2012 Crop
Micro Milling and Baking Evaluation
Set 2012 M06

2012 SUWWSN
Entries #: 1210958 – 1211008

A total of 51 samples were grown as a micro sample set and were submitted 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.

			From Advanced Milling Database Scoring						Predicted from Measured Data					
Lab Number	Entry Number	ENTRY	Milling Quality Score		Baking Quality Score		Softness Equivalent Score		Milling Quality Score		Baking Quality Score		Softness Equivalent Score	
1210958	1	ERNIE	53.03	D	58.62	D	57.83	D	37.20	F	12.92	F	57.60	D
1210959	2	COKER 9835	57.84	D	57.76	D	78.42	B	34.90	F	14.74	F	74.89	B
1210960	3	BESS	56.50	D	60.61	C	66.03	C	46.63	E	34.41	F	51.81	D
1210961	4	JAMESTOWN	54.90	D	38.79	F	59.12	D	38.02	F	16.89	F	59.76	D
		Average	55.57		53.94		65.35		39.19		19.74		61.01	
		Adjustment Bias for Trial	16.38		34.21		4.34							
		Diagnostics - Correlations	0.1		0.3		0.7							

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 $r>0.1$, $r>0.3$, and $r>0.7$, respectively. The relative rankings and correlations indicate that the results of the softness equivalence quality score is likely predictive of future results. The correlation for the baking quality score is lower than usual and may not be as predictive of future breeding performance as in previous trials, probably due to the overall compression of scale for the softness equivalent and solvent retention capacity

values. Milling quality score is also uncharacteristically low and should be monitored, as it may not be as predictive of future breeding performance as in previous trials.

Changes in 2012 Evaluations

The Soft Wheat Quality Lab is continuously striving to improve the milling and baking quality of soft wheat cultivars in the Eastern US by developing new methods of evaluating quality and conducting cooperative research with wheat breeding programs.

One improvement we focused on was the micro milling procedure using the Quadrumat Junior Flour Mill. Our standard procedure has been to mill the grain and recover the product for sifting on a Great Western Sifter Box. The sifter has 40 and 94 mesh screens that separate mill product into bran (above 40), mids (between 40 and 94) and flour (through the 94 screen). The bran and mid fractions were then weighed to help determine milling yield and softness equivalence. In past years, the mids were then added back to the fraction that passed through the 94 mesh screen to produce the final flour product for further analysis.

Since advanced milling involves several reduction steps with an end product of fine particle size, we reasoned that baking predictions might improve by analyzing only the flour (through the 94 screen without mids). We found that removing the mids from the flour, we improved our efficiency and quality analysis. Using the new micro-milling method, the four solvent retention capacity tests of lactic acid, sucrose, sodium carbonate, and water generated results that are more comparable to the advanced milling four solvent retention capacity tests. This new method also gives a better estimated cookie diameter. I have attached a spreadsheet that shows the four solvent results which compares the advanced milling procedure, the micro milling procedure with the over 94 fraction, and the new micro milling procedure without adding the over 94 fraction. The similarity of the advanced milling procedure to that of the new micro milling procedure is evident.

Milling yield, softness equivalence, and flour protein are not affected by the new procedure, as we continue to measure these traits as we have always done.

We will be moving forward with this improved micro milling procedure starting this year for the 2012 harvest. If you have an ongoing, multiyear project, your SRC data could be affected by values produced using new method.

Additional Information on Analysis
Possibly due to weather damaged grain, the quality trait averages of flour protein, lactic acid SRC, and sucrose SRC all had above average values, whereas the milling yield and softness equivalence had reduced average values.

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. The nursery's milling yield average was 66.3% as the target for flour yield is typically 70% and greater. There were 2 test lines that generated flour yield greater than 70%. These lines were ARS09-513 and ARS09-446. Line GA 051173-S25 had the least yield out of this group with a value of 61.2%.

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. An average softness equivalence of 52.5% was acquired for this nursery, with the check Coker 9835 being tops at 61.4%. Entry NC06-16-26-988 had similar softness equivalence to Coker 9835. A total of 10 entries acquired a softness equivalent below 50%. They would likely be poor for a wide range of soft wheat products and are particularly poor for cakes. The entries should be considered for discarding unless they have some redeeming factor in field performance. Also in this set, 3 entries have softness equivalents below 40% and are likely to contain true hard wheat traits. They are ARS09-643, ARS09-173, and ARS09-446.

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 have a target of 95% or less for sucrose SRC. This nursery's average was well above the target range with a value of 105.8% as there were no experimental lines below 95%. Not only did line VA09W-73 have the lowest absorption rate at 95.9%, it also had the largest estimated cookie diameter of 18.3 cm and the top baking score of 80.5.

The lactic acid SRC correlates to flour protein concentration, but the effect is dependent on genotypes and growing conditions. Weathering often falsely elevates lactic acid SRC values, a measure of gluten strength. The average for this trial was 139.8% with a range of 115.9% to 168.5% which exhibit "strong" characteristics of gluten strength (above 105%). Likely some of the genotypes in this trial are strong gluten genotypes that may have extra value in the marketplace for the manufacture of

crackers or other products requiring gluten strength. However, the samples should be assessed in another environment to confirm the gluten strength.

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 lactic acid, selecting the lines that were better than average in each case. After the sort, NC8355-4 *(Fhb1),* GA 051207-S21, and VA10W-140 fit these criteria.

Please contact me if you have questions concerning this trial.

Best regards,
Tony Karcher