2012 Crop
Micro Milling and Baking Evaluation
Set 2012 M05

2012 NUWWSN
Entries #: 1210958 – 1211008

A total of 60 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	
1210889	1	ERNIE	53.03	D	58.62	D	57.83	D	27.51	F	20.64	F	57.17	D
1210890	2	FREEDOM	54.43	D	72.21	B	63.53	C	39.91	F	30.08	F	52.31	D
1210891	3	TRUMAN	57.10	D	68.09	C	67.52	C	43.42	E	43.93	E	60.18	C
1210892	4	PIONEER 2545	49.86	E	66.52	C	66.33	C	38.73	F	31.14	F	57.99	D
		Average	53.61		66.36		63.80		37.39		31.45		56.91	
		Adjustment Bias for Trial	16.21		34.91		6.89							
		Diagnostics - Correlations	0.4		0.6		0.3							

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 $r>0.4$, $r>0.6$, and $r>0.3$, respectively. 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 and softness equivalent

quality scores are 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

Across this trial, flour analysis shows that the quality trait averages of flour protein, lactic acid SRC, and sucrose SRC all had above average values, whereas the milling yield had reduced values. Softness equivalent was within the limits 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. The cumulative average for the checks tallied 64.3%. There were 45 test lines that computed greater milling yield than this average with VA10W-21 being tops at 70.1%. Others worth noting consist of NE10514, NE10449, and NW03666.

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. This nursery produced an average softness equivalence of 54.4% with 6 entries scoring an "A". This list is comprised of DH1-46, LCS19103, IL06-23571, DH2-45, DH1-62, and LCS19104. Overall, a total of 8 entries had poor softness equivalence (below 50%), a sign that these lines may not have commercial application as a cultivar. A few samples include high millers such as NW10401, NE10449, NE10514, and VA10W-21.

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. The majority of this group (88% of the samples) was above the target range as only 7 samples fell below 95% sucrose SRC absorption. The lowest of the 7 samples was DH2-4 at 90.7%, but LCS19103 recorded the highest baking score at 100.7. This is due to the combination of low sucrose SRC and low flour protein that typically produces a larger cookie diameter and higher baking scores, which is evident with this sample.

Typically, as sucrose SRC values increase, so do lactic acid SRC values. The sucrose SRC preferentially hydrates arabinoxylans but also swells the gliadins of the flour. Elevated sucrose values in those given entries were likely due to gliadins and would be acceptable for most soft wheat products that require strong gluten. A few examples are KWS003, IL06-23571, and MO081320.

The lactic acid SRC also correlates to flour protein concentration, but the effect is dependent on genotypes and growing conditions. As a reminder, weathering often falsely elevates lactic acid SRC values. The average for this trial was 125.8% which exhibit “strong” characteristics of gluten strength (above 105%). There were 7 samples below 105% including the check Pioneer 2545. Pioneer 2545 historically attain low lactic acid SRC values and entries beneath Pioneer 2545 should be considered for discarding. 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.

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, MD08-22-32 and VA09W-73 fit these criteria.

Please contact me if you have questions concerning this trial.

Best regards,
Tony Karcher