW Flour	Cookie Baking Performance			Overall Acceptability for Cookie Baking		
	Score*	Qualities Liked	Quality Disliked	Score*	Qualities Liked	Quality Disliked
Control 1	7.0	N/A	Prefer better spread & crispiness	7.0	Local market accepted quality	Prefer weaker gluten
AGS 2056	6.8	N/A	Lack of hardness & brittleness	6.6	N/A	Product lack of hardness
AGS 2035	7.7	Good crispiness		7.8	Reasonable good flour yield &	N/A
AGS 2060	6.8	N/A	Lack of hardness & crispiness	6.8	N/A	Low flour yield, lack of hardness & crispiness
USG 3251	8.0	Good crispiness & brittleness		7.4	Good crispiness & brittleness	N/A
USG 3201	7.5	N/A	Prefer better hardness	7.2	Good test weight & flour yield	Prefer harder baked product
Terral TV 8861	6.6	N/A	Lack of hardness & brittleness	6.9	Good test weight & flour yield	Cookie lack of hardness
SY 9978**						
Ricochet	7.4	N/A	Prefer better hardness	6.7	N/A	Prefer better hardness
Croplan 9101	7.2	N/A	Prefer better hardness	6.5	N/A	Very high wheat moisture
RM1201	7.8	Good crispiness & brittleness	N/A	6.0	N/A	Too high wheat moisture

* 1 = Very poor/ 9 = Excellent; ** Removed due to scab damage.

Table 5-29. Target End Products and Quality Preferences in Mexico

Primary End Product Uses for SRW	Primary Flour Used	Used Only in blend with Other Flours
Cookies	X	
Tortilla		X

Quality Preferences	Acceptable Quality (Minimum Quality)	Preferred Quality (High Quality)
Ashes	maximum .530	.480 - .500
Gluten	maximum 30 %	25 - 30 %
Gluten Index	70%	> 80%

Table 5-30. Flour Quality and Dough Properties for Baking Cookie in Malaysia Mexico

SRW Flour	Overall Flour Quality			Dough Properties		
	Score*	Qualities Liked	Quality Disliked	Score*	Qualities Liked	Quality Disliked
Control 1	8.7	Good water absorption		8.5	Handles well	
AGS 2056	8.6	Good absorption, good protein		8.5	Handles well	
AGS 2035	7.8	Good absorption	W high, ashes high	7.6	Handles well	
AGS 2060	7.7	Good absorption	Low % of starch damaged, high W	7.4		Sticky dough
USG 3251	7.6	Good absorption	Low protein, stability very low	7.6		Sticky dough
USG 3201	7.7	Good W	Very extensible	7.8	Handles well	
Terral TV 8861	8.4	Good W	Low Protein	8.3	Handles well	
SY 9978**						
Ricochet	7.4	Good W	Very extensible, Stability very low	7.8		Sticky dough
Croplan 9101	7.0	Good absorption	Low protein, P/L low, low stability	7.9		Sticky dough
RM1201	7.3	Good W	Very extensible	7.4		Sticky dough

* 1 = Very poor/ 9 = Excellent; ** Removed due to scab damage.

Table 5-31. Cookie Baking Performance of SRW Wheat Evaluated in Mexico

SRW Flour	Cookie Baking Performance			Overall Acceptability for Cookie Baking		
	Score*	Qualities Liked	Quality Disliked	Score*	Qualities Liked	Quality Disliked
Control 1	8.7	Texture, diameter and height acceptable		8.7	Good wheat quality	
AGS 2056	8.4	Texture, diameter and height acceptable			Good W and P/L	
AGS 2035	8.3	Texture, diameter and height acceptable			Good protein	W high
AGS 2060	8.7	Texture, diameter and height acceptable			Good protein quality	W high
USG 3251	8.4	Texture, diameter and height acceptable			Good protein	Low protein, low stability
USG 3201	8.7	Texture, diameter and height acceptable			Good W	low stability
Terral TV 8861	8.5	Texture, diameter and height acceptable			Good W	Low protein
SY 9978**						
Ricochet	8.2	Texture, diameter and height acceptable				low stability
Croplan 9101	8.4	Texture, diameter and height acceptable				low stability
RM1201	8.4	Texture, diameter and height acceptable			Good W	Very extensible

* 1 = Very poor/ 9 = Excellent; ** Removed due to scab damage.

Table 5-32. Target End Products and Quality Preferences in Peru

Primary End Product Uses for SRW	Primary Flour Used	Used Only in blend with Other Flours
Cookies	X	
Cake		X

Quality Preferences	Acceptable Quality (Minimum Quality)	Preferred Quality (High Quality)
Alveograph P		20 - 50
Alveograph L		70 - 140
Alveograph W		80 - 140
Farinograph absorption		Maximum 53.5 %

Table 5-33. Flour Quality and Dough Properties for Baking Cookie in Peru

SRW Flour	Overall Flour Quality			Dough Properties		
	Score*	Qualities Liked	Quality Disliked	Score*	Qualities Liked	Quality Disliked
Control 1	6.5	High flour yield, good P/L balance		5.5	Handles well	
AGS 2056	6.0	High flour yield		6.5	Handles very well	
AGS 2035	5.5	Good solvent retention capacity, high flour yield, good farinograph absorption	High W	4.5		High strength & absorption
AGS 2060	5.0	Good solvent retention capacity	High W	4.5		High strength
USG 3251	4.5		High damaged kernels	5.5	Handles well	
USG 3201	5.5			6.5	Handles very well	
Terral TV 8861 SY 9978**	5.5			5.5	Handles well	
Ricochet	6.0	Good P/L balance		6.5	Handles very well	
Croplan 9101	4.5		Low protein	5.0		Shows poor extensibility
RM1201	7.0	Good solvent retention capacity, good P/L balance & farinograph absorption		6.0	Handles very well	Slightly high absorption

* 1 = Very poor/ 9 = Excellent; ** Removed due to scab damage.

Table 5-34. Cookie Baking Performance of SRW Wheat Evaluated in Peru

SRW Flour	Cookie Baking Performance			Overall Acceptability for Cookie Baking		
	Score*	Qualities Liked	Quality Disliked	Score*	Qualities Liked	Quality Disliked
Control 1	6.0	Acceptable texture, good spread		6.0	Nice flour quality	
AGS 2056	5.0	Acceptable texture	Poor spread	5.5	Nice flour quality	Prefer less strength
AGS 2035	4.5		High thickness	4.5		Prefer less strength, prefer more extensibility Prefer less strength, prefer more extensibility
AGS 2060	4.5		High thickness	4.5		
USG 3251	5.5	Good top grain		5.0	Acceptable quality	
USG 3201	5.5	Good texture	High thickness	6.0	Nice flour quality	
Terral TV 8861	6.0	Good texture		6.0	Nice flour quality	
SY 9978**						
Ricochet	7.5	Excellent spread, good texture		7.0	Very nice flour quality	
Croplan 9101	5.5	Acceptable texture		5.5		Prefer more extensibility
RM1201	7.0	Good spread, excellent texture		7.0	Very nice flour quality	

* 1 = Very poor/ 9 = Excellent; ** Removed due to scab damage.

Table 5-35. Target End Products and Quality Preferences in Philippines/PHMC

Primary End Product Uses for SRW	Primary Flour Used	Used Only in blend with Other Flours
Cake	X	
Cookie & Cracker	X	
Cracker	X	
Wafer	X	
Noodles		X
Spring Rolls	X	
Pancake	X	
Frying Flour	X	
Gravy	X	
Pasta		X

Quality Preferences	Acceptable Quality (Minimum Quality)	Preferred Quality (High Quality)
Flour Protein	9.0 maximum	8.5 maximum
Flour Ash	0.500 maximum	0.480 maximum
Wet Gluten	24 – 28	23 – 27
Water Absorption	53 – 58	53 – 56

Table 5-36. Flour Quality and Dough Properties for Baking Cookie in Philippines/PHMC						
SRW Flour	Overall Flour Quality			Dough Properties		
	Score*	Qualities Liked	Quality Disliked	Score*	Qualities Liked	Quality Disliked
Control 1	7.0	Acceptable flour analysis, good milling	Yellowish flour color, high moisture & ash	7.0	Good handling and processing	Soft dough
AGS 2056	7.0	Good milling extraction, low ash	High moisture content, high starch damage	6.0	N/A	Slightly crumbly dough
AGS 2035	7.0	Good milling extraction	High moisture content, high ash & starch damage	7.0	Good handling and processing	Soft dough
AGS 2060	6.0	N/A	Low milling extraction, high moisture & ash	6.0	N/A	Slightly crumbly dough
USG 3251	5.0	Low ash content	Low milling extraction, high moisture, low protein & absorption, too low stability	6.0	N/A	Soft and sticky dough
USG 3201	7.0	Acceptable milling extraction, low ash	High moisture content, low absorption	6.0	N/A	Soft and slightly sticky dough
Terral TV 8861	6.5	Acceptable milling extraction, low ash	High moisture content, low protein	6.0	N/A	Soft and slightly sticky dough
SY 9978**						
Ricochet	5.0	Low ash content	Low milling extraction, high moisture & starch damage, low protein & absorption, too low stability	6.0	N/A	Soft and sticky dough
Croplan 9101	6.0	Low ash content	Low milling extraction, high moisture, low protein	6.0	N/A	Soft and slightly sticky dough
RM1201	6.0	Low ash content	Low milling extraction, high moisture & starch damage, low stability	6.0	N/A	Soft and slightly sticky dough

* 1 = Very poor/ 9 = Excellent; ** Removed due to scab damage.

Table 5-37. Cookie Baking Performance of SRW Wheat Evaluated in Philippines/PHMC						
SRW Flour	Cookie Baking Performance			Overall Acceptability for Cookie Baking		
	Score*	Qualities Liked	Quality Disliked	Score*	Qualities Liked	Quality Disliked
Control 1	7.0	High percent diameter increase, good spread & texture	High percent weight loss	7.0	Acceptable flour & end product quality	N/A
AGS 2056	5.0	Low percent weight loss	Low percent diameter increase, poor spread & texture	6.0	Acceptable flour quality	Prefer good end product quality, prefer good dough handling
AGS 2035	6.0	Slightly low percent weight loss, good texture	Low percent diameter increase, poor spread	6.0	Acceptable flour quality	Prefer good end product quality
AGS 2060	5.0	Low percent weight loss, high diameter increase	Poor spread, poor texture	5.0	N/A	Prefer good flour quality, prefer good product quality & dough handling
USG 3251	9.0	Slightly low percent weight loss, high diameter increase, good spread & texture	N/A	9.0	Good end product quality	Prefer slightly stronger flour quality, prefer good dough handling
USG 3201	6.0	Slightly low percent weight loss, good texture	Low percent diameter increase, poor spread	6.0	Acceptable flour quality	Prefer good end product quality, prefer good dough handling
Terral TV 8861	5.0	Slightly low percent weight loss	Low percent diameter increase, poor spread & texture	6.0	Acceptable flour quality	Prefer good end product quality, prefer slightly high protein & dough handling
SY 9978**						
Ricochet	9.0	Slightly low percent weight loss, high diameter increase, good spread & texture	N/A	6.5	Acceptable end product quality	Prefer good flour quality, prefer good dough handling
Croplan 9101	5.0	Slightly low percent weight loss	Low percent diameter increase, poor spread & texture	5.5	N/A	Prefer slightly stronger flour quality, prefer good product quality & dough handling
RM1201	6.0	Slightly low percent weight loss, good texture	Low percent diameter increase, poor spread	6.0	Acceptable flour quality	Prefer good end product quality, prefer good product quality & slightly long stability
* 1 = Very poor/ 9 = Excellent; ** Removed due to scab damage.						

Table 5-38. Target End Products and Quality Preferences in Philippines/Pilmoco

Primary End Product Uses for SRW	Primary Flour Used	Used Only in blend with Other Flours
Cookie	X	X
Cake	X	
Bread		X
Noodles	X	X

Quality Preferences	Acceptable Quality (Minimum Quality)	Preferred Quality (High Quality)
Protein	7.5 – 8.5	8.5 – 9.0
Ash	0.56 MAX	0.55 MAX
Falling Number	250 MIN	300 MIN
Wet Gluten	23 – 24.5	24.5 – 26
Water Absorption	52.5 MIN	54 MIN

Table 5-39. Flour Quality and Dough Properties for Baking Cookie in Philippines/Pilmoco						
SRW Flour	Overall Flour Quality			Dough Properties		
	Score*	Qualities Liked	Quality Disliked	Score*	Qualities Liked	Quality Disliked
Control 1	7.0	Average ash, falling #, gluten content. High water absorption & protein content	Low gluten index	7.0	Soft & good handling	N/A
AGS 2056	6.8	Low ash content, average falling #, water absorption & protein content	N/A	6.0	N/A	Slightly crumbly
AGS 2035	6.5	Average ash content, average falling #, water absorption & protein content	N/A	7.0	Soft & good handling	N/A
AGS 2060	6.7	Low ash content, average falling #, water absorption & protein content	N/A	6.0	N/A	Slightly crumbly
USG 3251	6.0	Average ash content, average falling #	Low protein content, low water absorption	6.0	Soft	Sticky
USG 3201	6.3	Low ash content, average falling # & protein content	Low water absorption	6.2	Soft	Slightly sticky
Terral TV 8861	6.4	Low ash content, average falling # & water absorption	Low protein content	6.2	Soft	Slightly sticky
SY 9978**						
Ricochet	5.9	Low ash content, average falling #	Low water absorption, low protein	6.0	Soft	Sticky
Croplan 9101	5.0	Low ash content	Too low protein content, low falling # & water absorption	6.2	Soft	Slightly sticky
RM1201	6.8	Average protein content, low ash, average falling # & water absorption	N/A	6.2	Soft	Slightly sticky

* 1 = Very poor/ 9 = Excellent; ** Removed due to scab damage.

Table 5-40. Cookie Baking Performance of SRW Wheat Evaluated in Philippines/Pilmoco						
SRW Flour	Cookie Baking Performance			Overall Acceptability for Cookie Baking		
	Score*	Qualities Liked	Quality Disliked	Score*	Qualities Liked	Quality Disliked
Control 1	7.0	Excellent spread; average color, cracks & hardness; very brittle	N/A	7.0	Good flour quality, analytical results, dough handling &	N/A
AGS 2056	5.5	Emphasized cracks, average hardness	Poor spread; light color; not so brittle	6.0	Good flour quality & analytical results	Slightly crumbly cookie dough; below average cookie performance
AGS 2035	5.3	Average color; average hardness & brittleness	Poor spread; less cracks	6.8	Average flour quality, analytical results &	N/A
AGS 2060	5.0	Good spread, very brittle	Light color; less cracks; too hard	5.0	Average flour quality	Slightly crumbly cookie dough; not so good for cookie
USG 3251	8.0	Excellent spread; average color; very brittle; emphasized cracks; average hardness	N/A	7.2	Excellent cookie performance	Below average flour quality, sticky dough
USG 3201	6.8	Good spread; average color, cracks & brittleness	Soft cookie	6.0	Average flour quality, average cookie performance	Slightly sticky dough; soft cookie
Terral TV 8861	7.3	Good spread; emphasized cracks; average hardness & brittleness	Light color	6.7	Good cookie performance; average flour quality	Slightly sticky dough
SY 9978**						
Ricochet	7.4	Good spread; average color; very brittle; emphasized cracks; average hardness	N/A	6.5	Good cookie performance	Below average flour quality; soft & sticky dough
Croplan 9101	6.5	good spread; average color; emphasized cracks; very brittle	Too hard	5.5	Average cookie performance	Too hard cookie; soft & sticky dough; poor analytical results
RM1201	6.7	Average color, emphasized cracks; average hardness; very brittle	Poor spread	6.3	Average flour quality, average cookie performance	Soft & sticky dough

* 1 = Very poor/ 9 = Excellent; ** Removed due to scab damage.

Table 5-41. Target End Products and Quality Preferences in Philippines III

Primary End Product Uses for SRW	Primary Flour Used	Used Only in blend with Other Flours
Cakes	X	
Cookies	X	
Crackers		X
Wafer	X	
Cones	X	
Spring Roll	X	
Snacks		X

Quality Preferences	Acceptable Quality (Minimum Quality)	Preferred Quality (High Quality)
Flour moisture %	12.5% max	12.5% max
Protein %	8.50%- 9.50%	8.50-9.5%
Ash Content	0.50-0.60	0.50-0.60
Gluten %	24 min	24 min
Water Absorption	54.0 min	54.0 min
Peak time	1.0 minute minimum	1.0 minute minimum 1.50 minutes
Stability	1.50 minutes minimum	minimum

SRW Flour	Overall Flour Quality			Dough Properties		
	Score*	Qualities Liked	Quality Disliked	Score*	Qualities Liked	Quality Disliked
Control 1	7.0	Low Protein, low gluten	N/A	7.0	Handles well	Slightly low water absorption
AGS 2056	6.5	Low Protein Content	High moisture	6.5	Longer stability	Slightly low water absorption, slightly crumbly
AGS 2035	6.5	Low Protein Content	High moisture	7.0	Acceptable water absorption	N/A
AGS 2060	6.5	Low Protein content	High moisture	6.5	Longer stability	Slightly low water absorption, slightly crumbly
USG 3251	6.0	High Ash content	Too low protein content, high moisture	5.0	N/A	Slightly low water absorption, slightly crumbly, sticky dough
USG 3201	6.0	High Ash content, low protein	High moisture	6.3	Longer stability	Slightly low water absorption, sticky dough
Terral TV 8861	6.0	High Ash content	Too low protein content, high moisture	5.0	N/A	Slightly low water absorption, low stability
SY 9978**						
Ricochet	6.0	High ash content	Too low protein content, high moisture	5.0	N/A	Slightly low water absorption, low stability
Croplan 9101	6.0	High ash content	Too low protein content, high moisture	5.0	N/A	Slightly low water absorption, low stability
RM1201	6.5	Low protein content	High moisture	6.5	N/A	Slightly low water absorption

* 1 = Very poor/ 9 = Excellent; ** Removed due to scab damage.

Table 5-43. Cookie Baking Performance of SRW Wheat Evaluated in Philippines/RFM						
SRW Flour	Cookie Baking Performance			Overall Acceptability for Cookie Baking		
	Score*	Qualities Liked	Quality Disliked	Score*	Qualities Liked	Quality Disliked
Control 1	7.0	Good spread	Less hard	7.0	Low protein & gluten	Less hard
AGS 2056	5.0	N/A	Less spread	6.3	Low protein content	High moisture
AGS 2035	6.5	Crispy, hard	Less spread	6.8	Low protein content	High moisture
AGS 2060	6.8	Good spread, brittle	Less hard	6.7	Low protein content, longer stability	High moisture
USG 3251	6.8	Good spread, brittle, crispy	Less hard	6.2	Good spread	Too low protein content
USG 3201	6.8	Good spread, hard	Less brittle	6.5	High ash content, low protein content	High moisture
Terral TV 8861	6.8	Good spread	Less crispy	6.1	Good spread	Too low protein content
SY 9978**						
Ricochet	8.0	Good spread, hard	N/A	6.6	Good spread, hard	Too low protein content, high moisture
Croplan 9101	6.5	Good spread	Less hard	6.0	Good spread, low ash	Too low protein content, low stability
RM1201	7.0	Brittle, good spread	N/A	6.9	Low protein content, handle well	High moisture

* 1 = Very poor/ 9 = Excellent; ** Removed due to scab damage.

Table 5-44. Target End Products and Quality Preferences in Philippines/PHMC

Primary End Product Uses for SRW	Primary Flour Used	Used Only in blend with Other Flours
Cake	X	
Cookie & Cracker	X	
Cracker	X	
Wafer	X	
Noodles		X
Spring Rolls	X	
Pancake	X	
Frying Flour	X	
Gravy	X	
Pasta		X

Quality Preferences	Acceptable Quality (Minimum Quality)	Preferred Quality (High Quality)
Flour Protein	9.0 maximum	8.5 maximum
Flour Ash	0.500 maximum	0.480 maximum
Wet Gluten	24 – 28	23 – 27
Water Absorption	53 – 58	53 – 56

Table 5-45. Flour Quality and Dough Properties for Baking Chiffon Cake in Philippines/PHMC						
SRW Flour	Overall Flour Quality			Batter Properties		
	Score*	Qualities Liked	Quality Disliked	Score*	Qualities Liked	Quality Disliked
Control 1	7.0	Acceptable flour analysis; good milling extraction & flour color	N/A	7.0	Smooth and flowy	N/A
Control 2	6.0	Acceptable flour analysis; good milling extraction	Yellowish flour color, high ash	7.0	Smooth and flowy	N/A
AGS 2056	6.5	Good milling extraction, low ash	High moisture & starch damage	7.0	Smooth and flowy	N/A
AGS 2035	6.0	Good milling extraction	High moisture, ash & starch damage	7.0	Smooth and flowy	N/A
AGS 2060	5.0	Low starch damage	Low milling extraction; high moisture, protein & ash; long stability	7.0	Smooth and flowy	N/A
USG 3251	6.0	Low ash content	Low milling extraction; high moisture; too low stability; low absorption	7.0	Smooth and flowy	N/A
USG 3201	6.0	Acceptable milling extraction, low ash	High moisture content, low absorption	7.0	Smooth and flowy	N/A
Terral TV 8861	6.5	Acceptable milling extraction, low ash	High moisture content	7.0	Smooth and flowy	N/A
SY 9978**						
Ricochet	5.0	Low ash content	Low milling ; high moisture & starch damage; too low stability; low absorption	7.0	Smooth and flowy	N/A
Croplan 9101	5.0	Low ash content	Low milling extraction; high moisture; too low protein & stability	7.0	Smooth and flowy	N/A
RM1201	5.5	Low ash content	Low milling extraction; high moisture & starch damage	7.0	Smooth and flowy	N/A

* 1 = Very poor/ 9 = Excellent; ** Removed due to scab damage.

Table 5-46. Chiffone Cake Baking Performance of SRW Wheat in Philippines/PHMC						
SRW Flour	Chiffone Cake Baking Performance			Overall Acceptability for Chiffone Cake Baking		
	Score*	Qualities Liked	Quality Disliked	Score*	Qualities Liked	Quality Disliked
Control 1	7.0	Good cake height, symmetrical	N/A	7.0	Acceptable flour & end product quality	N/A
Control 2	4.0	N/A	Poor symmetry; tough crust, open grain, thick cell walls, slightly tough	6.0	Acceptable flour quality	Prefer good end product quality
AGS 2056	9.0	Good cake height; good external & internal		8.0	Acceptable flour quality & good end	Prefer low moisture content
AGS 2035	5.0	Good cake height	Slightly unsymmetrical; inferior external & internal characteristics	6.0	Acceptable flour quality	Prefer low moisture content & good end product quality
AGS 2060	5.5	Good cake height	Slightly inferior external characteristics, inferior internal characteristics	5.0	N/A	Prefer good flour quality, weaker flour quality & slightly better end product quality
USG 3251	5.5	Good cake height	Slightly inferior external & internal characteristics	6.0	Acceptable flour quality	Prefer slightly better end product quality
USG 3201	10.0	Good cake height; good external & internal characteristics; fine grain	N/A	8.0	Acceptable flour quality, good end product quality	Prefer low moisture content
Terral TV 8861	5.0	Good cake height	Poor symmetry; inferior external & internal	6.0	Acceptable flour quality	Prefer good end product quality
SY 9978**						
Ricochet	5.0	Good cake height	Slightly unsymmetrical; inferior external & internal characteristics	4.0	N/A	Prefer good flour & end product quality
Croplan 9101	6.0	Good cake height, acceptable internal characteristics	Slightly unsymmetrical, inferior external characteristics	5.0	N/A	Prefer good flour quality & better external product quality
RM1201	7.0	Good cake height; acceptable external & internal characteristics	Slightly unsymmetrical	6.0	Acceptable flour & end product quality	Prefer low moisture content

* 1 = Very poor/ 9 = Excellent; ** Removed due to scab damage.

Table 5-47. Target End Products and Quality Preferences in Philippines/Pilmoco

Primary End Product Uses for SRW	Primary Flour Used	Used Only in blend with Other Flours
Cookie	X	X
Cake	X	
Bread		X
Noodles	X	X

Quality Preferences	Acceptable Quality (Minimum Quality)	Preferred Quality (High Quality)
Protein	7.5 – 8.5	8.5 – 9.0
Ash	0.56 MAX	.550 MAX
Falling Number	250 MIN	300 MIN
Wet Gluten	23 – 24.5	24.5 – 26
Water Absorption	52.5 MIN	54 MIN

Table 5-48. Flour Quality and Dough Properties for Baking Chiffon Cake in Philippines/Pilmoco						
SRW Flour	Overall Flour Quality			Batter Properties		
	Score*	Qualities Liked	Quality Disliked	Score*	Qualities Liked	Quality Disliked
Control 1	7.0	Average ash content; average falling #; high water absorption & protein; average gluten content	Low gluten index	7.0	Smooth & flowy	N/A
AGS 2056	6.8	Low ash content; average falling #, water absorption & protein	N/A	7.0	Smooth & flowy	N/A
AGS 2035	6.5	Average ash content; average falling #, water absorption & protein	N/A	7.0	Smooth & flowy	N/A
AGS 2060	6.7	Low ash content; average falling #, water absorption & protein	N/A	7.0	Smooth & flowy	N/A
USG 3251	6.0	Average ash content & falling #	Low protein & water absorption	7.0	Smooth & flowy	N/A
USG 3201	6.3	Low ash content; average falling # & protein	Low water absorption	7.0	Smooth & flowy	N/A
Terral TV 8861	6.4	Low ash content; average falling # & water absorption	Low content	7.0	Smooth & flowy	N/A
SY 9978**						
Ricochet	5.9	Low ash content, average falling #	Low protein & water absorption	7.0	Smooth & flowy	N/A
Croplan 9101	5.0	Low ash content	Low protein, water absorption & falling #	7.0	Smooth & flowy	N/A
RM1201	6.8	Average protein content; low ash; average falling # & water absorption	N/A	7.0	Smooth & flowy	N/A
* 1 = Very poor/ 9 = Excellent; ** Removed due to scab damage.						

SRW Flour	Chiffone Cake Baking Performance			Overall Acceptability for Chiffone Cake Baking		
	Score*	Qualities Liked	Quality Disliked	Score*	Qualities Liked	Quality Disliked
Control 1	7.0	Smooth crust; average crumb color (light yellow); fine crumb texture	Low volume, light crust color	7.0	Good flour quality; smooth & flowy batter; average performance	Low volume
AGS 2056	7.3	Average crust, crumb color & volume; wrinkled; slightly fine crumb texture	Small holes on the crumb	7.2	Good flour quality; smooth & flowy batter; average performance	Small holes in the crumb
AGS 2035	5.0	N/A	Very dark crust color; too much wrinkled; collapsed; low volume	5.0	Average flour quality; smooth & flowy batter	Poor chiffon cake performance; low volume; collapsed
AGS 2060	6.3	Wrinkled, average crumb color, average volume	Slightly dark crust; slightly tough crumb texture; slightly big holes	5.5	Average flour quality; smooth & flowy batter	Slightly big holes in the crumb; below average performance
USG 3251	7.5	Average crust, crumb color & volume; wrinkled; average	N/A	5.7	Smooth & flowy batter; average performance	Below average flour quality
USG 3201	7.5	Average crust color & volume; wrinkled; slightly fine crumb; very small holes	Dark crumb color	6.3	Good chiffon cake performance; smooth & flowy batter	Dark crumb color
Terral TV 8861	5.5	Average crust, crumb color & volume; slightly fine crumb texture	Too much wrinkled; collapsed; slightly big holes	5.0	Average flour quality; smooth & flowy batter	Collapsed; too much wrinkle; slightly big holes; poor performance
SY 9978**						
Ricochet	5.4	Average crumb color (Light yellow); average volume; slightly fine texture	Slightly dark crust color; very wrinkled; collapsed; slightly big holes	5.0	Smooth & flowy batter; average flour quality	Very wrinkled crust; collapsed with holes; poor performance
Croplan 9101	6.5	Average crust color; wrinkled; average volume; slightly fine crumb texture	Dark crumb color; slightly big holes	6.0	Smooth & flowy batter; wrinkled; average volume & performance	Below average flour quality
RM1201	7.3	Average crust & crumb color; wrinkled; average volume; slightly fine crumb texture	Slightly big holes on crumb	6.2	Average flour quality & cake performance; smooth & flowy batter	Slightly big holes on crumb
* 1 = Very poor/ 9 = Excellent; ** Removed due to scab damage.						

Table 5-50. Target End Products and Quality Preferences in Philippines III

Primary End Product Uses for SRW	Primary Flour Used	Used Only in blend with Other Flours
Cakes	X	
Cookies	X	
Crackers		X
Wafer	X	
Cones	X	
Spring Roll	X	
Snacks		X

Quality Preferences	Acceptable Quality (Minimum Quality)	Preferred Quality (High Quality)
Flour Moisture Content	12.5% max	12.5 % max
Protein	7 - 8%	7 - 8%
Ash Content	0.30-0.40	0.30-.0.40

Table 5-51. Flour Quality and Dough Properties for Baking Chiffon Cake in Philippines/RFM						
SRW Flour	Overall Flour Quality			Batter Properties		
	Score*	Qualities Liked	Quality Disliked	Score*	Qualities Liked	Quality Disliked
Control 1 (cake flour)	7.0	Low Protein Content, good flour color	N/A	7.0	Smooth & flowy batter	N/A
Control 2 (cookie flour)	6.5	N/A	Slightly strong gluten, high protein	7.0	Smooth & flowy batter	N/A
AGS 2056	6.0	N/A	High Protein & moisture	7.0	Smooth & flowy batter	N/A
AGS 2035	5.5	N/A	High Protein content, ash & moisture	6.5	Smooth & flowy batter	Slightly high absorption
AGS 2060	5.5	N/A	High Protein content; slightly high ash; high moisture	7.0	Smooth & flowy batter	N/A
USG 3251	6.0	Low protein content	Slightly high ash; high moisture	7.0	Smooth & flowy batter	N/A
USG 3201	5.5	N/A	Slightly High Protein & ash; high moisture	7.0	Smooth & flowy batter	N/A
Terral TV 8861	6.8	Low protein content	Slightly high ash; high moisture	7.0	Smooth & flowy batter	N/A
SY 9978**						
Ricochet	6.8	Low protein content	High moisture	7.0	Smooth & flowy batter	N/A
Croplan 9101	7.0	Low protein content	Slightly high ash	7.0	Smooth & flowy batter	N/A
RM1201	6.0	N/A	High protein; slightly high ash	7.0	Smooth & flowy batter	N/A

* 1 = Very poor/ 9 = Excellent; ** Removed due to scab damage.

Table 5-52. Chiffone Cake Baking Performance of SRW Wheat in Philippines/RFM						
SRW Flour	Chiffone Cake Baking Performance			Overall Acceptability for Chiffone Cake Baking		
	Score*	Qualities Liked	Quality Disliked	Score*	Qualities Liked	Quality Disliked
Control 1 (cake flour)	7.0	Fine and even grains; good crumb color	Slight shrinkage at center	7.0	Low protein content	Slight shrinkage at center
Control 2 (cookie flour)	7.0	No shrinkage; good volume	Slightly uneven grain structure	6.5	No shrinkage	Prefer weaker gluten
AGS 2056	6.3	Good volume	Shrinkage at center	6.7	Good volume	High protein content
AGS 2035	6.0	Acceptable grain structure	Low volume; shrinkage at center	6.2	Acceptable grain structure	High protein content
AGS 2060	6.0	Good color of crust	Low volume; shrinkage at center	6.0	Good color of crust	High protein
USG 3251	7.0	Good symmetry, good volume	Character of crust; poor grain structure	6.7	Low protein content	High moisture
USG 3201	6.5	Good symmetry	Poor crust color; poor character of crust	6.4	Good symmetry	Slightly high protein content
Terral TV 8861	6.2	Good color of crust	Poor symmetry & grain structure	6.9	Low protein content	High moisture
SY 9978**						
Riccochet	6.3	Good color of crust, good volume	Poor symmetry	6.6	Low protein content	High moisture
Croplan 9101	6.2	Good color of crust, good volume	Poor symmetry	7.2	Low protein content	Slightly high ash
RM1201	6.2	Good volume, grain structure	Poor symmetry	6.3	Good volume	High protein content

* 1 = Very poor/ 9 = Excellent; ** Removed due to scab damage.

Table 5-53. Target End Products and Quality Preferences in Thailand

Primary End Product Uses for SRW	Primary Flour Used	Used Only in blend with Other Flours
Cake		X
Cookie		X

Quality Preferences	Acceptable Quality (Minimum Quality)	Preferred Quality (High Quality)
Protein content	10.0-11.0%	10.2-10.7%
Extraction rate	70-76 %	72-75%
Water absorption	56-60%	57-60%
Extensibility at 135 min.	160-175 min.	160-170 min.

Table 5-54. Flour Quality and Dough Properties for Baking Cookie in Thailand						
SRW Flour	Overall Flour Quality			Dough Properties		
	Score*	Qualities Liked	Quality Disliked	Score*	Qualities Liked	Quality Disliked
Control 1	7.0	Good yield	Slightly too low protein	7.0	Handles well	N/A
AGS 2056	6.0	High yield, high falling #	Slightly too low protein	5.0	N/A	Weak flour strength
AGS 2035	7.0	Good yield, high falling #	Slightly too low protein	6.0	N/A	Low water absorption
AGS 2060	6.5	Good yield, high falling #	Acceptable protein content	6.0	Acceptable flour strength	Low water absorption
USG 3251	6.5	High yield, high falling #	Low protein content	3.5	N/A	Weak flour strength
USG 3201	7.0	High yield, high falling #	Low protein content	4.0	N/A	Weak flour strength
Terral TV 8861	6.0	High yield, high falling #	Low protein content	4.5	N/A	Weak flour strength
SY 9978**						
Ricochet	6.0	Good yield	Low protein content	4.0	N/A	Weak flour strength
Croplan 9101	5.5	Good yield	Very low protein	3.5	N/A	Weak flour strength
RM1201	6.5	Good yield	Low protein content	6.0	Acceptable flour strength	Low water absorption

* 1 = Very poor/ 9 = Excellent; ** Removed due to scab damage.

Table 5-55. Cookie Baking Performance of SRW Wheat Evaluated in Thailand						
SRW Flour	Cookie Baking Performance			Overall Acceptability for Cookie Baking		
	Score*	Qualities Liked	Quality Disliked	Score*	Qualities Liked	Quality Disliked
Control 1	7.0	Acceptable texture	Less spread	7.0	Nice wheat and flour quality	Prefer higher protein
AGS 2056	6.5	Good brittleness	Slightly crumbly dough	6.5	Nice wheat and flour quality	prefer higher protein
AGS 2035	8.5	Good brittleness	Less spread	8.5	Nice wheat and flour quality	Prefer higher protein
AGS 2060	6.0	Good brittleness	Slightly crumbly dough	6.0	Nice wheat and flour quality	N/A
USG 3251	8.5	Good brittleness & spread	Sticky dough	8.5	Nice wheat and flour quality	Prefer higher protein
USG 3201	7.8	Good brittleness & spread	Sticky dough	7.8	Nice wheat and flour quality	Prefer higher protein
Terral TV 8861	6.5	Good brittleness & spread	Sticky dough	6.5	Nice wheat and flour quality	Prefer higher protein
SY 9978**						
Ricochet	8.0	Good brittleness & spread	Sticky dough	8.0	Nice wheat and flour quality	Prefer higher protein
Croplan 9101	7.5	Good brittleness & spread	Sticky dough	7.5	Nice wheat and flour quality	Prefer higher protein
RM1201	8.5	Good brittleness & spread	Sticky dough	8.5	Nice wheat and flour quality	Prefer higher protein

* 1 = Very poor/ 9 = Excellent; ** Removed due to scab damage.

Table 5-56. Target End Products and Quality Preferences in Thailand

Primary End Product Uses for SRW	Primary Flour Used	Used Only in blend with Other Flours
Cake		X
Cookie		X

Quality Preferences	Acceptable Quality (Minimum Quality)	Preferred Quality (High Quality)
Protein content	10.0-11.0%	10.2-10.7%
Extraction rate	70-76 %	72-75%
Water absorption	56-60%	57-60%
Extensibility at 135 min.	160-175 min.	160-170 min.

Table 5-57. Flour Quality and Batter Properties for Baking Sponge Cake in Thailand						
SRW Flour	Overall Flour Quality			Batter Properties		
	Score*	Qualities Liked	Quality Disliked	Score*	Qualities Liked	Quality Disliked
Control 1	7.0	Good yield	Slightly too low protein	7.0	Handles well	N/A
AGS 2056	6.0	High yield	Slightly too low protein	5.0	N/A	Weak flour strength
AGS 2035	7.0	Good yield	Slightly too low protein	6.0	N/A	Low water absorption
AGS 2060	6.5	Good yield	Acceptable protein content	6.0	Acceptable flour strength	Low water absorption
USG 3251	6.5	High yield	Low protein content	3.5	N/A	Weak flour strength
USG 3201	7.0	High yield	Low protein content	4.0	N/A	Weak flour strength
Terral TV 8861	6.0	High yield	Low protein content	4.5	N/A	Weak flour strength
SY 9978**						
Ricochet	6.0	Good yield	Low protein content	4.0	N/A	Weak flour strength
Croplan 9101	5.5	Good yield	Very low protein	3.5	N/A	Weak flour strength
RM1201	6.5	Good yield	Low protein content	6.0	Acceptable flour strength	Low water absorption

* 1 = Very poor/ 9 = Excellent; ** Removed due to scab damage.

Table 5-58. Sponge Cake Baking Performance of SRW Wheat Evaluated in Thailand						
SRW Flour	Sponge Cake Baking Performance			Overall Acceptability for Sponge Cake Baking		
	Score*	Qualities Liked	Quality Disliked	Score*	Qualities Liked	Quality Disliked
Control 1	7.0	Acceptable texture	Slightly coarse grain	7.0	Nice wheat and flour quality	prefer higher protein
AGS 2056	4.0	Acceptable texture	Slightly coarse grain, small cake volume	4.0	Nice wheat and flour quality	Prefer higher protein
AGS 2035	5.5	Acceptable texture	Slightly coarse grain, small cake volume	5.5	Nice wheat and flour quality	Prefer higher protein
AGS 2060	6.8	Acceptable texture	Slightly coarse grain	6.8	Nice wheat and flour quality	N/A
USG 3251	5.5	Acceptable texture	Slightly coarse grain	5.5	Nice wheat and flour quality	Prefer higher protein
USG 3201	5.0	Acceptable texture	Slightly coarse grain	5.0	Nice wheat and flour quality	Prefer higher protein
Terral TV 8861	6.5	Acceptable texture	Slightly coarse grain	6.5	Nice wheat and flour quality	Prefer higher protein
SY 9978**						
Ricochet	7.5	Acceptable texture	Slightly coarse grain, small cake volume	7.5	Nice wheat and flour quality	Prefer higher protein
Croplan 9101	6.0	Acceptable texture	Slightly coarse grain, small cake volume	6.0	Nice wheat and flour quality	Prefer higher protein
RM1201	6.0	Acceptable texture	Slightly coarse grain	6.0	Nice wheat and flour quality	Prefer higher protein

* 1 = Very poor/ 9 = Excellent; ** Removed due to scab damage.

APPENDIX

Appendix I. Methods of the Soft Wheat Quality Laboratory

PART I: PRELIMINARY QUALITY DATA INCLUDED IN THE SHIPMENT OF FLOUR

Laboratory Test Milling

Based on average whole grain moisture, of a subset of the group to be milled, samples are tempered to 15.0% moisture. Sample preparation for moisture determination uses the Tag-Heppenstall corrugated rolls. Tempered grain samples are milled after 36 hours to allow for equal water distribution throughout the kernel.

Samples are milled in a controlled temperature and humidity room (19 – 21 C and RH 57% - 62%). Milling is conducted on a modified Quadrumat Senior flour mill. Prior to sample analysis, mill should be operating, warm, and equilibrated (33 C +/- 1.0). Standard sample size for micro milling is 80 g. Tempered grain is milled and the product recovered for sifting on a Great Western Sifter Box. The sifter should have 40 mesh and a 94 mesh screen to separate mill product into bran (above 40), middling fractions (mids – material recovered between 40 mesh and 94 mesh screen) and flour (through 94 screen and recovered in the flour pan on the bottom).

To calculate softness equivalent (a modified particle size index), the weights of the bran and mids are recorded. The mids are added back to the flour that passed through the 94 mesh screen to produce the final flour product for analysis.

Flour yield

Flour yield “as is” is calculated as the bran weight (over 40 weight) subtracted from the grain weight, divided by grain weight and times 100 to equal “as is” flour yield. Flour yield is calculated to a 15% grain moisture basis as follows: Flour moisture is regressed to predict the grain moisture of the wheat when it went into the Quad Mill using the formula Initial grain moisture = $1.3429 \times (\text{flour moisture}) - 4$. The flour yields are corrected back to 15% grain moisture after estimating the initial grain moisture using the formula $\text{Flour Yield}_{(15\%)} = \text{Flour Yield}_{(\text{as is})} - 1.61\% \times (15\% - \text{Actual flour moisture})$.

Softness Equivalent

Softness Equivalent (as is) is calculated from the fraction of mill product that is in the mids, with smaller amounts of mids correlating to smaller particle size, greater break flour yield, and greater softness equivalent. The mids weight (over 94) is subtracted from the unadjusted flour yield to calculate the quantity of fine flour that passed through the 94 mesh, which is divided by the unadjusted flour yield and multiplied by 100%. Softness Equivalent at 15% grain moisture is calculated using the estimated grain moisture prior to milling (see milling formulas). The softness equivalents are adjusted to 15% grain moisture with the formula $\text{Softness Equivalent}_{(15\%)} = \text{Softness Equivalent}_{(\text{as is})} - 1.08\% \times (15\% - \text{Actual flour moisture})$.

Mill Score

Mill score represents a standard adjustment based on flour yield by comparing the test variety to a check. The check variety produces a score that can be used as a handicap against its traditional

expected yield, and the test variety mill score is adjusted to the same degree as the check. This method relates test varieties providing a score that is independent of the environmental influences.

Kernel and Whole Wheat Tests

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

1000 Kernel Weight: Units are recorded as grams/1000 kernels of cleaned wheat. There is little difference between 1000-kernel weight and milling quality when considering shriveled-free grain. However, small kernelled varieties that have 1000-kernel weight below 30 grams likely will have reduced milling yield of about .75%.

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

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

Whole Wheat Crude Protein: Nitrogen combustion analysis using Elementar Nitrogen Analyzer. Units are recorded in % protein converted from nitrogen x 5.7 and expressed on 12% moisture basis.

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

Whole Wheat - Amylase Activity: (AACC Method 22-06) Units are expressed in alpha amylase activity as SKB units/gram (@ 25°C).

PART II: PREPARATION OF FLOUR FOR SHIPMENT TO COOPERATORS

Miag Multomat Mill

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

Milling Procedure: All SRW varieties are tempered to a 14.5% moisture level. Tempered wheat is held for at least 24 hours in order for the moisture to equilibrate throughout the grain. Wheat is introduced into the first break rolls at a rate of 54.4 Kg/hour (80 #/hour). Straight grade flour is a blend of ten flour streams, the three break flour streams and the five reduction streams, plus the grader flour from the break streams and the duster flour from the reduction streams. The

straight grade flour mean volume diameter is about 75 microns with ash content usually between 0.34% and 0.48%.

Flour generated by the (SWQL) Miag Multomat Mill very nearly represents that of commercially produced straight grade flour. Bran, head shorts, tail shorts and red dog are by-products which are not included with the flour. Flour yields vary between 68% and 78% which is variety dependent due to milling quality differences and/or grain condition. Recovery of all mill products is usually about 99%. Least significant differences for straight grade flour yield and break flour yield are 0.75% and 0.82%, respectively.

Flour Tests

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

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

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

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

Flour Crude Protein: Protein determined by NIR using a Unity Spectra Star 2200 NIR instrument calibrated by nitrogen combustion analysis using Elementar Nitrogen Analyzer. Units are recorded in % protein converted from nitrogen x 5.7 and expressed on 14% moisture basis.

Flour protein differences among varieties can be a reliable indicator of genetic variation provided the varieties are grown together, but can vary from year to year at any given location. Flour protein from a single, non-composite sample may not be representative. Based on the Soft Wheat Quality Laboratory grow-outs, protein can vary as much 1.5 % for a variety grown at various locations in the same ½ acre field.

Protein quality is an evaluation of “elasticity” or gluten strength and is not the same as protein quantity. A variety possessing a low quantity of protein could still exhibit strong gluten strength. Gluten strength is thought to be a desirable characteristic for cracker production. Gluten strength is measured using a Mixograph and is graded on a scale of 1-8, with 1 as weakest and 8 as strongest. Evaluation of gluten strength using the Mixograph or Farinograph is difficult for soft wheat flours that are 8.5% protein and lower. Since the representative protein range for breeders’ samples is 8-9%, many of these flours are not adequately evaluated using the Mixograph or Farinograph methods. The Lactic Acid SRC, which does not require mixing action to assess gluten, tends to be a better measurement of protein quality when evaluating soft wheat varieties. Lactic acid hydrates the native matrix of insoluble polymeric protein (IPP) present in the flour.

Flour Falling Numbers: (AACC Method 56-81B) Units are expressed in seconds using the Perten Falling Numbers instrument. Numbers above 400 seconds reflect factors other than alpha

amylase activity (such as particle size). The correlation between alpha amylase activity and falling number is best for samples with falling number values between 200 and 300 seconds. For cake flours and batters, 350 seconds is a common minimum value. For breakfast cereals or cookies and other high sugar products values of 250 seconds are more common cut-off values.

Flour Damaged Starch: Chopin SDMatic starch damage instrument using the supplied AACC calibration. Starch damage is a measure of the damage to the starch granule occurring during the milling process.

Alveograph Evaluations

Alveographs were conducted with the gracious assistance of the Wheat Marketing Center in Portland Oregon.

Solvent Retention Capacity Test (SRC): (Flour Lactic Acid, Sucrose, Water, and Sodium Carbonate Retention Capacities AACC Method 56-11)

Units are expressed as %.

Water SRC is a global measure of the water affinity of the macro-polymers (starch, arabinoxylans, gluten, and gliadins). It is often the best predictor of baked product performance. Water SRC is correlated to Farinograph water absorption but does not directly measure the absorption of the glutenin macropolymer hydration during mixing as does the Farinograph. Water SRC is negatively correlated to flour yield and softness equivalent among flour samples milled on the Quad advanced flour mill ($r=-0.43$ and $r=-0.45$, respectively). Lower water values are desired for cookies, cakes, and crackers with target values below 51% on small experimental mills and 54% on commercial or long-flow experimental mills.

Sucrose SRC is a measure of arabinoxylans (also known as pentosans) content, which can strongly affect water absorption in baked products. Water soluble arabinoxylans are thought to be the fraction that most greatly increases sucrose SRC. Sucrose SRC probably is the best predictor of cookie quality with sugar snap cookie diameters decreasing by 0.07 cm for each percentage point increase in sucrose SRC. The negative correlation between wire-cut cookie and sucrose SRC values is $r=-0.66$ ($p<0.0001$). Sucrose SRC typically increases in wheat samples with lower flour yield ($r=-0.31$) and lower softness equivalent ($r=-0.23$). The cross hydration of gliadins by sucrose also causes sucrose SRC values to be correlated to flour protein ($r=0.52$) and lactic acid SRC ($r=0.62$). Soft wheat flours for cookies typically have a target of 95% or less when used by the US baking industry for biscuits and crackers. Sucrose SRC values increase by 1% for every 5% increase in lactic acid SRC. The 95% target value can be exceeded in flour samples where a higher lactic acid SRC is required for product manufacture since the higher sucrose SRC is due to gluten hydration and not to swelling of the water soluble arabinoxylans.

Sodium carbonate SRC is a very alkaline solution that ionizes the ends of starch polymers increasing the water binding capacity of the molecule. Sodium carbonate SRC increases with starch damage. Sodium carbonate is an effective predictor of milling yield and is negatively correlated to flour yield on the Quad advanced milling system ($r=-0.48$, $p<0.0001$). It also is one of several predictors of cookie diameter ($r=-0.22$, $p<0.0001$). Normal values for good milling soft varieties are 68% or less.

Lactic acid SRC measures gluten strength. Typical values are below 85% for “weak” soft varieties and above 105% or 110% for “strong” gluten soft varieties. See the above discussion of protein quality in this section for additional details of the lactic acid SRC. Lactic acid SRC results correlate to the SDS-sedimentation test. The lactic acid SRC is also correlated to flour protein concentration, but the effect is dependent on genotypes and growing conditions. The SWQL typically reports a protein-corrected lactic acid SRC value to remove some of the inherent protein fluctuation not due to variety genetics. Lactic acid is corrected to 9% protein using the assumption of a 7% increase in lactic acid SRC for every 1% increase in flour protein. On average across 2007 and 2009, the change in lactic acid SRC value was closer to 2% for every 1% protein.

PART III. EXPERIMENTAL BAKED PRODUCT TESTS

Wire Cut Cookie: (AACC Method 10-53, Macro Method)

This method determines the texture (hardness) of the cookies. The use of high-fructose corn syrup and lower sucrose concentration allows for a texture more similar to standard commercial cookie formulations. Differences in hardness reflect differences in flour quality, with softer cookie texture produced with better soft wheat quality.

Sugar snap Cookie: (AACC method 10-52, Micro Method)

See new method presented in this document. Diameter and stack height of cookies baked according to this method are measured and used to evaluate flour baking quality. All data reported in this report were produced using the accepted method prior to December, 2009.

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

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

The best single predictor of cookie diameter is sucrose SRC. The strong negative correlation of sucrose SRC to cookie diameter ($r=-0.66$, $p<0.0001$) has led to its adoption in lieu of baking cookies for most samples. The best prediction model for cookie diameter among grain samples milled on the Quadrumat advanced system uses a combination of sucrose SRC, softness equivalent, and flour protein ($R^2=0.61$). These three measures are combined into the baking quality score used in Quad Micro milling with the baking quality score favoring lower sucrose SRC and flour protein and greater softness equivalent values.

Varieties that possess excellent milling properties nearly always produce large diameter cookie spreads. Poor milling varieties nearly always produce smaller cookie spreads. Varieties that are very soft in granulation usually produce good cookie spreads.

Statistical Analysis

Correlation analysis was used for all tests of significance. The primary correlations were of a quality measure with a score or a rank provided by the cooperator with the purpose of trying to identify the basis of the cooperator's preference. Ten pairs of observations were used for each correlation. The magnitude of the correlation was expressed as a correlation coefficient "r" with significance expressed as a "p" value. The r value is the square root of the R^2 value of a regression coefficient and the p value is the probability of obtaining that correlation coefficient by random chance alone.

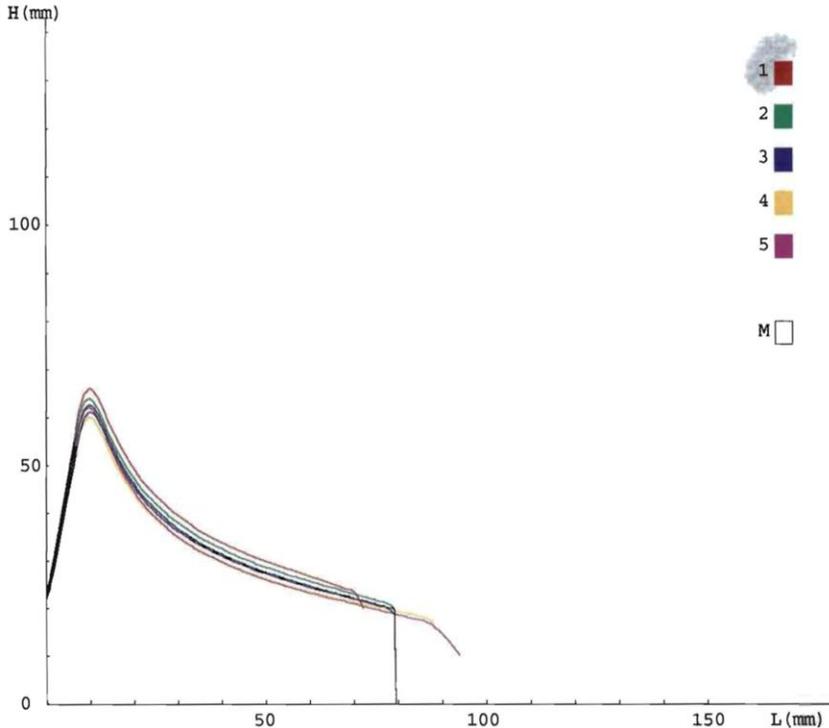
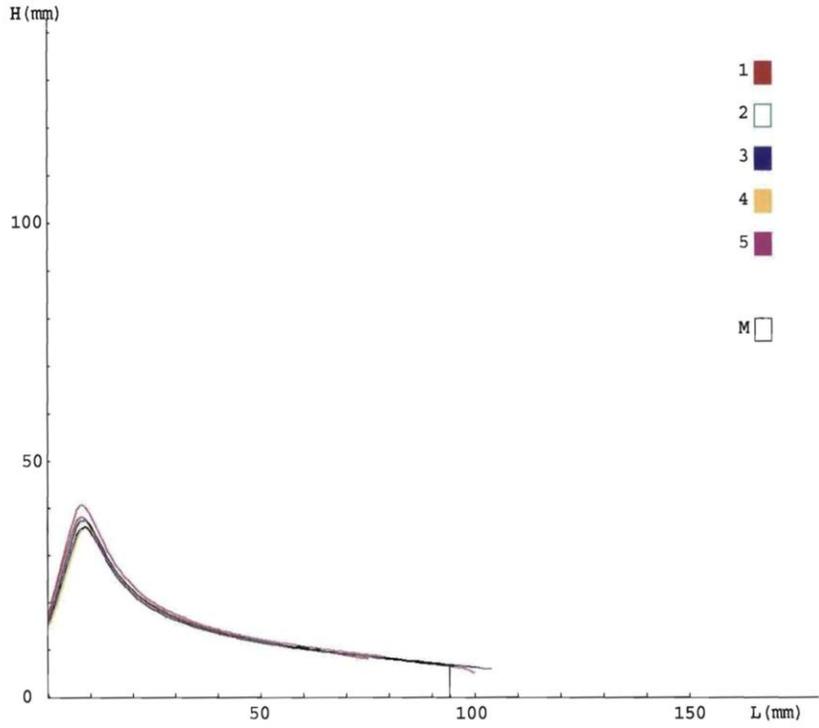
Appendix II. Alveograms of 2012 OVA Flour Samples

AGS 2056

AGS 2035

PARAMETERS		RESULTS
LAB. TEMP. :	LAB. HYGROM. :	P = 42 mmH2O
FLOUR :	MILL :	L = 94 mm
MOISTURE : 13.20 %		G = 21.6
PROTEIN :	FN VALUE :	W = 96 10E-4J
S.D. :	W.A. :	P/L = 0.45
ZELENY :		Ie = 36.9 %
ASH CONT. :	EXTRAC. R. :	W(0) = 0 10E-4J
GLUTEN :		
COMMENTS		
V:d2.8C +5.9		

PARAMETERS		RESULTS
LAB. TEMP. :	LAB. HYGROM. :	P = 69 mmH2O
FLOUR :	MILL :	L = 80 mm
MOISTURE : 13.35 %		G = 19.9
PROTEIN :	FN VALUE :	W = 179 10E-4J
S.D. :	W.A. :	P/L = 0.86
ZELENY :		Ie = 50.6 %
ASH CONT. :	EXTRAC. R. :	W(0) = 0 10E-4J
GLUTEN :		
COMMENTS		
V:d2.8C +5.9		

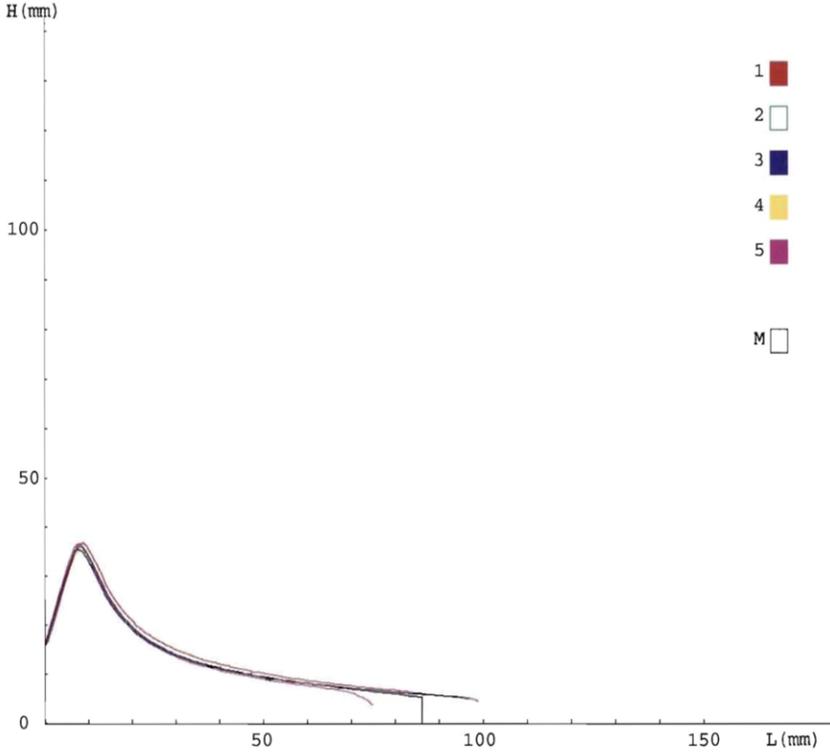
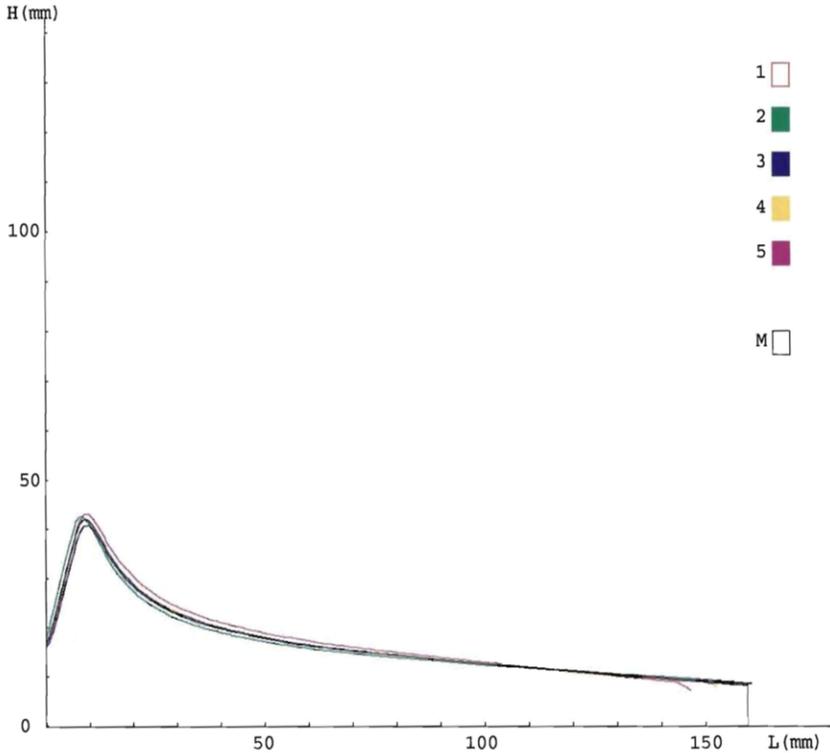


AGS 2060

USG 3251

PARAMETERS		RESULTS
LAB. TEMP. :	LAB. HYGROM. :	P = 46 mmH2O
FLOUR :	MILL :	L = 160 mm
MOISTURE : 13.30 %		G = 28.2
PROTEIN :	FN VALUE :	W = 177 10E-4J
S.D. :	W.A. :	P/L = 0.29
ZELENY :		Ie = 48.5 %
ASH CONT. :	EXTRAC. R. :	W(0) = 0 10E-4J
GLUTEN :		
COMMENTS		
V:d2.8C +5.9		

PARAMETERS		RESULTS
LAB. TEMP. :	LAB. HYGROM. :	P = 40 mmH2O
FLOUR :	MILL :	L = 87 mm
MOISTURE : 13.35 %		G = 20.8
PROTEIN :	FN VALUE :	W = 80 10E-4J
S.D. :	W.A. :	P/L = 0.46
ZELENY :		Ie = 31.7 %
ASH CONT. :	EXTRAC. R. :	W(0) = 0 10E-4J
GLUTEN :		
COMMENTS		
V:d2.8C +5.9		

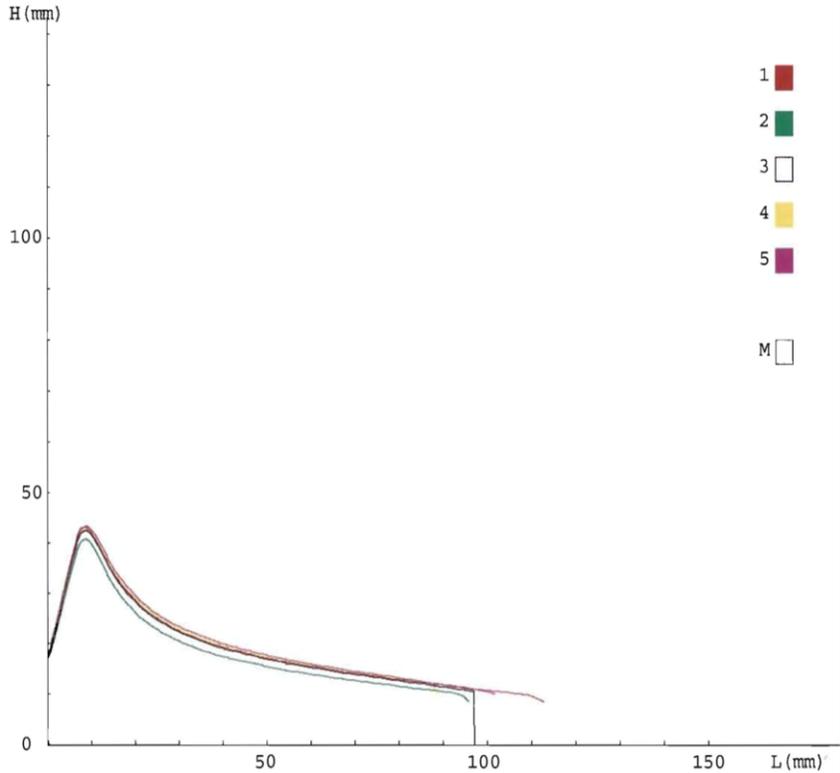
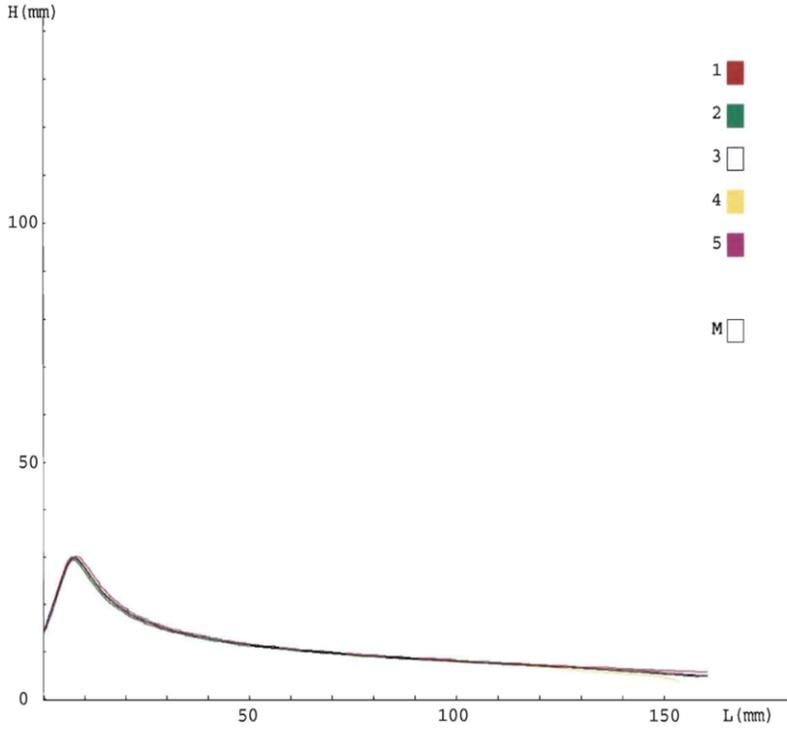


USG 3201

Terral TV 8861

DATE: 02/25/2013 TIME: 3:49 pm		SAMPLE IDENTIFICATION: 120130045 FILE NAME : 02250009A113	
PARAMETERS		RESULTS	
LAB. TEMP. :	LAB. HYGROM. :	P	= 33 mmH2O
FLOUR :	MILL :	L	= 162 mm
MOISTURE : 13.30 %		G	= 28.3
PROTEIN :	FN VALUE :	W	= 118 10E-4J
S.D. :	W.A. :	P/L	= 0.20
ZELNY :		Ie	= 43.6 %
ASH CONT. :	EXTRAC. R. :	W(0)	= 0 10E-4J
GLUTEN :			
COMMENTS			
v:d2.8C +5.9			

PARAMETERS		RESULTS	
LAB. TEMP. :	LAB. HYGROM. :	P	= 47 mmH2O
FLOUR :	MILL :	L	= 98 mm
MOISTURE : 13.50 %		G	= 22.0
PROTEIN :	FN VALUE :	W	= 128 10E-4J
S.D. :	W.A. :	P/L	= 0.48
ZELNY :		Ie	= 45.4 %
ASH CONT. :	EXTRAC. R. :	W(0)	= 0 10E-4J
GLUTEN :			
COMMENTS			
v:d2.8C +5.9			

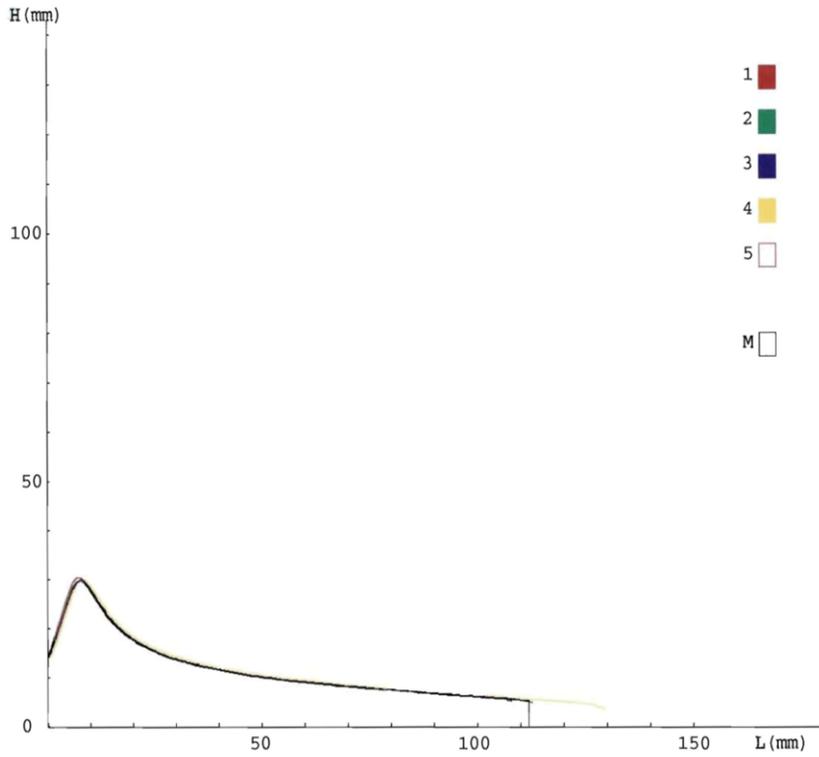
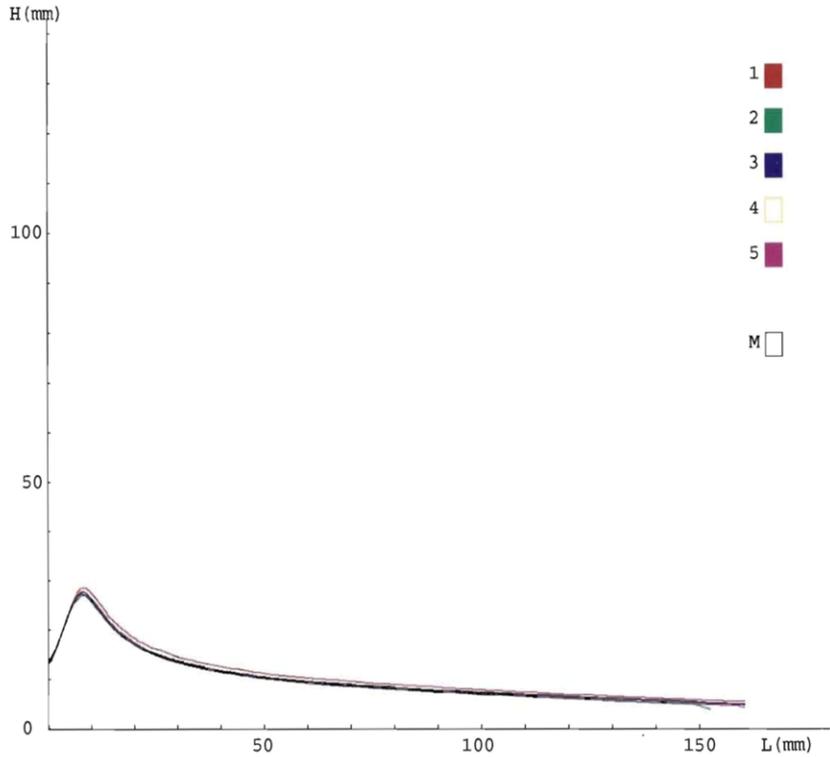


SY 9978

Ricochet

PARAMETERS		RESULTS
LAB. TEMP. :	LAB. HYGROM. :	P = 31 mmH2O
FLOUR :	MILL :	L = 164 mm
MOISTURE : 13.35 %		G = 28.5
PROTEIN :	FN VALUE :	W = 109 10E-4J
S.D. :	W.A. :	P/L = 0.19
ZELNY :		Ie = 42.4 %
ASH CONT. :	EXTRAC. R. :	W(0) = 0 10E-4J
GLUTEN :		
COMMENTS		V:d2.8C +5.9

PARAMETERS		RESULTS
LAB. TEMP. :	LAB. HYGROM. :	P = 33 mmH2O
FLOUR :	MILL :	L = 112 mm
MOISTURE : 13.50 %		G = 23.6
PROTEIN :	FN VALUE :	W = 88 10E-4J
S.D. :	W.A. :	P/L = 0.29
ZELNY :		Ie = 39.7 %
ASH CONT. :	EXTRAC. R. :	W(0) = 0 10E-4J
GLUTEN :		
COMMENTS		V:d2.8C +5.9

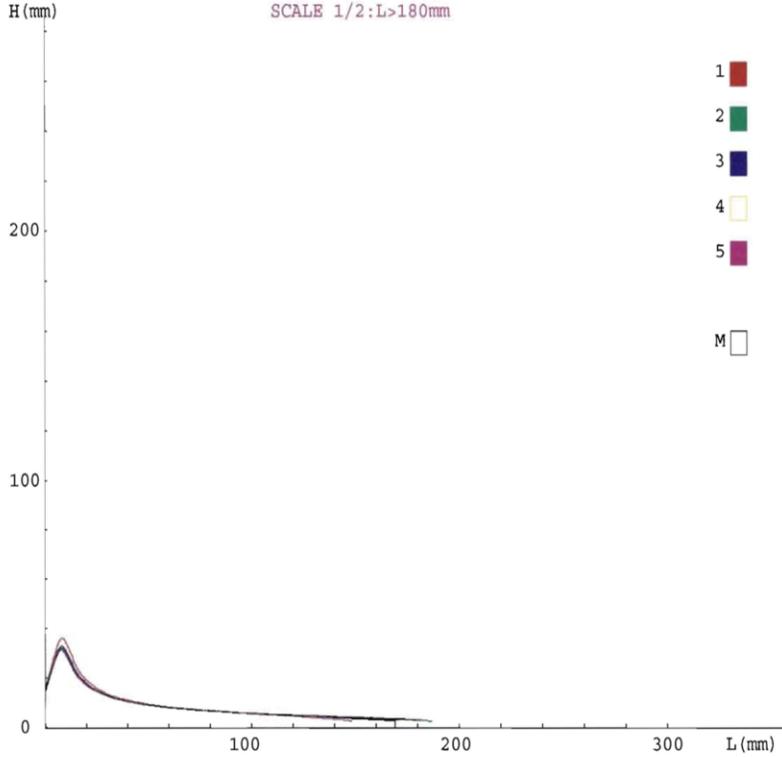
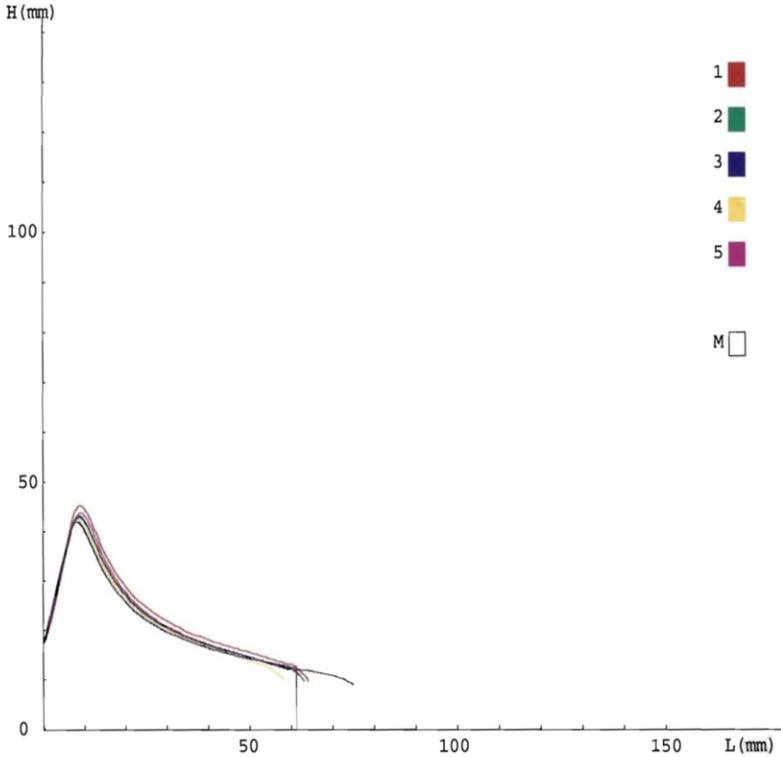


Croplan 9101

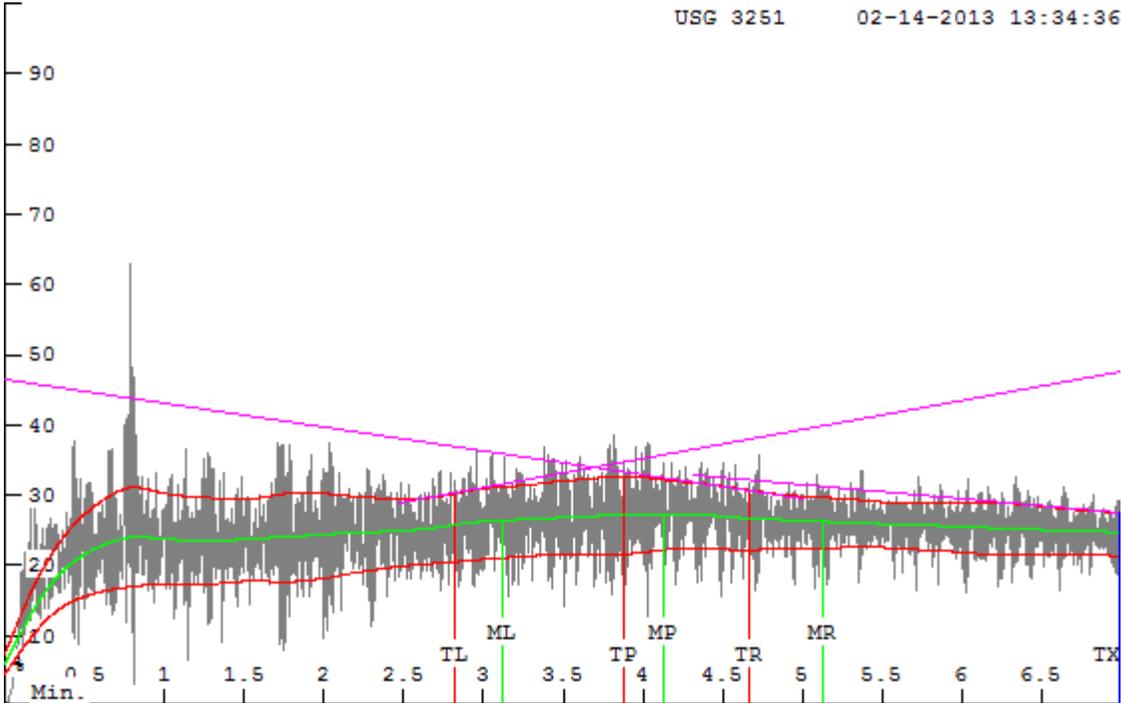
RM 1201

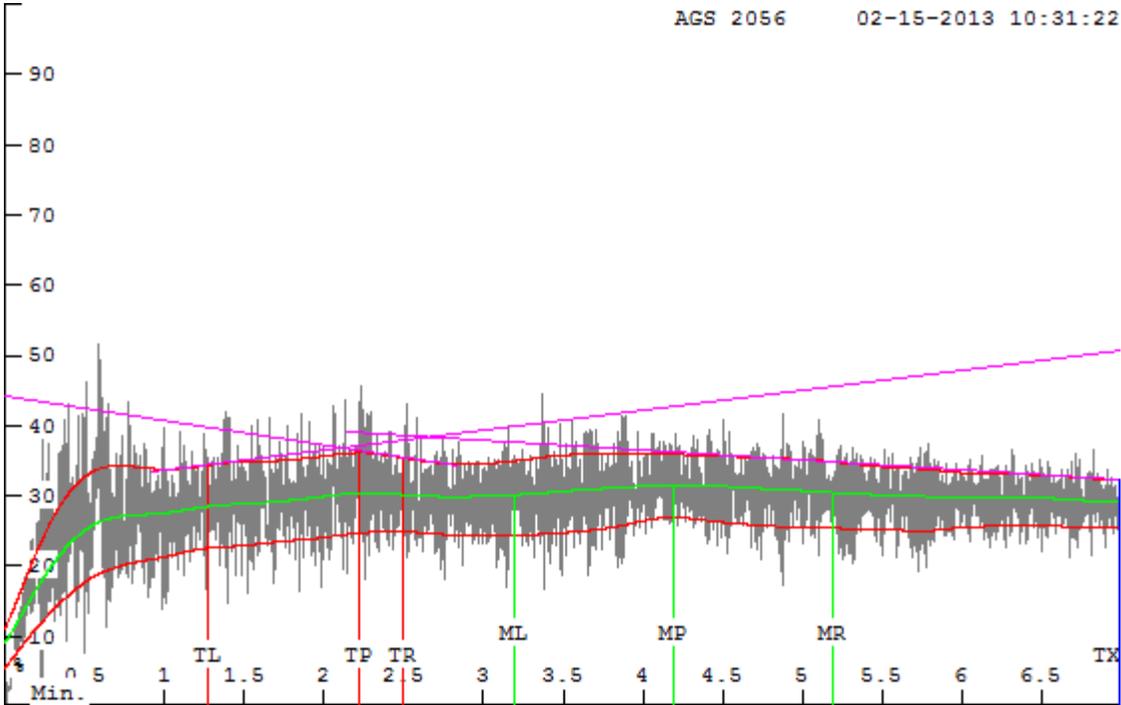
PARAMETERS		RESULTS
LAB. TEMP. :	LAB. HYGROM. :	P = 48 mmH2O
FLOUR :	MILL :	L = 62 mm
MOISTURE : 13.20 %	FN VALUE :	G = 17.5
PROTEIN :	W.A. :	W = 92 10E-4J
S.D. :	EXTRAC.R. :	P/L = 0.77
ZELENY :		Ie = 39.6 %
ASH CONT. :		W(0) = 0 10E-4J
GLUTEN :		
COMMENTS		
V:d2.8C +5.9		

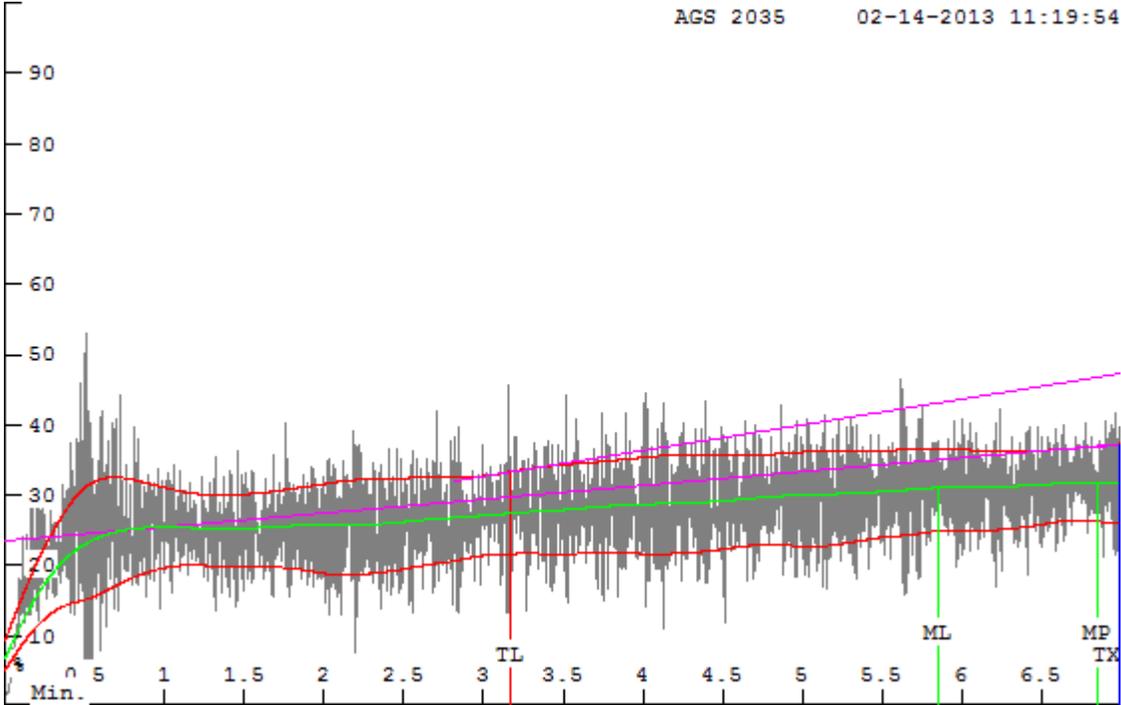
PARAMETERS		RESULTS
LAB. TEMP. :	LAB. HYGROM. :	P = 37 mmH2O
FLOUR :	MILL :	L = 170 mm
MOISTURE : 13.35 %	FN VALUE :	G = 29.0
PROTEIN :	W.A. :	W = 104 10E-4J
S.D. :	EXTRAC.R. :	P/L = 0.22
ZELENY :		Ie = 33.2 %
ASH CONT. :		W(0) = 0 10E-4J
GLUTEN :		
COMMENTS		
V:d2.8C +5.9		

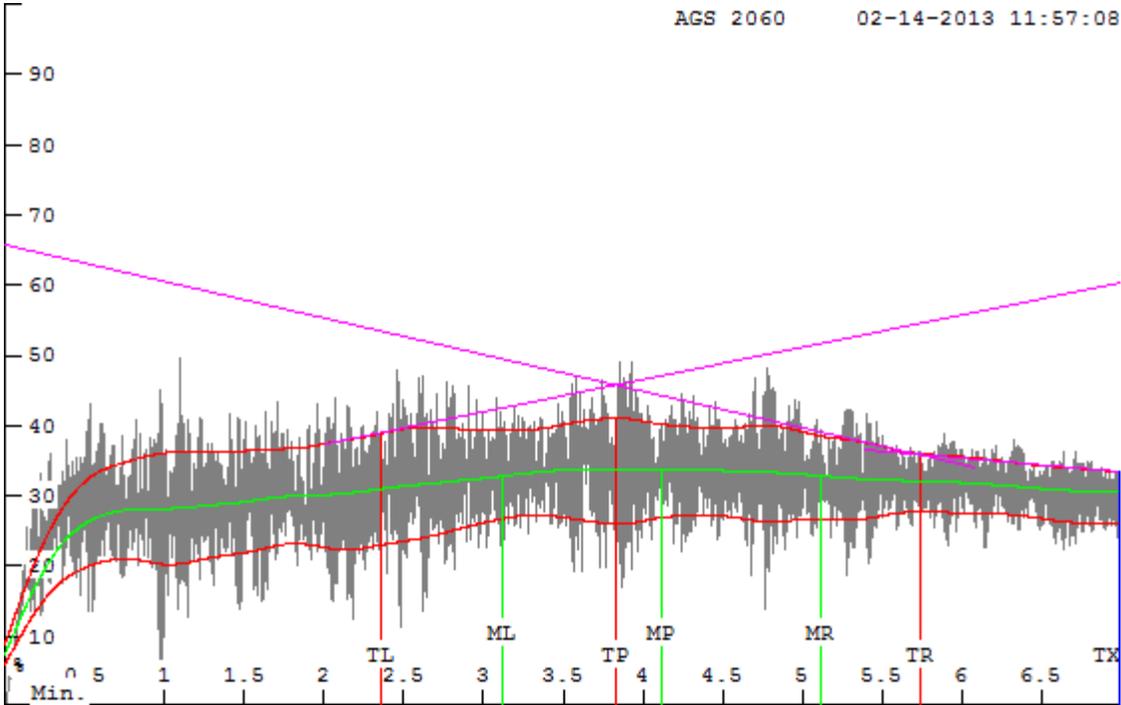


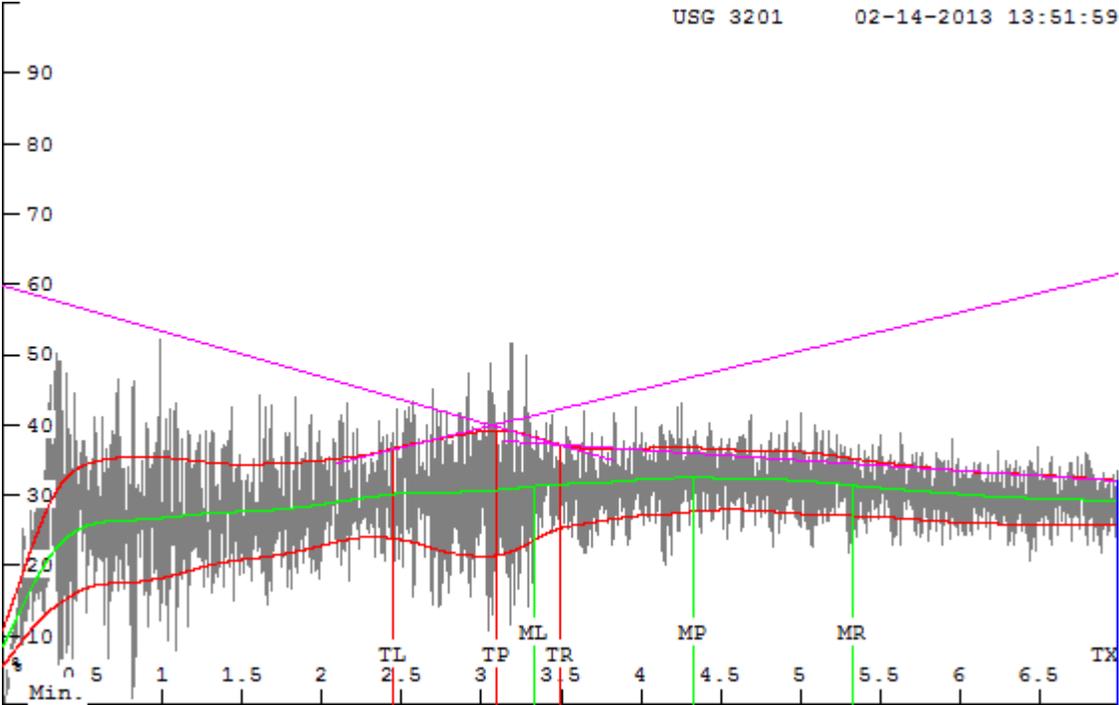
Appendix III. Mixograms of 2012 OVA Flour Samples

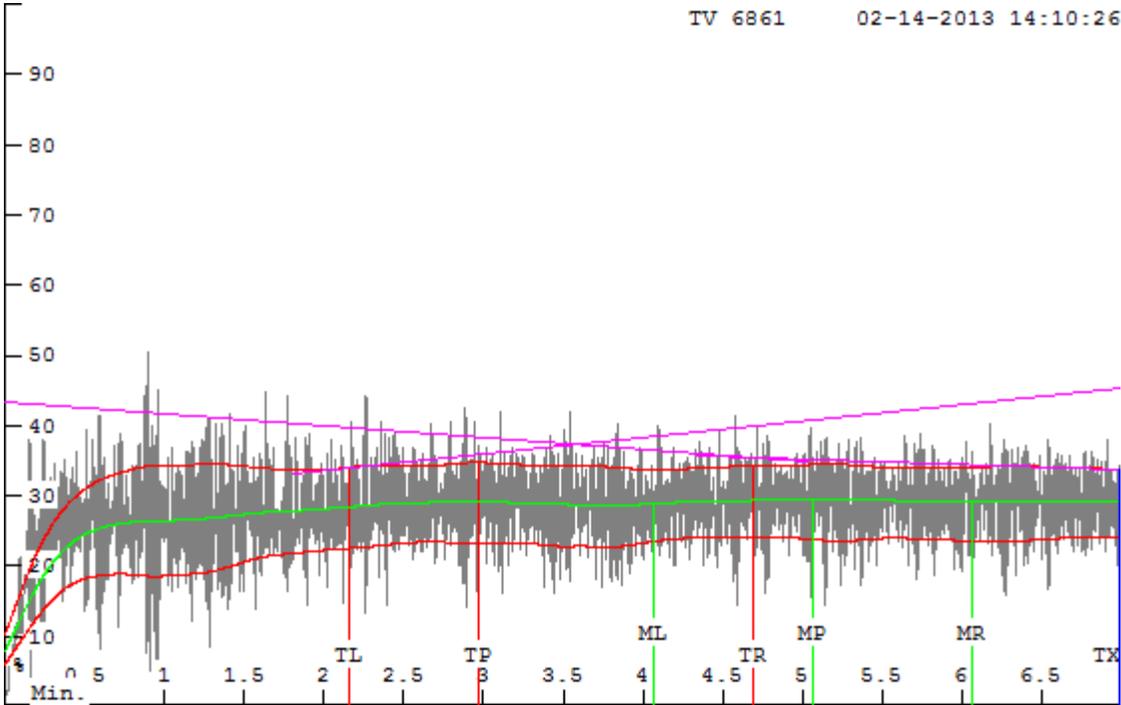


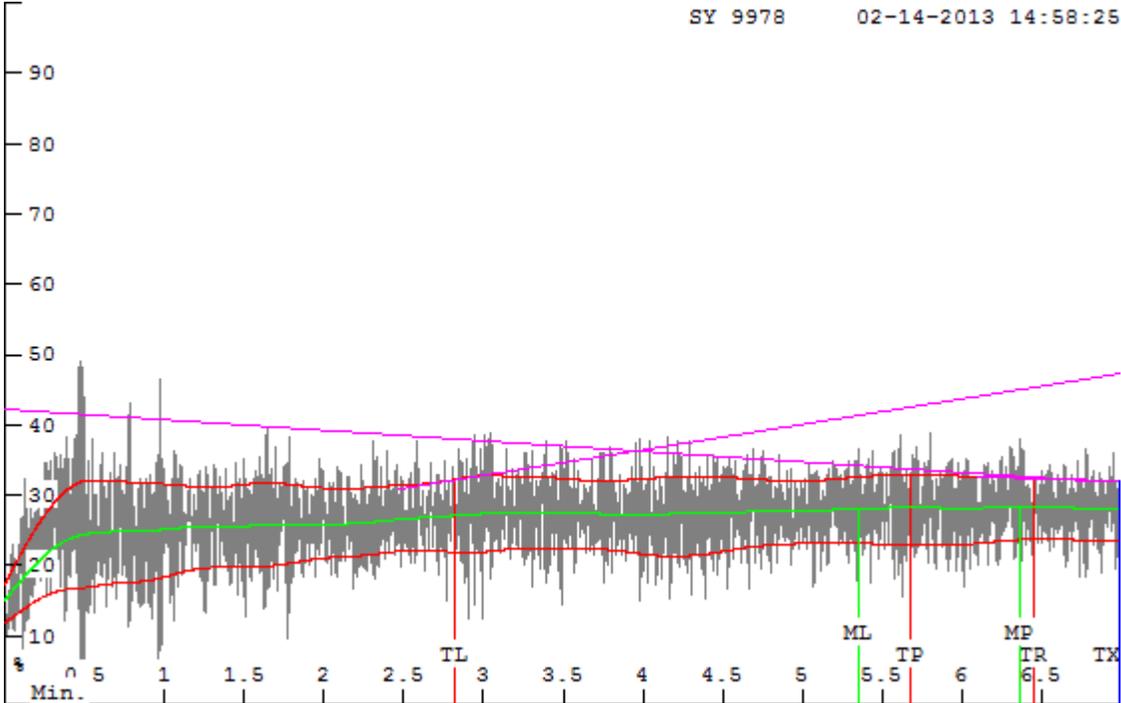


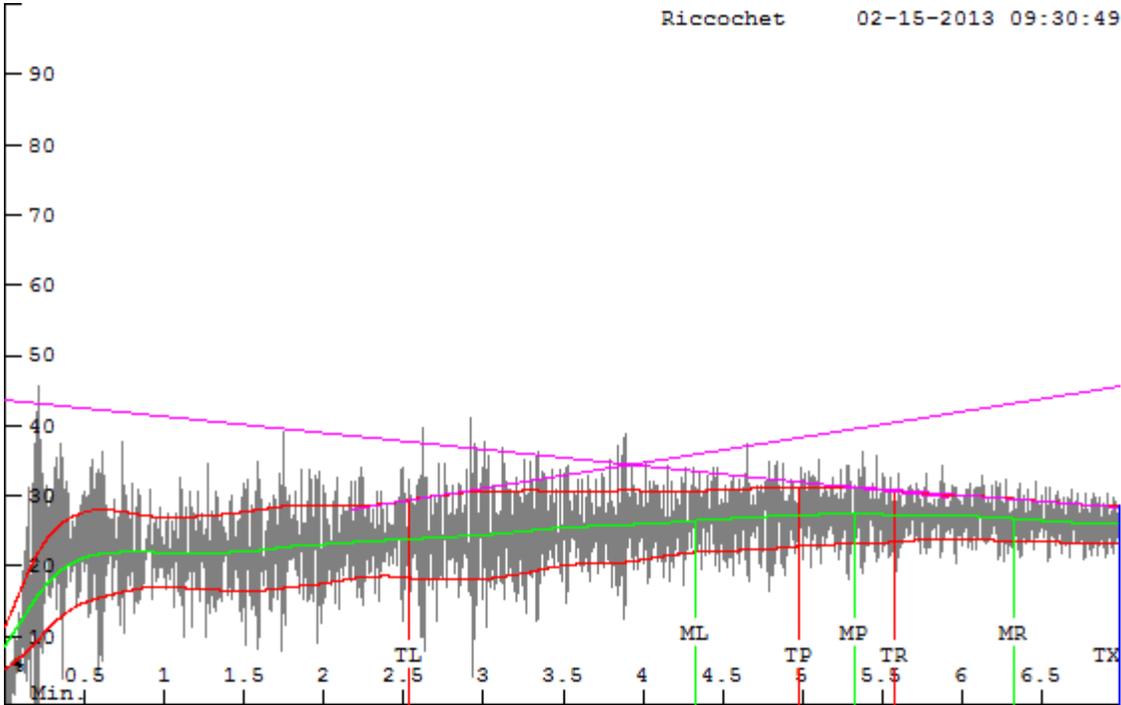


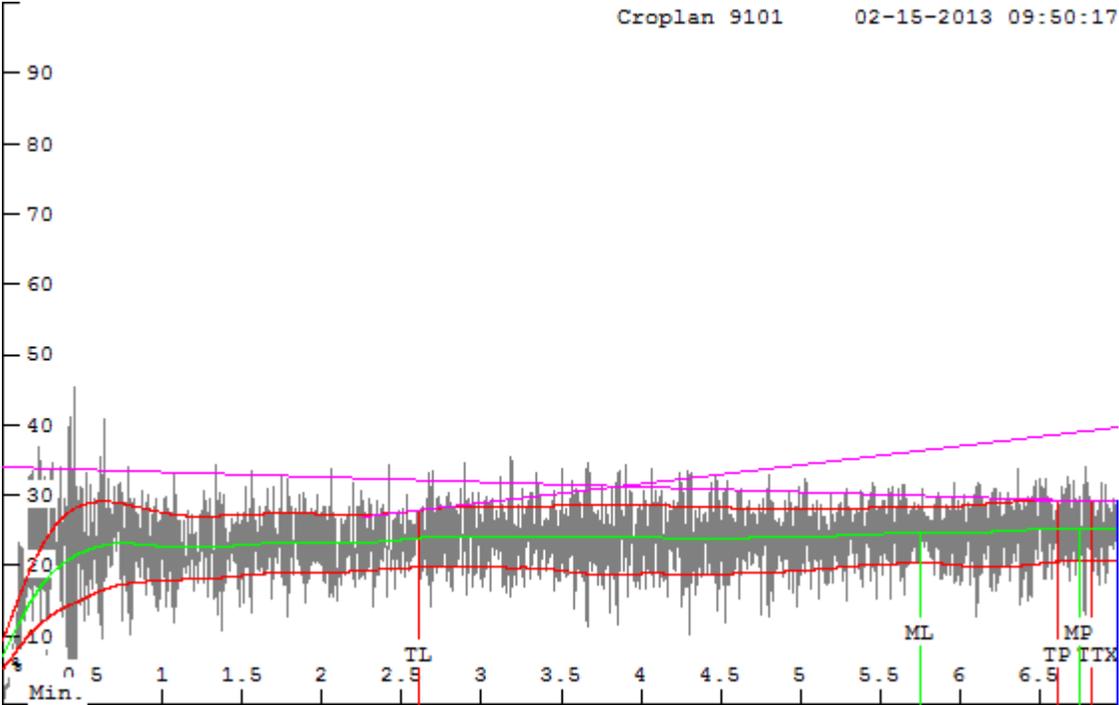












Appendix IV. Analysis of Local Control Flours Used by Cooperators

China I	Control 1**	Control 2**	AGS 2056	AGS 2035	AGS 2060	USG 3251	USG 3201	Terral TV 8861	SY 9978***	Riccoch et	Croplan 9101	RM1201
Lab Mill Extraction (%)									**			
Color: L*									**			
a*									**			
b*									**			
Protein (%) 14%/0% moisture basis	9.16		10.08	10.17	10.43	9.32	9.62	9.32	**	8.88	7.65	10.14
Moisture (%) corrected to 14% ml	12.4		12.1	12.4	12.3	12.3	12.1	12.0	**	11.6	12.2	12.3
Ash (%) 14%/0% moisture basis	0.44		0.52	0.60	0.58	0.55	0.55	0.55	**	0.58	0.49	0.49
Wet Gluten (%)	21.2		22.1	24.9	24.5	19.6	21.5	20.5	**	20.6	15.5	23.7
Gluten Index	92		83	52	78	53	71	90	**	83	90	80
Falling Number (sec)	319		389	372	325	341	319	328	**	345	311	323
Amylograph Viscosity 65 g (BU)									**			
Starch Damage (%)									**			
Solvent Retention Capacity (%)									**			
Water/50% Sucrose									**			
5% Lactic Acid/5% Na ₂ CO ₃									**			
Farinograph:									**			
Peak Time (min)	0.3		0.3	0.5	0.4	0.5	0.2	0.5	**	0.5	0.5	0.3
Stability (min)	1.4		2.9	1.9	3.6	1.5	2.7	1.9	**	1.2	0.8	2.9
Absorption (%)	53.8		53.2	54.4	52.8	51.6	50.0	52.2	**	49.9	51.5	52.0
Alveograph: P (mm)									**			
L (mm)									**			
P/L Ratio									**			
W (10 ⁻⁴ joules)									**			
Wire Cut Cookies									**			
Diameter (cm)	6.00		5.60	5.60	6.10	5.70	5.70	5.80	**	5.80	5.70	5.60
Stack Height (cm)									**			
Texture-Force (g)	16.30		15.70	16.00	16.30	16.30	15.80	16.30	**	16.30	15.30	16.80
Texture-Distance (mm)									**			
Sugar Snap Cookies									**			
Diameter (cm)									**			
Top Grain	8.5		8.0	8.0	8.5	8.0	8.5	7.5	**	7.5	7.5	8.5
Crumb Grain and Texture	8.5		9.0	9.0	8.5	8.0	8.0	7.5	**	7.0	6.5	8.0
Loaf Volume (cc)	33.30		31.33	31.00	34.30	31.30	30.70	32.00	**	35.00	32.00	33.30
Cookie Spread Ratio	2.04		2.00	1.94	2.10	1.92	1.94	1.96	**	2.15	2.09	1.98
Sponge Cake: (Volume (cc))	1000		1100	940	920	1200	1120	1020	**	1040	1020	1040
Total Score	8.0		8.3	6.5	7.0	6.8	7.5	6.0	**	8.5	7.3	7.8

China II	Control 1**	Control 2**	AGS 2056	AGS 2035	AGS 2060	USG 3251	USG 3201	Terral TV 8861	SY 9978***	Riccochet	Croplan 9101	RM1201
Lab Mill Extraction (%)									**			
Color: L*	91.95		91.47	91.22	92.42	91.8	91.99	92.1	**	91.98	91.96	91.86
a*	-1.82		-1.71	-1.96	-1.81	-1.82	-2.1	-2.08	**	-2.55	-2.21	-2.19
b*	7.45		7.36	8.42	6.65	7.69	8.46	7.89	**	9.55	8.48	8.91
Protein (%) 14%/0% moisture basis	8.2		9.5	8.5	8.3	8.2	8.4	7.9	**	7.8	7.2	7.2
Moisture (%) corrected to 14% mb	13.5		11.4	11.8	11.6	12.3	12	11.8	**	11.5	13.2	13.2
Ash (%) 14%/0% moisture basis	0.44		0.43	0.52	0.48	0.5	0.46	0.46	**	0.48	0.45	0.44
Wet Gluten (%)	24.6		29.4	24.9	24.4	24.4	22.4	22.4	**	21.5	20	20.2
Gluten Index	89		98.8	86	84.5	71.7	90	72.7	**	82	80	86.8
Falling Number (sec)	500		364	371	381	391	381	382	**	370	362	362
RVA Viscosity 3.5 g/25gwater (cp)	2340		2036	1993	2237	2709	2220	2541	**	1770	2415	2642
Starch Damage (%)	9.5		10.8	10.8	4.31	7.58	9.2	8.3	**	9.6	9.7	10.5
Solvent Retention Capacity (%)									**			
Water/50% Sucrose									**			
5% Lactic Acid/5% Na ₂ CO ₃									**			
Farinograph:									**			
Peak Time (min)	1.5		1.4	1.2	1.5	1	1.5	1.4	**	1	1	1.7
Stability (min)	5.3		2.4	2.2	4	1.1	3.2	2.1	**	1.5	1.2	3.1
Absorption (%)	56		55.2	55.6	54.8	53.3	52	53.7	**	51.5	52.8	53.8
Alveograph: P (mm)***					Extensogr aph:extens ibility164/1 47				**	Extensogr aph:extens ibility133/1 09		
L (mm)					resistance: 229/318				**	resistance: 211/257		
P/L Ratio									**			
W (10 ⁻⁴ joules)									**			
Wire Cut Cookies									**			
Diameter (cm)									**			
Stack Height (cm)									**			
Texture-Force (g)									**			
Texture-Distance (mm)									**			
Sugar Snap Cookies									**			
Diameter (cm)									**			
Top Grain									**			
Crumb Grain and Texture									**			
Loaf Volume (cc)									**			
Cookie Spread Ratio									**			

Dominican Republic	Control 1**	Control 2**	AGS 2056	AGS 2035	AGS 2060	USG 3251	USG 3201	Terral TV 8861	SY 9978***	Riccochet	Croplan 9101	RM1201
Lab Mill Extraction (%)									**			
Color: L*	94.89		95.99	95.9	96.71	96.2	96.34	96.42	**	96.22	96.44	96.2
a*	-1.15		-0.69	-0.95	-0.71	-0.82	-1.08	-1.02	**	-1.49	-1.3	-1.2
b*	7.03		7.44	8.56	6.64	7.88	8.66	7.81	**	9.86	8.9	9.81
Protein (%) 14%/0% moisture basis	7.75 / 9.01		8.73 / 10.15	8.73 / 10.15	9.00 / 10.47	7.88 / 9.16	8.34 / 9.70	7.97 / 9.27	**	7.87 / 9.15	6.63 / 7.71	8.81 / 10.24
Ash (%) 14%/0% moisture basis	0.40 / 0.47		0.40 / 0.47	0.53 / 0.52	0.49 / 0.57	0.52 / 0.61	0.51 / 0.59	0.50 / 0.58	**	0.49 / 0.57	0.47 / 0.55	0.45 / 0.53
Wet Gluten (%)	22.96		26.26	22.74	24.27	22.74	25.29	23.00	**	22.46	17.06	26.10
Gluten Index	72.92		31.20	91.49	69.48	47.40	57.01	69.70	**	76.15	82.59	61.41
Falling Number (sec)	342		409	383	354	365	347	377	**	368	335	358
Amylograph Viscosity 65 g (BU)									**			
Starch Damage (%)	3.28		8.34	7.12	4.01	5.23	6.39	5.72	**	7.61	6.9	8.0
Farinograph:									**			
Peak Time (min)	1.5		2.5	1.4	4.1	1.5	2	1.7	**	0.8	0.7	3.1
Stability (min)									**			
Absorption (%)									**			
Alveograph: P (mm)	34		40	71	40	37	32	48	**	30	52	37
L (mm)	87		92	80	134	79	133	81	**	115	61	136
P/L Ratio	0.39		0.43	0.89	0.3	0.47	0.24	0.59	**	0.26	0.85	0.27
W (10 ⁻⁴ joules)	87		91	87	143	74	104	120	**	82	98	106
Wire Cut Cookies									**			
Diameter (cm)									**			
Stack Height (cm)									**			
Texture-Force (g)									**			
Texture-Distance (mm)									**			
Sugar Snap Cookies									**			
Diameter (cm)									**			
Top Grain									**			
Crumb Grain and Texture									**			
Loaf Volume (cc)	70		73	69	75	71	68	70	**	71	70	55
Cookie Spread Ratio									**			

Mexico	Control 1**	Control 2**	AGS 2056	AGS 2035	AGS 2060	USG 3251	USG 3201	Terral TV 8861	SY 9978***	Riccochet	Croplan 9101	RM1201
Lab Mill Extraction (%)									**			
Color: L*									**			
a*									**			
b*									**			
Color Agtron			41	36	58	42	52	57		51	53	49
Protein (%) 14% moisture basis	9.24		8.60	9.60	10.10	8.40	8.60	9.30		9.60	8.40	8.60
Moisture (%)	12.75		13.20	13.20	13.10	13.20	13.20	13.20		13.20	13.20	13.30
Ash (%) 14%	0.52		0.41	0.53	0.51	0.48	0.48	0.46		0.47	0.43	0.42
Wet Gluten (%)	22.30		25.61	20.47	11.99	17.96	19.00	19.51		18.00	12.69	21.60
Gluten Index	64.50		53.62	96.18	95.51	70.05	90.27	94.56		95.30	95.30	93.36
Falling Number (sec)	380.000		474	387	355	365	326	369		320	320	385
Amylograph Viscosity 65 g (BU)									**			
Starch Damage (%)									**			
Solvent Retention Capacity (%)									**			
Water/50% Sucrose									**			
5% Lactic Acid/5% Na ₂ CO ₃									**			
Farinograph:												
Peak Time (min)												
Stability (min)			2.6	3.2	3.1	1.5	2.1	2.1		1.1	1.2	2.5
Absorption (%) corrected for 500 FU)	52.3		54.8	54.8	55.9	53.1	51.8	54.1	**	51.1	52.5	52.6
Absorption (%) corrected to 14% mb)	52.3		53.9	53.9	54.8	52.2	50.9	53.2		50.2	51.6	51.8
Development Time (min)	2		1.5	2	1.7	1.2	1.4	1.7		1.2	1.3	2
MTI (FU)			91	56	105	115	83	87		102	111	94
Alveograph:									**			
P (mm)	0.7		47	73	47	43	38	50		35	51	39
L (mm)			72	62	62	63	74	83		81	52	100
P/L Ratio			0.65	1.16	0.39	0.68	0.51	0.60		0.43	0.98	0.39
W (10 ⁻⁴ joules)	95		92	161	161	76	89	128		78	86	87
P/G			2.5	4.1	1.9	2.4	2.0	4.1		4.1	3.2	4.5
G			18.9	17.5	24.6	17.7	19.1	20.3		20	16.1	22.3
Wire Cut Cookies									**			
Diameter (cm)			7.9	8.02	8.03	7.5	7.6	8.0		8.03	7.95	7.78
Stack Height (cm)			1.02	0.99	0.99	1.02	1.02	1.02		1.00	0.96	0.91
Texture-Force (g)									**			
Texture-Distance (mm)									**			
Sugar Snap Cookies									**			
Diameter (cm)									**			
Top Grain									**			
Crumb Grain and Texture									**			
Loaf Volume (cc)									**			
Cookie Spread Ratio									**			

<i>Indonesia</i> <i>Control Flour Analysis</i>	Indonesia I Control Flour			
	<i>Cake</i>	<i>Cookie</i>	<i>Bread 1</i>	<i>Bread 2</i>
Test Weight (lb/bu)	65.76	65.34	64.40	64.03
(kg/hl)	82.20	81.71	80.50	80.04
Damaged Kernels (%)	0.325	0.389	1.189	0.861
Foreign Material (%)	0.430	0.332	0.233	0.467
Shrunken & Broken (%)	1.992	2.105	3.152	3.016
Total Defects (%)	2.747	2.827	4.574	4.342
Moisture (%)	9.65	9.43	12.40	11.37
Protein (%) Dry Basis	10.83	10.81	16.32	14.77
Protein (%) 12% M.B.	9.53	9.51	14.36	13.00
Ash (%) Dry Basis	1.55	1.57	1.85	1.75
Ash (%) 12% M.B.	1.36	1.38	1.63	1.54
1000 Kernel Weight (g)	40.8	40.5	35.9	37.4
Falling Number (sec)	370	361	336	372
E. Coli (cfu/g)	0	0	0	0
Total Coliform (cfu/g)	2.0 x 10 ⁴	1.8 x 10 ⁴	1.0 x 10 ⁴	1.2 x 10 ⁵
Yeast (cfu/g)	1.1 x 10 ⁴	1.3 x 10 ⁴	1.0 x 10 ⁴	1.0 x 10 ⁴
Mold (cfu/g)	2.0 x 10 ⁴	1.8 x 10 ⁴	1.0 x 10 ⁴	2.0 x 10 ⁴
Commercial Mill Extraction (%)	76.4	76.7	65.0	77.0
Lab Mill Extraction (%)	72.70	72.72	73.66	73.39
Color: L*	93.01	92.80	91.63	91.89
a*	-0.63	-0.63	-0.46	-0.33
b*	9.39	9.26	10.35	10.11
Flour Moisture (%)	13.60	14.00	13.90	14.20
Protein (%) - Dry Basis	9.77	9.88	14.75	14.02
Protein (%) - 14% M.B.	8.40	8.50	12.70	12.06
Ash (%) - Dry Basis	0.61	0.62	0.50	0.63
Ash (%) - 14% M.B.	0.52	0.53	0.43	0.54
Wet Gluten (%)	23.4	23.5	37.0	33.1
Gluten Index	95	96	78	91
Falling Number (Sec)	410	377	443	435
Amylograph Viscosity 65 g (BU)	561	588	819	566
Starch Damage (%)	6.91	5.06	5.90	6.26
Maltose Value (mg/10g)	2.38	1.65	1.78	1.95
<i>Solvent Retention Capacity (SRC)</i>				
Water	61.28	61.24	68.31	69.18
Pentosan (50% Sucrose)	98.92	95.78	103.07	110.76
Glutenin (5% Lactic Acid)	107.26	99.83	141.96	141.34
Damaged Starch (5% Na ₂ CO ₃)	79.72	81.37	87.74	94.98
<i>Farinograph</i>				
Absorption (%)	57.00	56.60	66.70	64.10
Arrival Time (min)	1.00	1.00	3.60	2.20
Peak Time (min)	1.80	1.50	7.20	7.70
Departure Time (min)	8.20	7.40	29.60	14.00
Stability (min)	7.20	6.40	26.00	11.80
Mixing Tolerance Index (MTI)	19	24	6	20
<i>Extensograph</i>				
Resistance (BU) - @ 45 mins	222	212	281	278
Extensibility (cm)	15.50	15.30	19.60	18.30
Area (sq cm)	57.00	54.00	113.00	103.00
Resistance (BU) - @ 90 mins	259	200	286	320
Extensibility (cm)	13.80	15.10	19.40	18.20
Area (sq cm)	57.00	51.00	115.00	113.00
Resistance (BU) - @ 135 mins	250	235	288	302
Extensibility (cm)	14.60	14.80	19.70	18.10
Area (sq cm)	62.00	59.00	114.00	111.00
<i>Alveograph</i>				
P (mm)	64.00	66.00	105.00	108.00
L (mm)	80.00	59.00	68.31	89.00
P/L Ratio	0.79	1.11	1.10	1.22
W (10 ⁻⁴ joules)	158.00	135.00	328.00	331.00
Remarks	Non-Chlorinated	Non-Chlorinated		

Indonesia <i>Control Flour Analysis</i>	Indonesia II Flour Mill								
	Cake			Cookie			Bread		
	SWW	ASW	Flour	SWW	ASW	Flour	DNS	AH	Flour
Blend %	70	30	100	50	50	100	80	20	100
Test Weight (lb/bu)									
(kg/hl)	81.91	83.07		81.91	83.07		82.84	84.98	
Damaged Kernels (%)	0.0			0.0			0.5		
Foreign Material (%)	0.1			0.1			0.1		
Shrunken & Broken (%)	0.8	0.83		0.8	0.83		1		
Total Defects (%)	0.9			0.9			1.6		
Grade	SW 2	ASW1		SW 2	ASW1		HRS 2	AH2	
Dockage (%)	0.32	1.01		0.32	1.01		0.43	0.56	
Moisture (%)	8.84	10.29		8.84	10.29		10.54	10.88	
Protein (%) Dry Basis	11.22	11.07		11.22	11.07		15.94	13.59	
Protein (%) 12% M.B.	9.87	9.74		9.87	9.74		14.03	11.96	
Ash (%) Dry Basis	1.43	1.45		1.51	1.45		1.74	1.56	
Ash (%) 12% M.B.	1.25	1.28		1.33	1.28		1.53	1.37	
1000 Kernel Weight (g)	39.90	42.20		39.90	42.20		30.29	39.91	
Kernel Size (% lg / md / sm)									
Single Kernel: Hardness									
Weight (mg)									
Diameter (mm)									
Sedimentation (cc)									
Falling Number (sec)	366	446		366	446		419	489	
E. Coli (cfu/g)									
Total Coliform (cfu/g)									
Yeast (cfu/g)									
Mold (cfu/g)									
Commercial Mill Extraction (%)									
Lab Mill Extraction (%)	69.0	75.8	76.5	69.0	75.8	77.5	68.2	73.3	72.5
Color: L*	92.02	91.56	90.69	92.02	91.56	90.45	92.42	91.89	89.77
a*	-0.43	-0.37	-0.33	-0.43	-0.37	-0.32	-0.15	-0.08	-0.08
b*	8.24	9.54	8.95	8.24	9.54	9.13	9.83	9.11	9.6
Flour Moisture (%)	13.09	12.8	12.24	13.09	12.8	12.54	14.54	13.98	12.84
Protein (%) - Dry Basis	10.02	10.67	9.59	10.02	10.67	9.87	14.73	12.75	14.56
Protein (%) - 14% M.B.	8.62	9.18	8.25	8.62	9.18	8.49	12.67	10.97	12.52
Ash (%) - Dry Basis	0.51	0.67	0.62	0.51	0.67	0.64	0.50	0.57	0.52
Ash (%) - 14% M.B.	0.44	0.57	0.53	0.44	0.57	0.55	0.43	0.49	0.44
Wet Gluten (%)	25.55	23.00	23.10	25.55	23.00	24.00	36.05	33.05	36.50
Gluten Index			78.67			82.17			87.84
Falling Number (Sec)	370	448	379	370	448	394	437	453	513
Amylograph Viscosity 65 g (BU)									
Starch Damage (%)			6.64			6.89			7.67
Maltose Value (mg/10g)			168			208.5			179.8
Solvent Retention Capacity (SRC)									
Water	54.51	68.47	57.82	54.51	68.47	60.91	69.26	73.48	67.35
Penotosan (50% Sucrose)	86.8	102.56	98.75	86.8	102.56	103.41	120.79	115.65	110.63
Glutenin (5% Lactic Acid)	97.3	113.66	87.28	97.3	113.66	93.73	158.11	127.24	148.53
Damaged Starch (5% Na ₂ CO ₃)	73.93	98.99	77.79	73.93	98.99	81.07	93.43	99.26	86.5
<i>Farinograph</i>									
Absorption (%)	53.3	61.1	55.9	53.3	61.1	57.4	61	62.7	63
Arrival Time (min)	0.6	1.6	0.8	0.6	1.56	0.9	1.5	1.5	1.5
Peak Time (min)	1.3	4.3	1.2	1.3	4.3	1.5	7	4.9	20
Departure Time (min)	4.2	7.3	5.2	4.2	7.3	5.9	16.4	9	34.4
Stability (min)	3.5	6.3	4.5	3.5	6.3	5.0	14.9	7.5	32.7
Mixing Tolerance Index (MTI)	65	46	49	65	46	46	25	45	8
<i>Extensograph</i>									
Resistance (BU) - @ 45 mins	182	252	276	182	252	236	242	258	440
Extensibility (cm)	14.7	16	12.7	14.7	16	15.7	23.4	19.5	17.2
Area (sq cm)	46	77	55	46	77	67	141	109	157
Resistance (BU) - @ 90 mins	237	312	318	237	312	278	332	284	630
Extensibility (cm)	14	16.2	12.7	14	16.2	15.5	20.3	18.1	17.5
Area (sq cm)	55	96	64	55	96	77	150	106	225
Resistance (BU) - @ 135 mins	275	347	352	275	347	278	348	283	589
Extensibility (cm)	13.1	15.5	12.1	13.1	15.5	14.6	19.1	18.6	16.9
Area (sq cm)	58	103	65	58	103	71	150	112	199
<i>Alveograph</i>									
P (mm)			61.24			62.26			125.95
L (mm)			67.51			72.08			80.16
P/L Ratio			0.91			0.86			1.57
W (10 ⁻⁴ joules)			129.29			132.83			392.27
Remarks	Non-Chlorinated			Non-Chlorinated					

<i>Malaysia Control Flour Analysis</i>	Malaysia Control Flour	
	<i>General Purposes</i>	<i>Bread</i>
(kg/hl)	80.50	82.00
Foreign Material (%)	0.62	0.71
Shrunken & Broken (%)	2.75	2.36
Total Defects (%)	2.87	2.23
Grade	2	2
Dockage (%)		
Moisture (%)	12.20	12.50
Protein (%) Dry Basis	12.05	15.45
Protein (%) 12% M.B.	10.60	13.60
Ash (%) Dry Basis	1.50	1.55
Ash (%) 12% M.B.	1.32	1.36
1000 Kernel Weight (g)	35	38
Falling Number (sec)	350	380
Commercial Mill Extraction (%)	76	75
Color: L*	92.93	92.23
a*	-1.54	-1.63
b*	8.05	10.11
Flour Moisture (%)	13.52	13.75
Protein (%) - Dry Basis	11.56	14.99
Protein (%) - 14% M.B.	9.94	12.89
Ash (%) - Dry Basis	0.62	0.63
Ash (%) - 14% M.B.	0.54	0.54
Wet Gluten (%)	26.5	36.1
Gluten Index	95.08	85.49
Falling Number (Sec)	356	392
<i>Solvent Retention Capacity (SRC)</i>		
Water	68.43	
Penotosan (50% Sucrose)	108.3	
Glutenin (5% Lactic Acid)	101.12	
Damaged Starch (5% Na ₂ CO ₃)	90.16	
<i>Farinograph</i>		
Absorption (%)	61.3	62.7
Arrival Time (min)	1.3	2.5
Peak Time (min)	5.5	8.0
Departure Time (min)	9.5	15.0
Stability (min)	8.2	12.5
Mixing Tolerance Index (MTI)	40	30
<i>Extensograph</i>		
Resistance (BU) - @ 45 mins	324	472
Extensibility (cm)	152	193
Area (sq cm)	70	122
Resistance (BU) - @ 90 mins	368	501
Extensibility (cm)	127	181
Area (sq cm)	64	118
Resistance (BU) - @ 135 mins	378	479
Extensibility (cm)	125	176
Area (sq cm)	65	111
Remarks	Non-Chlorinated	

<i>Philippines</i> <i>Control Flour Analysis</i>	Philippine I Control Flour				
	<i>Cake</i>	<i>Cookie</i>	<i>Bread 1</i>	<i>Bread 2</i>	<i>Bread 3</i>
Damaged Kernels (%)	0.21	0.47	0.42	0.92	0.63
Foreign Material (%)	0.08	0.58	0.60	0.80	0.54
Shrunken & Broken (%)	0.92	1.92	2.82	1.21	1.53
Total Defects (%)	1.39	2.56	3.26	2.30	2.38
Grade	1	1	2	2	1
Dockage (%)	0.27	0.18	0.19	0.17	0.21
Moisture (%)	10.03	13.45	12.53	11.50	12.48
Protein (%) Dry Basis	10.50	12.80	15.80	15.40	15.90
Protein (%) 12% M.B.	9.20	11.20	13.90	13.60	14.00
Ash (%) Dry Basis	1.541	1.767	1.954	1.893	1.936
Ash (%) 12% M.B.	1.356	1.555	1.719	1.666	1.703
Falling Number (sec)	371	404	453	420	452
E. Coli (cfu/g)	0	0	0	0	0
Total Coliform (cfu/g)	0	0	0	0	0
Yeast (cfu/g)	10	10	10	0	10
Mold (cfu/g)	160	70	30	50	420
Lab Mill Extraction (%)	76	76	76	76	78
Color: L*	92.59	90.50	88.05	88.08	88.02
a*	-1.8	-2.53	-1.92	-2.06	-1.92
b*	6.46	11.04	11.83	12.20	11.69
Flour Moisture (%)	11.93	12.25	13.85	13.55	14.08
Protein (%) - Dry Basis	8.50	10.30	15.00	15.00	15.40
Protein (%) - 14% M.B.	7.30	8.80	12.90	12.90	13.20
Ash (%) - Dry Basis	0.441	0.663	0.630	0.606	0.669
Ash (%) - 14% M.B.	0.379	0.570	0.542	0.521	0.576
Wet Gluten (%)	21.88	27.17	35.28	37.7	38.47
Gluten Index	78.41	75.82	86.16	92.03	88.01
Maltose Value (mg/10g)	125	195	218.00	218.00	237.00
<i>Solvent Retention Capacity (SRC)</i>					
Water	60.94	58.80	68.26	68.49	69.75
Penotosan (50% Sucrose)	97.28	99.69	105.69	112.11	108.24
Glutenin (5% Lactic Acid)	87.21	73.49	125.2	116.09	120.61
Damaged Starch (5% Na ₂ CO ₃)	77.51	75.08	84.98	90.99	86.90
<i>Farinograph</i>					
Absorption (%)	55.2	54.6	65.4	66.0	65.1
Arrival Time (min)	1.5	2.3	8.5	8.2	8.8
Peak Time (min)					
Departure Time (min)					
Stability (min)	3.8	1.7	9.9	9.7	10.8
Mixing Tolerance Index (MTI)	62	84	27	24	28
<i>Extensograph</i>					
Resistance (BU) - @ 45 mins	510	58	320	202	183
Extensibility (cm)	7.9	168	215	219	219
Area (sq cm)					
Resistance (BU) - @ 90 mins	580		460	228	197
Extensibility (cm)	77		171	198	221
Area (sq cm)					
Resistance (BU) - @ 135 mins	500		554	204	208
Extensibility (cm)	60		162	201	204
Area (sq cm)					
Remarks	U.S. SWW	CWSWS 10.5 Pro	CWRS 12.5 Pro	CWRS 13.5 Pro	CWRS 14.0 Pro

<i>Philippines</i> <i>Control Flour Analysis</i>	Philippines II Control Flour			
	<i>Cake</i>	<i>Cookie</i>	<i>Bread 1</i>	<i>Bread 2</i>
Test Weight (lb/bu)				
(kg/hl)				
Damaged Kernels (%)				
Foreign Material (%)				
Shrunken & Broken (%)				
Total Defects (%)				
Grade		2	1	2
Dockage (%)				
Moisture (%)		13.46	13.49	12.86
Protein (%) 12% M.B.		10.63	12.55	14.69
Ash (%) 12% M.B.		1.570	1.591	1.679
1000 Kernel Weight (g)				
Kernel Size (%) lg / md / sm				
Single Kernel: Hardness				
Weight (mg)				
Diameter (mm)				
Sedimentation (cc)				
Falling Number (sec)		368	284	374
Commercial Mill Extraction (%)		75	77	77
Lab Mill Extraction (%)		79.22	77.63	81.09
Color: L*	93.09	91.17	88.63	87.69
a*	-0.93	-1.39	-0.95	-0.86
b*	4.11	7.37	8.51	9.6
Flour Moisture (%)	13.02	13.43	14.34	14.03
Protein (%) - Dry Basis	9.91	11.31	13.53	16.45
Protein (%) - 14% M.B.	8.52	9.73	11.64	14.15
Ash (%) - Dry Basis	0.436	0.638	0.746	0.786
Ash (%) - 14% M.B.	0.375	0.548	0.642	0.676
Wet Gluten (%)		25.37	34.66	42.48
Gluten Index	124.53	59.26	93.97	82.2
Falling Number (Sec)	365	367	394	391
Amylograph Viscosity 65 g (BU)				
Starch Damage (%)	6.58	5.62	5.57	6.04
Maltose Value (mg/10g)				
<i>Solvent Retention Capacity (SRC)</i>				
Water	95.28	56.07	64.67	71.02
Penotosan (50% Sucrose)	152.43	94.89	102.4	105.91
Glutenin (5% Lactic Acid)	101.83	70.01	112.98	120.86
Damaged Starch (5% Na ₂ CO ₃)	123.86	76.38	80.04	88.17
<i>Farinograph</i>				
Absorption (%)	75	58.00	64.0	69.3
Arrival Time (min)	6.50	1.50	2.25	2.75
Peak Time (min)	8.00	2.00	6.25	6.00
Departure Time (min)	9.50	4.00	16.25	15.75
Stability (min)	3.00	2.50	14.00	13.00
Mixing Tolerance Index (MTI)	125.00	110.00	50.00	45.00
<i>Extensograph</i>				
Resistance (BU) - @ 45 mins		80	490	280
Extensibility (cm)		212.5	237.5	200
Area (sq cm)		24.4	136.2	76.5
Resistance (BU) - @ 90 mins				
Extensibility (cm)				
Area (sq cm)				
Resistance (BU) - @ 135 mins				
Extensibility (cm)				
Area (sq cm)				
Remarks	Chlorinated	Non-Chlorinated	CPSR 12.3 Pro	CWRS 14.0 Pro

<i>Philippines Control Flour Analysis</i>	Philippines III Control Flour			
	<i>Cake</i>	<i>Cookie</i>	<i>Bread 1</i>	<i>Bread 2</i>
Test Weight (lb/bu)	62.72	62.72	62.79	62.79
(kg/hl)				
Damaged Kernels (%)	0.1	0.1	0.4	0.4
Foreign Material (%)	0.1	0.1	0.1	0.1
Shrunken & Broken (%)	0.15	0.15	0.18	0.18
Total Defects (%)	1.0	1.0	1.8	1.8
Grade	US No. 2 or better	US No. 2 or better	US No. 2 or better	US No. 2 or better
Dockage (%)	0.37	0.37	0.49	0.49
Moisture (%)	8.81	8.81	10.14	10.14
Protein (%) Dry Basis	10.50	10.50	15.21	15.21
Protein (%) 12% M.B.	10.13	10.13	14.90	14.90
Ash (%) Dry Basis	1.42	1.42	1.50	1.50
Ash (%) 12% M.B.	1.34	1.34	1.53	1.53
1000 Kernel Weight (g)	35.9	35.9	29.92	29.92
Falling Number (sec)	366	380	406	406
E. Coli (cfu/g)	Negative	Negative	Negative	Negative
Total Coliform (cfu/g)	<100	<100	10	10
Yeast and Molds (cfu/g)	<10	<10	50	50
Commercial Mill Extraction (%)	3.00	78.00	77.50	77.50
Lab Mill Extraction (%)		58.49	72.41	72.41
Color: L*	91.75	89.91	88.32	86.40
a*	-2.05	-1.71	-1.53	-1.23
b*	7.34	8.59	9.74	9.86
Flour Moisture (%)	11.7	11.43	13.50	12.96
Protein (%) - Dry Basis	7.63	9.47	13.51	14.37
Protein (%) - 14% M.B.	7.85	9.72	13.59	14.54
Ash (%) - Dry Basis	0.34	0.51	0.54	0.84
Ash (%) - 14% M.B.	0.35	0.52	0.55	0.85
Wet Gluten (%)	20.2	24.2	37.2	37.1
Gluten Index	85	86	97	92
Falling Number (Sec)	384	423	496	494
Amylograph Viscosity 65 g (BU)	700	520	785	643
Starch Damage (%)	6.25	5.64	6.30	6.61
Maltose Value (mg/10g)				
<i>Solvent Retention Capacity (SRC)</i>				
Water	53.01	72.47	66.91	66.15
Penotosan (50% Sucrose)	91.66	94.71	107.04	109.57
Glutenin (5% Lactic Acid)	108.42	88.42	127.20	98.67
Damaged Starch (5% Na ₂ CO ₃)	71.94	73.85	83.68	85.58
<i>Farinograph</i>				
Absorption (%)	52.8	53.77	63.37	64.0
Arrival Time (min)	0.6	1.2	4.1	4.0
Peak Time (min)	1.2	2.5	9.00	6.80
Departure Time (min)	3.1	4.9	20.70	14.90
Stability (min)	2.5	3.7	16.10	10.30
Mixing Tolerance Index (MTI)	106.67	106.67	21.33	26.67
<i>Alveograph</i>				
P (mm)	42	36	57	57
L (mm)	59	81	134	135
P/L Ratio	0.71	0.44	0.43	0.42
W (10 ⁻⁴ joules)	82	77	266	230
Remarks	Non-Chlorinated	Non-Chlorinated	Straight Run	Clear

<i>Thailand</i> <i>Control Flour Analysis</i>	Thailand Control Flour		
	<i>Cake</i>	<i>Cookie</i>	<i>Bread</i>
Test Weight (lb/bu)	63.2	63.2	62.8
(kg/hl)			
Damaged Kernels (%)	0.0	0.0	0.0
Foreign Material (%)	0.2	0.2	0.2
Shrunken & Broken (%)	1.1	1.1	0.4
Total Defects (%)	1.3	1.3	0.7
Grade	No.2 or better	No.2 or better	No.2 or better
Dockage (%)	1.08	1.08	0.88
Moisture (%)	9.63	9.63	12.09
Protein (%) Dry Basis	10.72	10.72	16.59
Protein (%) 12% M.B.	9.43	9.43	14.60
Ash (%) Dry Basis	1.49	1.49	1.92
Ash (%) 12% M.B.	1.30	1.30	1.69
1000 Kernel Weight (g)	38.01	38.01	28
Falling Number (sec)	353	353	420
Commercial Mill Extraction (%)	58.0	70.0	70.0
Lab Mill Extraction (%)	N/A	72.9	70.9
Flour Moisture (%)	11.87	12.03	12.88
Protein (%) - Dry Basis	9.44	10.24	15.14
Protein (%) - 14% M.B.	8.12	8.81	13.02
Ash (%) - Dry Basis	0.41	0.53	0.55
Ash (%) - 14% M.B.	0.35	0.46	0.47
Wet Gluten (%)	25.20	26.00	36.7
Gluten Index	77.81	80.06	89.49
Falling Number (Sec)	444	456	567
Amylograph Viscosity 65 g (BU)	600	590	630
Starch Damage (%)	6.69	7.42	9.92
Maltose Value (mg/10g)	176	205.8	246.80
<i>Solvent Retention Capacity (SRC)</i>			
Water	59.31	61.86	68.5
Penotosan (50% Sucrose)	97.42	100.7	113.39
Glutenin (5% Lactic Acid)	99.78	95.01	137.13
Damaged Starch (5% Na ₂ CO ₃)	76.79	79.12	88.28
<i>Farinograph</i>			
Absorption (%)	58.2	59.5	65.9
Arrival Time (min)	0.75	0.75	2.00
Peak Time (min)	1.5	1.5	17.5
Departure Time (min)	5.5	6.5	> 20.0
Stability (min)	4.5	5.5	> 20.0
Mixing Tolerance Index (MTI)	50	45	5
<i>Extensograph</i>			
Resistance (BU) - @ 45 mins	335	305	520
Extensibility (cm)	132	144	180
Area (sq cm)	70	78	193
Resistance (BU) - @ 90 mins	455	350	555
Extensibility (cm)	123	140	164
Area (sq cm)	84	84	188
Resistance (BU) - @ 135 mins	420	360	630
Extensibility (cm)	128	137	160
Area (sq cm)	92	87	200
Remarks			

Appendix V. Formulas and Procedures of Cookie, Sponge Cake and Chiffon Cakes Baked in the Singapore Bake Workshop

Cookie Baking Test

Ingredients	%	gm
Flour	100	250.0
Castor Sugar	6.7	16.8
Powdered Sugar	44.5	111.3
Salt	0.3	0.6
Water	22.2	55.5
Shortening	30	75.0
Milk Solid Non Fat	3	7.5
Ammonium Bicarbonate	0.5	1.3
Sodium Bicarbonate	0.5	1.1
Total	207.63	519.08

Procedure:

1. Dissolve the castor sugar, salt & milk solid with the water and keep the solution in the fridge for 1 hours.
2. Cream shortening & powdered sugar together with a paddle attachment at low speed for 1 minute. Scrape bowl.
3. Continue to mix at medium speed for another 2 minutes. Scrape bowl at interval of every 1 minute.
4. Dispense require amount of milk solution, then dissolve the sodium & ammonium bicarbonates in the solution.
5. Add in the milk solution into the fat mixture while mixing at medium within 45 seconds. Scrape bowl.
6. Continue to mix at medium speed for another 3 minutes.
7. Finally, add in the sieved flour and mix at low speed for 20 seconds. Scrape bowl.
8. Finish off the mixing with another 10 seconds at low speed.
9. Remove the mixed dough from mixer and divide into 6 equal dough balls.
10. Arrange the dough balls in a vertical manner of 3 rows x 2 columns.
11. Sheet the dough to a thickness of 8mm and cut out \varnothing 5cm round dough pieces.
12. Transfer the dough pieces onto greased tray and bake them at 220°C (Top) & 210°C (Bottom) for 10 minutes.
13. Remove baked cookies from hot tray and allow to cool on wire rack for 20 minutes before packing.
14. Keep the cookies overnight before evaluating for color & texture characteristics.

Sponge Cake Baking Test

Ingredients	%	gm
Flour	100	160.0
Sugar (<i>Type: Fine Granule</i>)	100	160.0
Salt	2	3.2
Whole Eggs	200	320.0
Emulsifier (<i>Type: Sponge Gel</i>)	7	11.2
Total	409.0	654.4

Procedure:

Mixing - Sponge Batter

1. Sift the flour. Set aside.
2. Add the eggs, sugar, salt & emulsifier into the mixing bowl & blend well.
3. Then add in the sifted flour & blend well.
4. Whisk the mixture at high speed for 3 minutes.
5. Then change to medium speed & continue whisking for another 1 minute.
6. Finally, complete the mixing with low Speed mixing for 1 minute.
7. Check & note down the specific gravity and batter temperature.

Depositing & Baking

1. Deposit 300gm of the batter into 2 round Ø 6 inches lined cake mold.
2. Bake the cake at 190°C for 30 minutes. (Lower top heat and higher bottom heat)
3. Remove from oven & drop the baked cakes from a height of about 10cm.
4. De-pan the baked cake & allow to cool completely.
5. Keep the cooled cakes in plastic bags for next day evaluation.

Chiffon Cake Baking Test

Ingredients	%	gm
Flour	100	125.0
Powdered Sugar	115	143.8
Salt	0.5	0.6
Emulsifier (SP)	8	10.0
Baking Powder	2.1	2.6
Vegetable Oil	82	102.5
Water	23	28.8
Whole Eggs	234	292.5
Total	564.6	705.8

Procedure:

Mixing - Batter

1. Sieve the flour, baking powder, powdered sugar & salt together into the mixing bowl.
2. Add in the emulsifier, eggs & water.
3. Combine all ingredients together at low speed for 1 minute.
4. Change to high speed & continue mixing for another 5 minutes.
5. Change to low speed & continue mixing for another 1 minute, meanwhile add in the oil slowly.
6. Check the temperature & specific gravity of the batter.

Pre & Post Baking Procedures

1. Deposit 200gm of the chiffon batter into 2 x Ø 6 inches baking pan.
2. Knock the bottom of the pan lightly with fingers to release any big bubbles from the batter.
3. Bake the cake at 180°C for 30 minutes. (Lower top heat and higher bottom heat)
4. Drop the baked cake from a height of about 10cm immediately after removing from oven.
5. De-pan after cooling & store the cooled cake in plastic bag for next day evaluation.

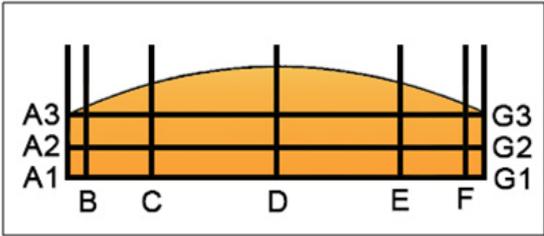
Results Calculations for Sponge Cakes and Chiffon Cakes

Shrinkage Value: $15.3\text{cm} - \frac{(A1 \text{ to } G1) + (A2 \text{ to } G2) + (A3 \text{ to } G3)}{2}$
 (Internal Pan ϕ)

Volume Index: Point B + Point C + Point D

Symmetry Index: $2 \times \text{Point C} - \text{Point B} - \text{Point D}$

Uniformity Index: Point B - Point D



Point A1 to G1 = Bottom ϕ of cake
Point A2 to G2 = Center ϕ of cake
Point A3 to G3 = Top ϕ of cake
Point B = 1cm from left edge
Point C = 4cm from left edge
Point D = Centre of cake
Point E = 4cm from right edge
Point F = 1cm from right edge

Result Interpretations

Shrinkage Value: Lesser value represents less sides shrinkage

Volume Index: Greater value represents bigger cake volume

Symmetry Index: 0 value represents perfect Symmetry
 Lesser value represents less crust convex
 Negative value represents crust is concave

Uniformity Index: 0 value represents perfect uniformity
 Positive value represents Point B is higher than Point D
 Negative value represents Point D is higher than Point B