

**2012 Crop  
Advanced Milling and Baking Evaluation  
Set 2012 A06**

**2012 Gulf Atlantic Wheat Nursery  
Entries #: 1250861 - 1250936**

A total of 76 samples were grown in a composite of nursery locations and submitted to the laboratory for milling and baking quality evaluations. The standard quality data were compared to the average for the cultivar checks given for this nursery and quality scores for all entries are adjusted to the check average. A table of observed and historical quality scores is given below.

Lab Number	Entry Number	ENTRY	From Advanced Milling Database Scoring						Predicted from Measured Data					
			Milling Quality Score		Baking Quality Score		Softness Equivalent Score		Milling Quality Score		Baking Quality Score		Softness Equivalent Score	
1250873	13	USG 3555	58.30	D	34.04	F	59.28	D	52.47	D	28.21	F	51.96	D
1250874	14	SHIRLEY	67.58	C	67.51	C	66.95	C	60.03	C	65.42	C	52.90	D
1250887	27	AGS 2060	66.11	C	39.49	F	52.16	D	63.41	C	38.34	F	35.95	F
1250888	28	SS 8641	58.25	D	53.27	D	65.37	C	56.49	D	42.10	E	46.34	E
		Average	62.56		48.57		60.94		58.10		43.52		46.79	
		Adjustment Bias for Trial	4.46		5.06		14.15							
		Diagnostics - Correlations	0.8		1.0		0.8							

The adjusted average values of the provided checks are predicted to have decreased milling, baking, and softness equivalent scores when compared to the historical average. The observed scores for the checks correlated to the historical scores for milling, baking, and softness equivalence at a level of  $r > 0.8$ ,  $r = 1.0$ , and  $r > 0.8$ , respectively. The rankings and correlations for the quality measures among the checks were consistent with expectations from previous evaluations. Therefore, we expect the outcome of the evaluations to be predictive of future performance of these breeding lines.

### **Changes in 2012 Evaluations**

After many years of use and buildup, our bake sheets have been replaced with newer ones. These new sheets produce a cookie with an average difference of 0.6 cm when compared to the old bake sheets. The cookie diameter was 96.8% (3.2% smaller) of the size of a cookie baked on the old sheets. This value was based on cookies made with 22 flour samples at the beginning of the evaluation process and resulted in a standard deviation of 1.36 and standard error of 0.29. We will be reporting the diameters using the new sheets for this year's samples, so you may need to adjust the baking quality score if comparing with test lines from previous years.

### **Additional Information on Analysis**

In general, grain condition for this nursery revealed Fusarium Head Blight, weathering, and black point before cleaning. Sprouting was found in LA06007E-P04, leading to a probability of high alpha-amylase activity as well as increased starch damage. Flour analysis of this nursery specifies that the quality trait averages of milling yield, softness equivalence, and flour protein, were within the expected target range for soft wheat characteristics. The solvent retention capacities of sucrose, water, and sodium carbonate were also within the limits. Only lactic acid exceeded the expected target range for soft wheat characteristics.

Of the characteristics of quality we measure at the Soft Wheat Quality Laboratory, milling yield is the most reproducible and perhaps most important because it is genetically and environmentally associated with good soft wheat flour quality. This nursery produced an average milling yield of 69.1%. Entry SCLA1030J1 recorded 73.5% milling yield, as this was tops amongst the nursery. Closely following SCLA1030J1 were SCLA1084C1 and SCLA1084A1. Only these 3 entries registered a score of an "A" for milling quality. Entry NC09-21256 had the least yield at 65%.

After milling yield, the second trait that we recommend for use in selection is softness equivalent. It tends to have high heritability and is an important predictor of break flour yield. Larger values are preferred for most soft wheat manufactured goods, particularly cakes and other high sugar baked products. The average for the 76 entries was 53.1%. Out of the given checks, Shirley had the largest softness equivalence at 53.6%. There were 35 entries with greater softness equivalence than Shirley. This includes SCLA1084A1, SCLA1084C1, and LA04041D-85. The check, AGS 2060, had softness equivalence similar to hard wheat. It is normally above 50%, but is harder due to the environmental conditions. There were 2 entries, NC09-22402 and AR00380-3-3, which recorded values below AGS 2060.

Generally, sucrose SRC is related to the levels of pentosan components. Lactic acid SRC is associated with gluten protein characteristics and sodium carbonate SRC coincides with damaged starch. Water SRC is influenced by all water absorbing components in flour. The combined pattern of these flour SRC results establishes a practical flour quality and functionality profile that is useful in predicting baking performance.

Sucrose SRC is probably the best predictor of cookie quality and is a measure of arabinoxylan content, which can strongly affect water absorption in baked products. Sucrose SRC typically increases in wheat samples with lower flour yield and lower softness equivalent. The cross hydration of gliadins by sucrose also causes sucrose SRC values to be correlated to flour protein and lactic acid SRC. Soft wheat flours for cookies typically also have a target of 95% or less for sucrose SRC and the majority of samples (55) are below 95%. A combination of low sucrose SRC and flour protein typically produces a larger cookie diameter and higher baking scores, which is evident in SCLA1084C1 as this sample ranks first in both diameter (19.3 cm) and baking score (79.4).

Gluten strength is measured by the lactic acid SRC. The lactic acid SRC also correlates to flour protein concentration, but the effect is dependent on genotypes and growing conditions. This nursery's average of 109.6% displays "strong" gluten strength (lactic acid above 105%) and these test lines may be of value for the manufacturing of crackers or other products requiring gluten strength. Line NC09-21251 may have the strongest lactic acid SRC value at 127.3%, but it demonstrates less than average quality for milling yield and softness equivalence. It would likely have limited use as a cultivar directly but could have value as a breeding parent for the strong gluten characteristic.

High sodium carbonate SRC absorption values point towards an increase in damaged starch. Normal values for good milling soft varieties are 68% or less. Over half of the nursery samples were below 68%. The lowest value belonged to AR00380-3-3 at 63.6%, while AR01168-3-1 had the highest value at 75.2%. High milling yield and low sodium carbonate SRC often indicate low damaged starch. This can be observed in samples SCLA1030J1 and AR01205-1-1.

Lower water values are desired for cookies, cakes, and crackers with target values below 51% on small experimental mills, such as our Quadrumat Junior Flour Mill. The average water SRC of the entries was on the high end with 55.5% as no entry fell below 51%. The collection of the water SRC values varied from 52% to 61.5%.

Soft wheat products such as cookies and crackers require flours with low water absorption. To select the best lines for milling and baking quality, we sequentially sorted for flour yield and selected all lines with greater flour yield than the nursery

average. We then repeated the operation for softness equivalent and the solvent retention capacities of sucrose and sodium carbonate, selecting the lines that were better than average in each case. After the sort, 19 samples fit these criteria. A few notable entries with the most balanced milling and baking qualities include AR01044-1-1, SCLA1084C1, VA09W-110, AR00343-5-1, and SCLA1084B1.

Please contact me if you have questions concerning this trial.

Best regards,  
Tony Karcher