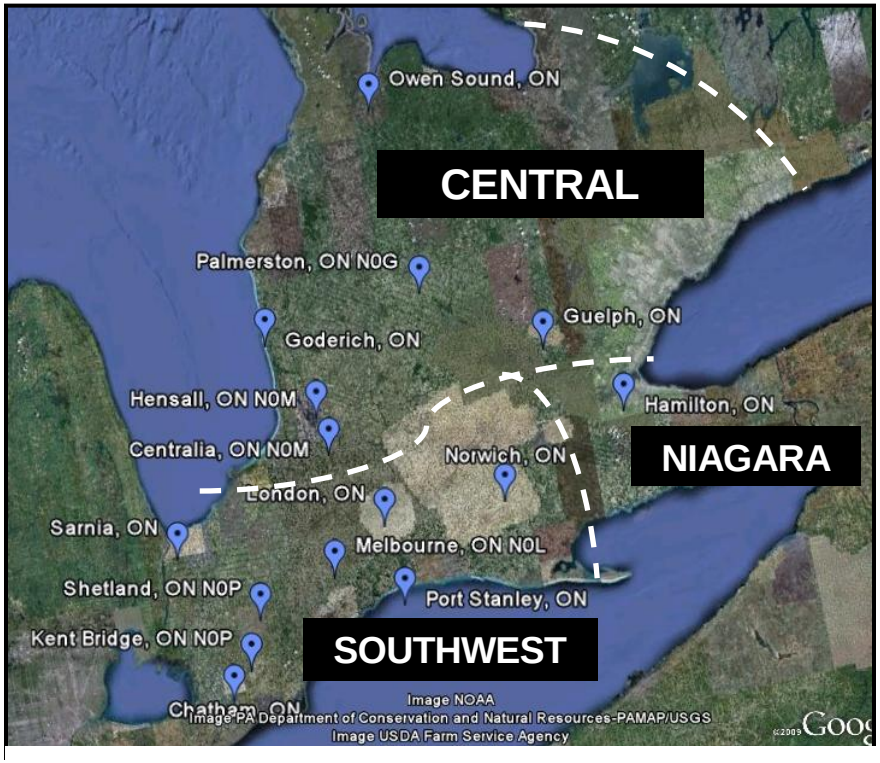
Sample Collection Points

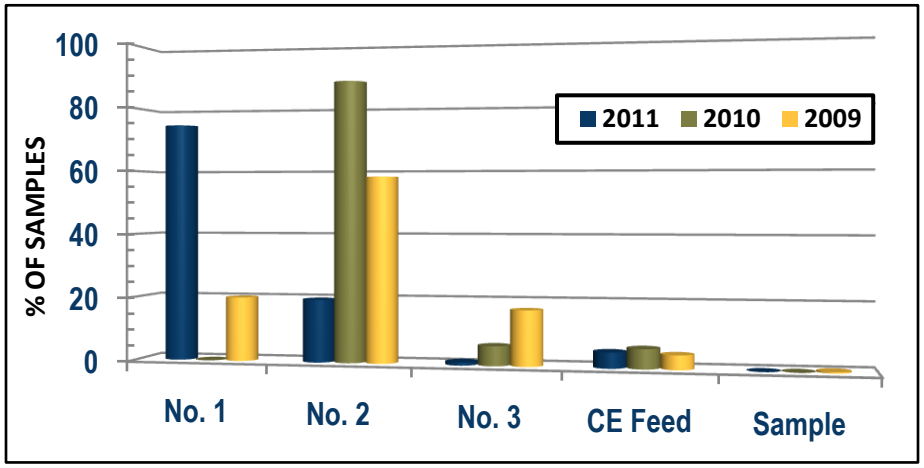


<u>NOTE:</u> Central region was previously referred to as the Northwest region.

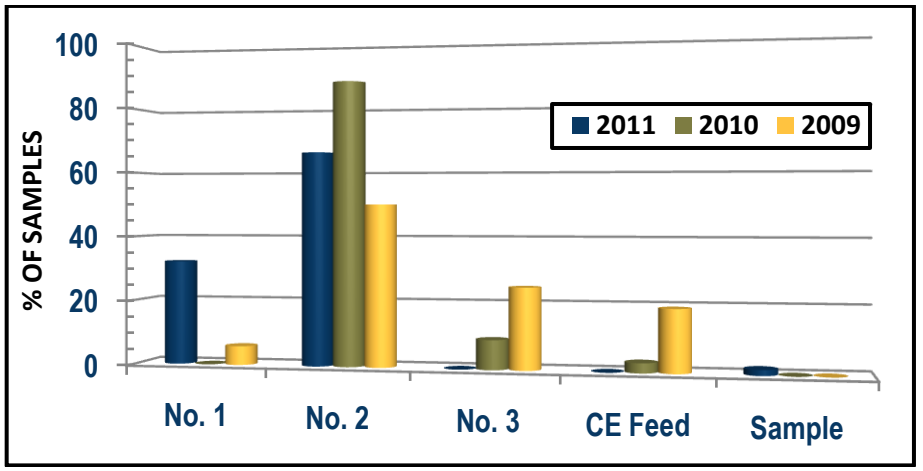
Location	Region
Pt. Colborne	Niagara
Hamilton	Niagara
Palmerston	Central
Guelph	Central
Goderich	Central
Centralia	Central
Owen Sound	Central
Hensall	Central
Melbourne	Southwest
Shetland	Southwest
Sarnia	Southwest
London	Southwest
Kent Bridge	Southwest
Norwich	Southwest
Chatham	Southwest
Port Stanley	Southwest

SOUTHWEST		CENTRAL		NIAGARA	
CLASS	**GRADE**	**CLASS**	**GRADE**	**CLASS**	**GRADE**
Soft Red Winter	1 CESRW	Soft Red Winter	1 CESRW	Soft Red Winter	1 CESRW
Soft Red Winter	2 CESRW	Soft Red Winter	2 CESRW		
Soft White Winter	1 CEWW	Soft White Winter	1 CEWW		
Hard Red Winter	1 CEHRW	Hard Red Winter	1 CEHRW		
		Hard Red Winter	2 CEHRW		

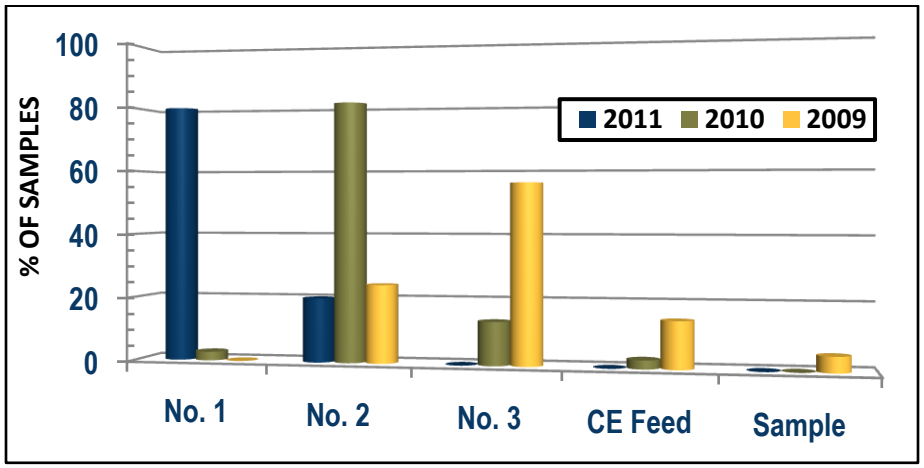
Southwest Region
Grade Results for Canada Eastern Soft Red Winter



Central Region
Grade Results for Canada Eastern Soft Red Winter



Niagara Region
Grade Results for Canada Eastern Soft Red Winter



2011 SOUTHWEST REGION

CANADA EASTERN SOFT RED WINTER WHEAT QUALITY

	2011		2010	2009
	1CESRW	2CESRW	2CESRW	2CESRW
WHEAT (13.5% mb)				
Test weight, kg/hL	79.9	79.9	77.5	79.3
Protein content , %	9.0	9.5	8.6	8.6
Protein content (dmb), %	10.4	11.0	9.9	9.9
Falling number, s	377	369	355	346
RVA Stirring number (SN), RVU	115	122	119	105
Ash content, %	1.54	1.47	1.44	1.44
Particle size index,%	66	64	71	71
Flour yield (total products basis), %	72.9	73.0	73.8	69.6
Flour yield (0.50% ash basis), %	74.6	74.5	77.3	78.1
FLOUR (14.0% mb)				
Protein content (CNA), %	7.6	8.0	6.9	7.1
Protein loss on milling, %	1.5	1.5	1.7	1.5
Wet gluten, %	23.6	25.0	19.1	20.9
Ash content, %	0.47	0.47	0.43	0.33
Minolta colour - L*	86.2	86.0	86.1	85.9
a*	-1.60	-1.40	-1.80	-1.74
b*	17.4	16.6	17.6	16.9
Starch damage (SDmatic), UCD	11.5	10.4	7.5	10.9
Amylograph peak viscosity, BU	555	615	640	460
Falling number, s	356	377	348	323

	2011		2010	2009
	1CESRW	2CESRW	2CESRW	2CESRW
FARINOGRAM				
Absorption, %	48.6	48.5	47.6	46.8
DDT, min	0.9	1.2	0.9	0.9
Stability, min	1.2	2.4	0.9	1.1
ALVEOGRAM				
P (height x 1.1), mm	21	21	18	21
L, mm	111	142	113	106
P/L	0.19	0.15	0.16	0.20
W (x 10E-4), J	52	57	45	55
[1]**SRC**				
Sucrose, %	86	88	85	88
Sodium carbonate, %	65	66	63	66
Lactic acid, %	88	89	84	90
Water, %	50	52	50	52
[2]**COOKIE BAKING**				
Width, mm	83.0	82.6	84.1	87.7
Spread (W/T)	9.5	9.1	11.8	11.5

[1]SRC = Solvent Retention Capacity

[2]AACC 10-53 (Wire cut cookie method)

2011 CENTRAL REGION

CANADA EASTERN SOFT RED WINTER WHEAT QUALITY

	2011		2010	2009
	1CESRW	2CESRW	2CESRW	2CESRW
WHEAT (13.5% mb)				
Test weight, kg/hL	80.3	79.9	80.1	80.1
Protein content , %	8.8	8.8	9.0	8.0
Protein content (dmb), %	10.1	10.1	10.4	9.3
Falling number, s	359	366	356	329
RVA Stirring number (SN), RVU	115	127	131	120
Ash content, %	1.41	1.49	1.45	1.39
Particle size index,%	66	67	68	71
Flour yield (total products basis), %	71.4	72.7	73.3	74.3
Flour yield (0.50% ash basis), %	73.2	76.8	77.8	79.3
FLOUR (14.0% mb)				
Protein content (CNA), %	7.2	7.2	7.5	6.7
Protein loss on milling, %	1.6	1.6	1.5	1.3
Wet gluten, %	21.5	20.5	21.9	19.2
Ash content, %	0.46	0.42	0.41	0.4
Minolta colour - L*	86.4	86.3	84.8	85.7
a*	-1.54	-1.50	-1.40	-1.49
b*	16.5	18.9	16.5	16.2
Starch damage (SDmatic), UCD	10.8	10.6	10.2	13.1
Amylograph peak viscosity, BU	650	530	450	250
Falling number, s	333	366	364	306

	2011		2010	2009
	1CESRW	2CESRW	2CESRW	2CESRW
FARINOGRAM				
Absorption, %	49.0	49.4	48.2	48.7
DDT, min	0.9	1.0	1.2	1.0
Stability, min	1.1	1.2	1.9	1.2
ALVEOGRAM				
P (height x 1.1), mm	23	26	20	20
L, mm	121	104	108	55
P/L	0.19	0.25	0.19	0.36
W (x 10E-4), J	62	66	43	29
[1]SRC				
Sucrose, %	87	91	90	90
Sodium carbonate, %	63	65	70	70
Lactic acid, %	86	90	86	77
Water, %	50	52	53	49
[2]COOKIE BAKING				
Width, mm	80.4	79.4	81.4	83.8
Spread (W/T)	8.2	8.3	11.3	10.8

[1]SRC = Solvent Retention Capacity

[2]AACC 10-53 (Wire cut cookie method)

2011 NIAGARA REGION

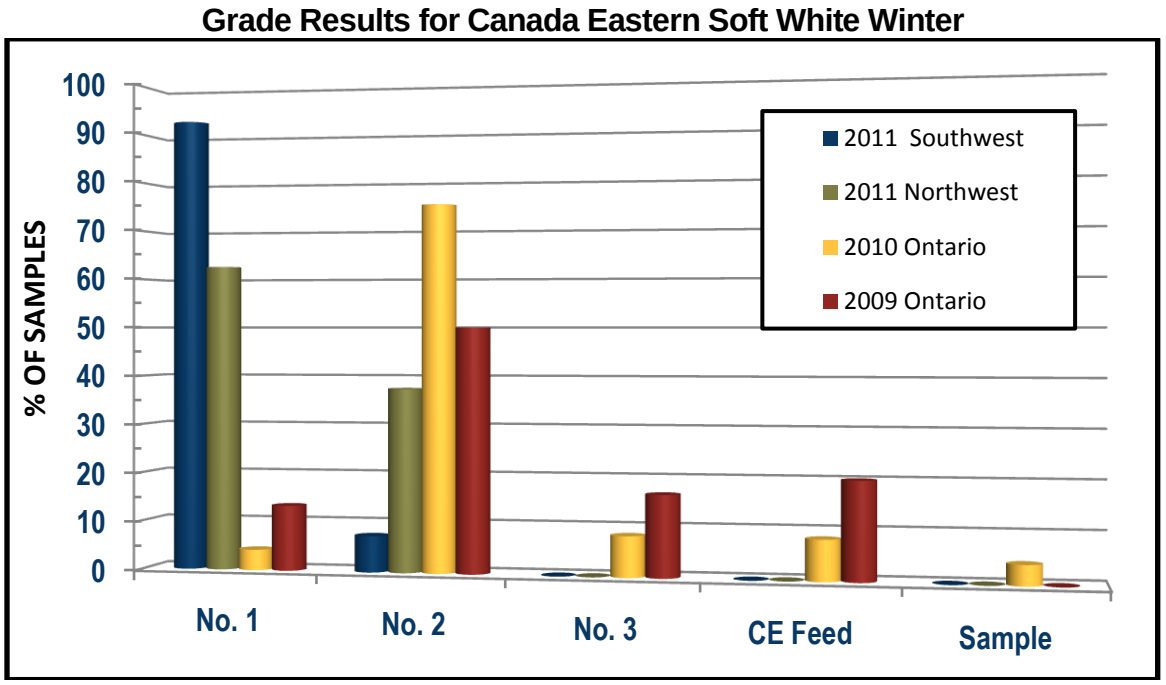
CANADA EASTERN SOFT RED WINTER WHEAT QUALITY

	2011 1CESRW	2010 2CESRW	2009 2CESRW
WHEAT (13.5% mb)			
Test weight, kg/hL	81.6	77.1	78.7
Protein content , %	8.4	9.1	8.8
Protein content (dmb), %	9.7	10.5	10.2
Falling number, s	371	349	269
RVA Stirring number (SN), RVU	110	125	92
Ash content, %	1.43	1.50	1.45
Particle size index,%	66	67	70
Flour yield (total products basis), %	73.6	75.3	71.4
Flour yield (0.50% ash basis), %	76.8	78.8	77.9
FLOUR (14.0% mb)	7.0	7.8	7.1
Protein content (CNA), %	1.4	1.3	1.7
Protein loss on milling, %	20.0	21.3	20.9
Wet gluten, %	0.44	0.43	0.37
Ash content, %	86.8	85.0	85.1
Minolta colour - L*	-1.77	-1.39	-1.37
a*	17.4	16.7	15.3
b*	7.9	11.8	11.5
Starch damage (SDmatic), UCD	640	460	220
Amylograph peak viscosity, BU	360	359	279
Falling number, s	81.6	77.1	78.7

	2011 1CESRW	2010 2CESRW	2009 2CESRW
FARINOGRAM			
Absorption, %	48.0	48.8	49.3
DDT, min	1.2	1.0	1.0
Stability, min	1.2	1.3	1.2
ALVEOGRAM			
P (height x 1.1), mm	22	20	20
L, mm	133	109	117
P/L	0.17	0.18	0.17
W (x 10E-4), J	57	43	45
[1]SRC			
Sucrose, %	87	89	88
Sodium carbonate, %	64	68	69
Lactic acid, %	104	85	88
Water, %	51	53	52
[2]COOKIE BAKING			
Width, mm	81.8	80.9	84.2
Spread (W/T)	8.1	11.4	11.6

[1]SRC = Solvent Retention Capacity

[2]AACC 10-53 (Wire cut cookie method)


Grade Results for Canada Eastern Soft White Winter
% OF SAMPLES
100
90
80
70
60
50
40
30
20
10
0
No. 1
No. 2
No. 3
CE Feed
Sample
2011 Southwest
2011 Northwest
2010 Ontario
2009 Ontario

2011 SOUTHWEST AND CENTRAL REGIONS

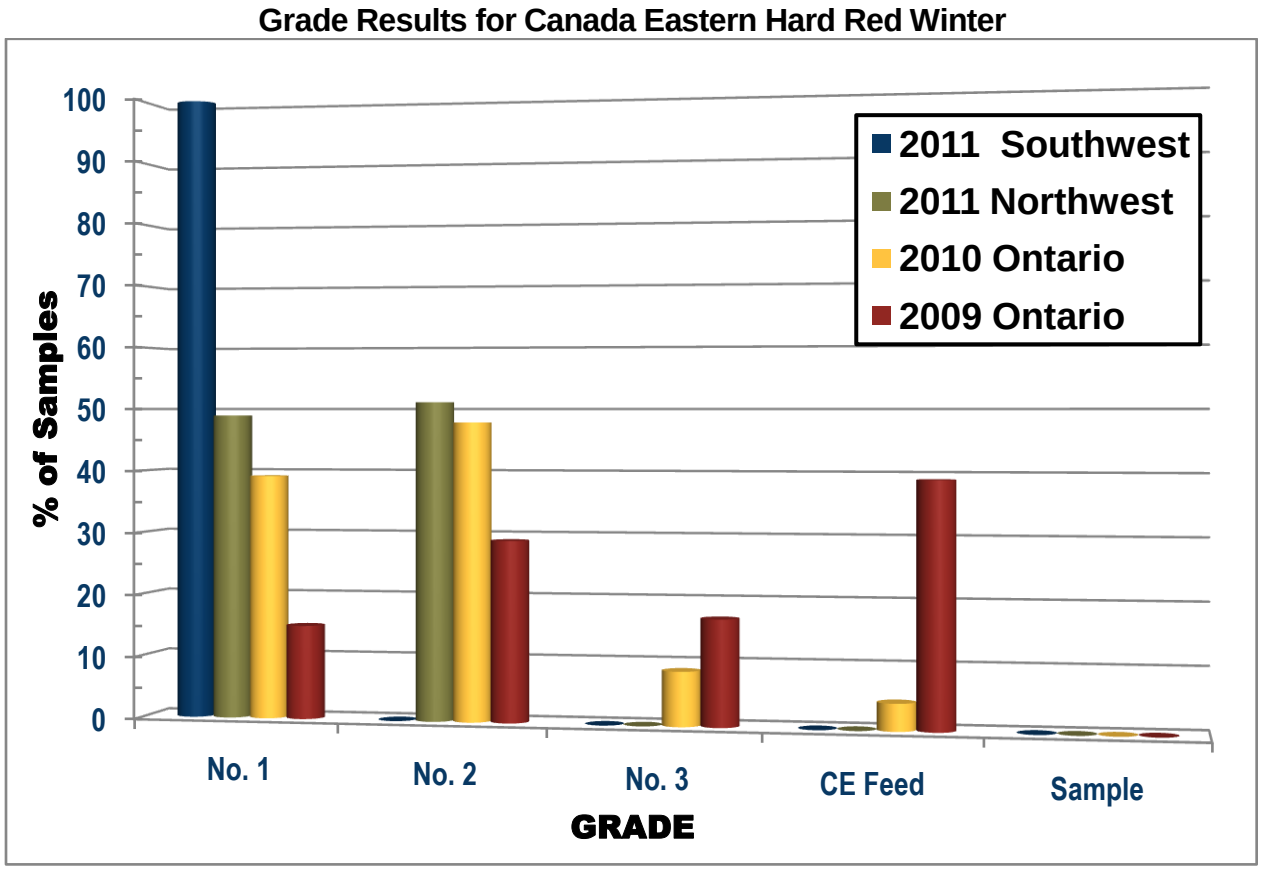
CANADA EASTERN SOFT WHITE WINTER WHEAT QUALITY

	2011		*2010	*2009		2011		*2010	*2009
	Southwest	Central	Ontario			Southwest	Central	Ontario	
	1CEWW	1CEWW	2CEWW	2CEWW		1CEWW	1CEWW	2CEWW	2CEWW
WHEAT (13.5% mb)					**FARINOGRAM**				
Test weight, kg/hL	81.6	79.9	80.1	80.5	Absorption, %	48.7	47.7	47.5	49.0
Protein content , %	9.1	8.9	9.0	8.4	DDT, min	1.0	0.7	1.2	0.9
Protein content (dmb), %	10.6	10.2	10.4	9.8	Stability, min	1.2	1.2	1.4	0.8
Falling number, s	368	366	364	299	**ALVEOGRAM**				
RVA Stirring number (SN), RVU	116	110	106	93	P (height x 1.1), mm	19	21	19	20
Ash content, %	1.59	1.50	1.52	1.44	L, mm	152	155	108	85
Particle size index,%	64	65	68	71	P/L	0.13	0.14	0.18	0.24
Flour yield (total products basis), %	73.0	73.1	71.0	76.0	W (x 10E-4), J	50	68	47	41
Flour yield (0.50% ash basis), %	76.8	78.1	74.0	81.0	**[1]SRC**				
FLOUR (14.0% mb)					Sucrose, %	86	85	84	86
Protein content (CNA), %	7.6	7.4	7.5	7.0	Sodium carbonate, %	65	63	62	66
Protein loss on milling, %	1.5	1.5	1.5	1.4	Lactic acid, %	85	90	82	84
Wet gluten, %	24.1	21.6	21.1	20.1	Water, %	51	50	50	52
Ash content, %	0.42	0.40	0.44	0.4	**[2]COOKIE BAKING**				
Minolta colour - L*	86.6	86.2	86.4	85.9	Width, mm	81.4	80.2	81.8	84.6
a*	-2.00	-1.57	-1.98	-1.85	Spread (W/T)	9.1	9.0	11.6	11.6
b*	18.3	15.1	17.8	17					
Starch damage (SDmatic), UCD	10.8	11.1	10.4	11					
Amylograph peak viscosity, BU	585	530	620	390					
Falling number, s	370	342	361	298					

*There were not enough samples collected to make regional composites.

[1]SRC = Solvent Retention Capacity

[2]AACC 10-53 (Wire cut cookie method


Grade Results for Canada Eastern Hard Red Winter
% of Samples
100
90
80
70
60
50
40
30
20
10
0
2011 Southwest
2011 Northwest
2010 Ontario
2009 Ontario
No. 1
No. 2
No. 3
CE Feed
Sample
GRADE

2011 SOUTHWEST REGION

CANADA EASTERN HARD RED WINTER WHEAT QUALITY

	2011	*2010 Ontario	
	1CEHRW	1CEHRW	2CEHRW
WHEAT (13.5% mb)			
Test weight, kg/hL	82.2	82.0	80.5
Protein content , %	10.3	11.1	11.0
Protein content (dmb), %	11.9	12.8	12.7
Falling number, s	408	375	324
RVA Stirring number (SN), RVU	129	127	113
Ash content, %	1.47	1.49	1.51
Particle size index,%	48	53	51
Flour yield (total products basis), %	73.0	77.9	77.4
Flour yield (0.50% ash basis), %	77.8	78.4	77.9
FLOUR (14.0% mb)			
Protein content (CNA), %	9.1	10.2	10.2
Protein loss on milling, %	1.2	0.9	0.8
Wet gluten, %	26.8	25.8	26
Ash content, %	0.41	0.49	0.49
Minolta colour - L*	86.4	85.0	84.8
a*	-0.97	-0.71	-0.67
b*	15.2	14.9	14.9
Starch damage (SDmatic), UCD	17.1	16.0	17.1
Amylograph peak viscosity, BU	615	210	150

	2011	*2010 Ontario	
	1CEHRW	1CEHRW	2CEHRW
FARINOGRAM			
Absorption, %	54.3	55.6	55.8
DDT, min	2.0	2.3	4.0
Stability, min	5.5	6.7	6.4
ALVEOGRAM			
P (height x 1.1), mm	57	58	55
L, mm	125	138	137
P/L	0.47	0.42	0.40
W (x 10E-4), J	219	231	214
[1]SRC			
Sucrose, %	97	101	96
Sodium carbonate, %	76	79	84
Lactic acid, %	125	123	117
Water, %	59	60	61
[2]EXTENSOGRAPH			
Rmax, BU	384 / 387	326 / 283	275 /283
R5, BU	252 / 262	234 / 214	194 /212
E, mm	184 / 173	179 / 181	179 /169
A, cm2	96 / 89	81 / 72	68 /66
Rmax/E	2.1 / 2.2	1.8 / 1.6	1.5 /1.7
[3]TEST BAKING			
Absorption, %	55.3	56.6	56.8
Mixing time, min	4.7	4.3	4.0
Loaf volume, cc	929	985	990

*There were not enough samples collected to make regional composites. [1]SRC = Solvent Retention Capacity

[2]Extensograph (45 / 145 min)

[3]No time dough metho

2011 CENTRAL REGION

CANADA EASTERN HARD RED WINTER WHEAT QUALITY

	2011		*2010 Ontario			2011		*2010 Ontario	
	1CEHRW	2CEHRW	1CEHRW	2CEHRW		1CEHRW	2CEHRW	1CEHRW	2CEHRW
WHEAT (13.5% mb)					**FARINOGRAM**				
Test weight, kg/hL	82.4	80.7	82.0	80.5	Absorption, %	54.5	53.5	55.6	55.8
Protein content , %	10.3	10.1	11.1	11.0	DDT, min	2.0	1.7	2.3	4.0
Protein content (dmb), %	11.9	11.7	12.8	12.7	Stability, min	7.9	4.0	6.7	6.4
Falling number, s	400	362	375	324	**ALVEOGRAM**				
RVA Stirring number (SN), RVU	133	131	127	113	P (height x 1.1), mm	61	59	58	55
Ash content, %	1.46	1.50	1.49	1.51	L, mm	124	129	138	137
Particle size index,%	51	53	53	51	P/L	0.50	0.46	0.42	0.40
Flour yield (total products basis), %	71.5	71.3	77.9	77.4	W (x 10E-4), J	236	241	231	214
Flour yield (0.50% ash basis), %	75.1	72.9	78.4	77.9	**EXTENSOGRAPH**				
FLOUR (14.0% mb)					Rmax, BU	314 / 316	345 / 322	326 / 283	275 /283
Protein content (CNA), %	9.2	8.9	10.2	10.2	R5, BU	216 / 218	244 / 223	234 / 214	194 /212
Protein loss on milling, %	1.1	1.2	0.9	0.8	E, mm	179 / 180	183 / 175	179 / 181	179 /169
Wet gluten, %	24.8	24.1	25.8	26	A, cm2	77 / 78	86 / 76	81 / 72	68 /66
Ash content, %	0.43	0.47	0.49	0.49	Rmax/E	1.8 / 1.8	1.9 / 1.8	1.8 / 1.6	1.5 /1.7
Minolta colour - L*	86.4	86.3	85.0	84.8	**SRC**				
a*	-0.97	-0.98	-0.71	-0.67	Sucrose, %	93	92	101	96
b*	14.7	14.1	14.9	14.9	Sodium carbonate, %	75	73	79	84
Starch damage (SDmatic), UCD	16.4	15.8	16.0	17.1	Lactic acid, %	121	122	123	117
Amylograph peak viscosity, BU	490	480	210	150	Distilled water, %	58	57	60	61
Falling number, s	399	389	350	333	**TEST BAKING**				
					Absorption, %	55.5	54.5	56.6	56.8
					Mixing time, min	5.0	5.1	4.3	4.0
					Loaf volume, cc	908	876	985	990

*There were not enough samples collected to make regional composites.

[1]SRC = Solvent Retention Capacity, [2]Extensograph (45 / 145 min), [3]No time dough method

METHODS

Quality Parameters

a. Protein:

There are many methods that can be used to determine the protein content of a sample. More and more laboratories are moving to adopting the Dumas method as the standard reference method for determination of protein content.

DUMAS

Analysis of a sample using the Dumas method (also referred to as combustion nitrogen analysis or CNA) involves three phases; burn, purge and analyze. A prepared sample is loaded into the analyzer and the instrument is purged of atmospheric gases. The sample drops into the combustion tube and is burned at high temperatures in an oxygen rich environment. Moisture and carbon dioxide are removed through a series of steps. Nitrogen oxides are converted to elemental nitrogen after passing through hot copper. A thermal conductivity detector is used to quantify the amount of nitrogen present in the initial sample. Using appropriate conversion factors (wheat N x 5.7; barley/pulses/feed N x 6.25) allows the amount of protein to be calculated. Sample analysis time is approximately 3 minutes. The Dumas method is considered a reference method that can be used for the calibration of NIR instruments.

NEAR-INFRARED (NIR) TESTING

The protein content of a sample of whole grain, ground grain or flour can be measured using NIR. Transmittance or reflectance of near-infrared (850-2500 nm) energy allows chemical constituents in the sample to be quantified. Determination of infrared absorption from combination or overtone frequencies of N-H molecular vibrations from peptide linkages between amino acids, allows for protein content to be determined. Samples can be analyzed in less than one minute. NIR requires calibration based on a reference method.

b. Particle Size Index (PSI):

PSI	Classification	Wheat Type
≤ 33	Extra hard	Durum
34-42	Very hard	Durum, some common Hard White Hard white, Hard red spring, Hard red winter
43-47	Hard	Hard white, Hard red spring, Hard red winter
48-54	Medium hard	Hard red spring, Hard red winter, Hard white
55-61	Medium soft	Soft red spring, Soft white spring
62-67	Soft	Soft white spring, Soft red spring
68-73	Very Soft	Soft white winter, Soft red winter, some Soft white spring
> 73	Extra Soft	Soft red winter, soft white winter,

Adapted from: Williams, P.C. and Sobering, D.C. 1986. Attempts at standardization of hardness testing of wheat. I. The grinding/sieving (particle size index) method. Cereal Foods World.31:359-364 and Williams, P.C. and Sobering, D.C. 1986. Attempts at standardization of hardness testing of wheat. II. The near-infrared reflectance method. Cereal Foods World.31:417-420.

c. Falling Number (FN):

Pre-harvest sprouting occurs when wet conditions are encountered during grain harvest. Sprouted kernels contain high levels of α-amylase and have detrimental effects on wheat and flour quality and result in end-products with undesirable properties such as bread with sticky crumb that affects slicing. Measurement of FN provides an estimate of the amount of sprout damage. The FN is the amount of time in seconds for the weighted stirrer to fall a measured distance through the hot slurry of whole meal/flour and water. High levels of α-amylase, as found in sprout damaged wheat, result in greater starch degradation and decreased slurry viscosity, therefore the weighted stirrer falls more quickly through the sample. Conversely, low levels of α-amylase, as found in sound wheat,

result in very little starch degradation and little effect on slurry viscosity, therefore the stirrer takes longer to fall through the sample. A falling number of >300 s is generally accepted as the baseline for sound wheat.

d. Amylograph:

The amylograph is primarily used to evaluate the effect of α-amylase activity due to sprout damage in a flour-water slurry. When wet harvest conditions occur, high levels of α -amylase are typically found in the sprouted kernels. Since α-amylase degrades starch this results in decreased viscosity of flourand water slurries when the sample is heated. The pasting properties of flour and/or starch and water over predefined heating and cooling cycles while stirring can also be measured using the amylograph. The hydration, swelling and gradual disintegration of starch granules cause changes in the viscosity of the slurry during the heating and cooling cycles.

e. Stirring Number [using the RAPID VISCOANALYZER (RVA)]:

The RVA is used to measure the pasting properties of flour and/or starch and water. The pasting properties are measured by subjecting flour/starch and water slurry to pre-defined heating and cooling cycles while stirring. The hydration, swelling and gradual disintegration of starch granules cause changes in the viscosity of the slurry during the heating and cooling cycles.

The RVA can also be used to measure the stirring number (SN) of a ground wheat/flour and water slurry. This provides a measurement of sprout damage in a manner similar to the FN method.

f. Wet Gluten:

The wet gluten content of a whole meal or flour sample can be determined by washing the sample with a salt solution and then weighing the wet gluten obtained at the end of the test. The wet gluten content of soft wheat flour is ideally around 25%.

g. Colour (Minolta Method):

The Minolta is a tristimulus colorimeter which is designed to duplicate the response of the human eye. The Minolta is used in applications including food, textiles and paint industries. While the Minolta can express color in several different measurements, the L* a* b* measurements are most frequently used when measuring flour or food color. L* is a measure or the lightness of a sample

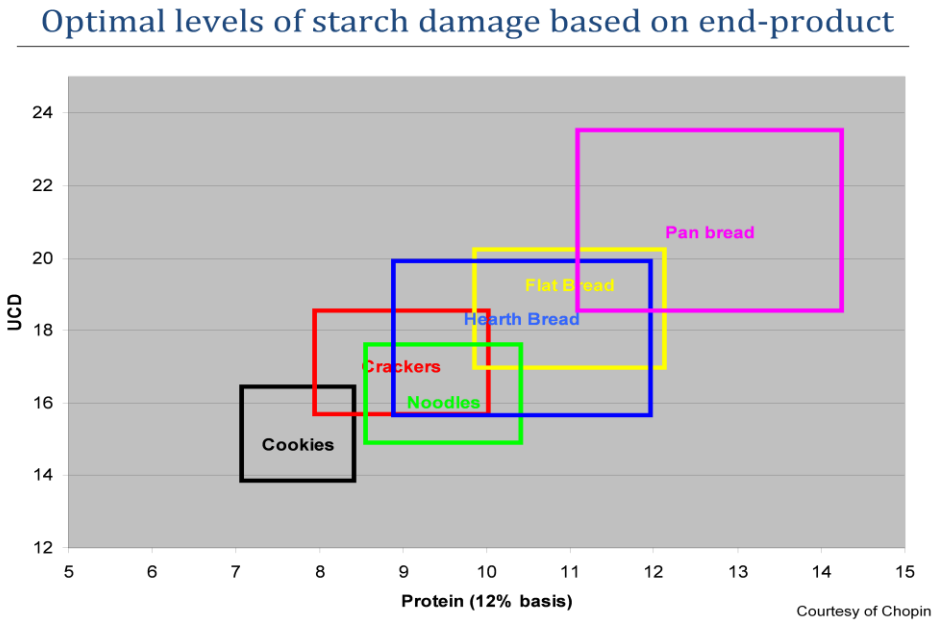
from 0 (black) to 100 (white). Values for a* range from positive a* (redness) to negative a* (greenness). Values for b* range from positive b* (yellowness) to negative b*(blueness).

h. Starch Damage:

Milling causes damage to starch granules. The severity of starch damage can be affected by the milling process, as well as the hardness of the wheat kernel. Damaged starch granules have been found to absorb two times the amount of water compared to undamaged starch granules. Although some starch damage is desirable, excessive starch damage has significant, undesirable effects on dough rheology as well as on the properties of the end-product. There are two main methods that can be used to measure damaged starch content.

IODOMETRIC METHODS

Using iodometric methods, increased reactivity with iodine is observed in damaged starch granules. Therefore the rate of iodine absorption can be quantified amperometrically or colorimetrically to determine the level of damaged starch. The Chopin SDmatic uses this principle for the determination of starch damage.



i. Alveograph:

The alveograph is used to evaluate the resistance of a dough to extension. Doughs are prepared in the mixing bowl and then extruded. Pieces of extruded dough are flattened to a constant thickness, cut into circular pieces and then allowed to relax at constant temperature. The dough pieces are then inflated with air into a bubble. In contrast to extensograph, which measures uniaxial dough extensibility (extensibility in one direction), the Alveograph measures biaxial extensibility (extensibility in all directions). Some common Alveograph measurements are:

P: resistance of the dough to deformation (height x 1.1). The amount of pressure required to inflate the dough.
L: measure of dough extensibility
P/L: the ratio of strength to extensibility.
W: deformation energy of the dough or the amount of work required to inflate the dough bubble.

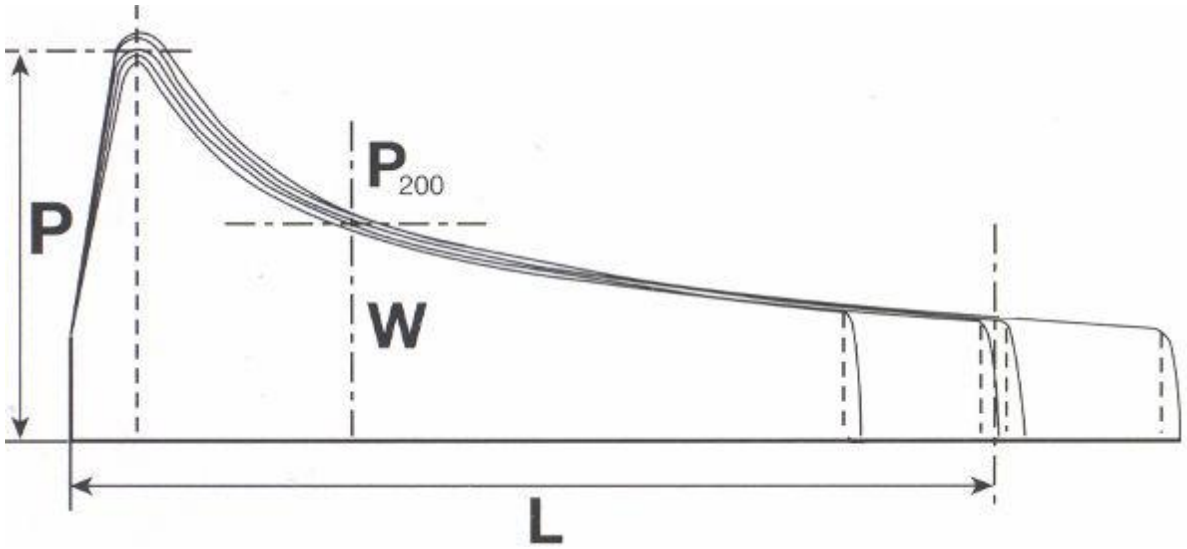


Figure 1: A typical alveograph with some commonly measured curve parameters. Courtesy of Chopin.

j. Farinograph:

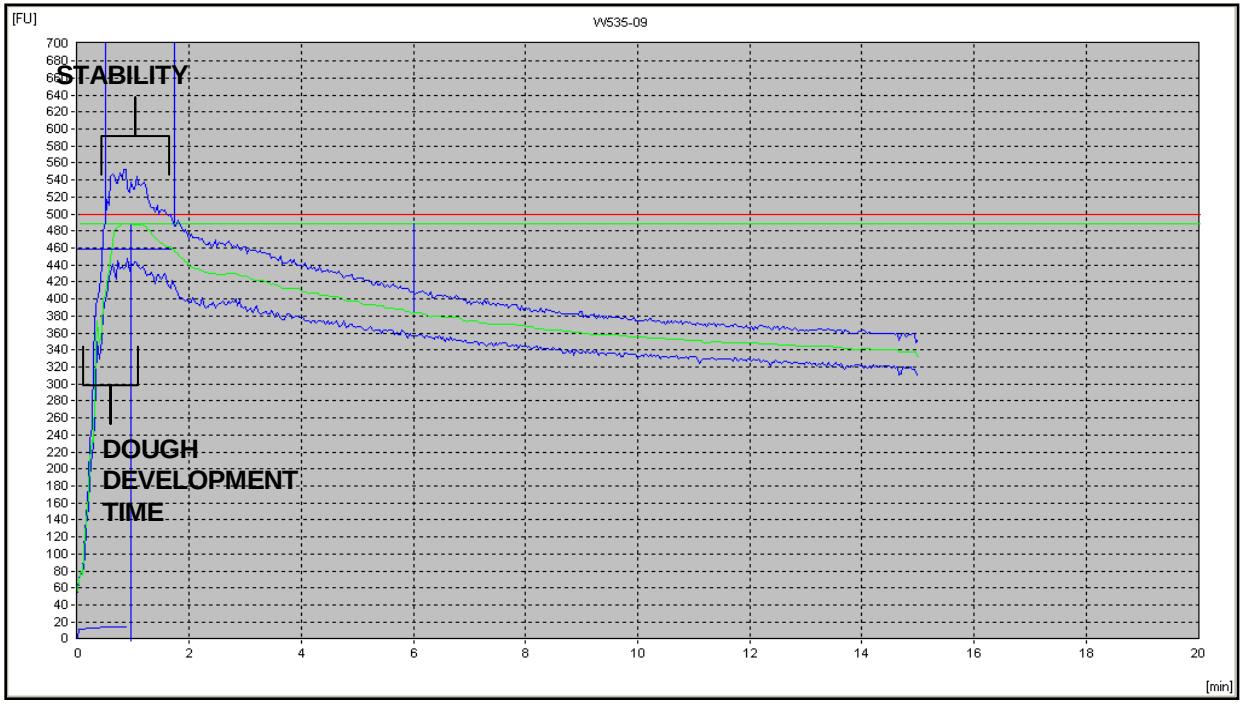
The Farinograph is an instrument that is widely used to test the physical or rheological properties of a dough during mixing at constant temperature. The water absorption of a flour is also determined. Several common farinograph measurements are:

Absorption: Amount of water required to produce a curve with maximum consistency (peak) centered at 500 BU.

Dough Development Time (DDT): Time to maximum consistency when the curve is centered at 500 BU. Also referred to as peak time.

Stability: Amount of time the top of the curve is above the 500 BU line. Also calculated by subtracting arrival time from departure time.

Mixing Tolerance Index (MTI): The drop in BU from the top of the curve at maximum consistency (DDT) to the top of the curve 5 minutes after peak.



A Farinograph of a 2009 CESRW samples showing some of the common measurements indicated above.

k. Solvent Retention Capacity (SRC) Profile

SRC is the weight of solvent held by flour after centrifugation (expressed as a %). Four solvents are independently used to produce four SRC values:

50% Sucrose – associated with pentosan characteristics
5% Sodium carbonate – associated with levels of starch damage
5% Lactic acid – associated with glutenin characteristics
Distilled Water – influenced by all of the above (pentosan, starch damage, glutenin)

l. Baking Quality of Cookie Flour (AACC 10-50D):

Cookie quality is determined by taking the average results of six cookies and measuring the width (*W*), thickness (*T*) and *W/T* ratio (cookie spread factor), with adjustments to constant atmospheric pressure and conditions. The formulation uses 225 g of flour, a mixing bowl and paddle, and a fixed amount of water. Dextrose is used to aid in the developing brown color. This method predicts the general quality of soft wheat flour for production of contemporary cookie and pastry products (except cake and crackers). High quality of pastry flour is usually associated with larger sugar-snap cookie diameter. The method is also useful to evaluate other flour types, various flour treatments, and other factors, such as ingredients, that affect cookie geometry.

Width is recommended as the most sensitive and reliable estimate of flour quality. Width and, in some cases, thickness of cookies are better estimates of flour quality than W/*T* ratio (spread factor) because it is a ratio of two measured parameters. Both width and thickness could vary such that several widths and thicknesses could give the same spread factor.