2012 Crop
Advanced Milling and Baking Evaluation
Set 2012 A04

2012 Mason-Dixon Regional Nursery
Entries #: 1250761 – 1250840

A total of 80 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.

			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	
1250761	1	Pioneer 26R15	66.02	C	54.19	D	70.71	B	66.43	C	35.40	F	59.28	D
1250762	2	Branson	68.26	C	72.03	B	81.31	A	61.40	C	53.05	D	67.31	C
1250763	3	Shirley	67.58	C	67.51	C	66.95	C	60.84	C	44.24	E	58.93	D
		Average	67.29		64.57		72.99		62.89		44.23		61.84	
		Adjustment Bias for Trial	4.40		20.34		11.15							
		Diagnostics - Correlations	-0.9		1.0		1.0							

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>-0.9, r=1.0, and r=1.0, respectively. The rankings and correlations for the baking and softness equivalent 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.

However, the milling quality score is uncharacteristically low and should be monitored, as the values are not as highly correlated with past performance.

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 adjustment 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, black point, and significant amount of sprouting before cleaning. Due to sprouting, high alpha-amylase activity may be a probability 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 lactic acid and sucrose both 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 68.4%. Entry VA09W-188WS recorded 71.6% milling yield, as this was tops amongst the nursery. Closely following VA09W-188WS were MD05W10208-11-6, ARS07-0542, and KY03C-2314-08. Entry KY04C-2151-41 had the least yield at 63.8%.

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 80 entries was 54.3%. Out of the given checks, Branson had the largest softness equivalence at 58.7%. There were 7 entries with greater softness equivalence than Branson. This includes KY03C-2314-08, KY04C-1128-4-13-3, and VA10W-123. A total of 4 entries expressed hard wheat

characteristics as their softness equivalence was below 50%. These entries consist of ARS09-572, ARS09-162, KY04C-2151-41, and MD04W249-11-12.

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. This nursery's average was above the target with a value of 99.7% as nearly ¾ of the nursery samples are over this target range. Sample ARS09-768 had the highest sucrose absorption at 120.9%, where as sample ARS07-1227 had the lowest absorption rate at 85.5%. ARS07-1227 also had the largest cookie diameter at 19 cm.

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. The lactic acid SRC is also correlated to flour protein concentration, but the effect is dependent on genotypes and growing conditions as weather damaged wheat may exhibit elevated lactic acid. This nursery's average of 114.4% displays "strong" gluten strength (lactic acid above 110%) and these test lines may be of value for the manufacturing of crackers or other products requiring gluten strength. While lines ARS09-750, ARS09-572, and VA10W-112 have strong lactic acid SRC values, they demonstrate less than average quality for other soft wheat traits. They would likely have limited use as a cultivar directly but could have values as breeding parents for strong gluten characteristic.

Many of the traits evaluated in this analysis are correlated to each other and the best quality genotypes will have favorable combinations of milling yield, softness equivalent, cookie diameter, and sucrose SRC values. Sequentially selecting the genotypes based on those criteria, and in that order, can identify the best overall genotypes in the set. The lines with the best overall quality in the set were KY03C-2314-08, KY03C-2309-25-17-5, and KY04C-1128-4-13-3. These entries are the best quality soft wheat lines in the nursery for general use in the widest range of soft wheat products. They have value both as potential cultivars but also as breeding parents for subsequent improvement of the soft winter wheat germplasm pool.

Please contact me if you have questions concerning this trial.

Best regards,
Tony Karcher