The Soft Wheat and Flour Products Committee is one of 23 technical committees working within the AACC International approved methods program to ensure that relevant, scientifically sound methods are available for use by individuals and laboratories in the grain science field. The focus of the Soft Wheat and Flour Products Committee is the development and review of methods for the measurement of soft wheat quality, including grains, flour, dough, batter, and cereal-based finished products.

In May 2009, the committee reviewed proposed changes to the equations used for calculation of solvent retention capacity of flour for both AACC International Method 56-11: Solvent Retention Capacity Profile (SRCP) and AACC International Method 56-10: Alkaline Water Retention Capacity (AWRC) (1). The AWRC method predates the SRCP method and is primarily used for predicting baking behavior of flour in cookies, based on the established inverse relationship between alkaline water retention of a flour and baked cookie diameter. The SRCP method includes a total of four solvents (water; 50% w/w sucrose in water; 5% w/w sodium carbonate in water; and 5% w/w lactic acid in water), which increased the diagnostic capability of the test for predicting the baking functionality of flours in cookies and crackers. Each method calculates solvent retention based on the weight of the flour tested, normalized to a 14% moisture content. When the SRCP method was originally developed in the late 1980s by Louise Slade at Nabisco, the only practical option was to harmonize the calculation of solvent retention with the same equation used in the AWRC method (Equation 1).

\[ \text{% SRC} = \left( \frac{\text{gel weight}}{\text{flour weight}} \times \left( \frac{86}{100 - \% \text{flour moisture}} \right) - 1 \right) \times 100 \]  

Equation 1

The calculation used in the AWRC method (56-10) multiplies the difference between the initial flour weight and the flour gel weight by the moisture correction factor derived from the actual solids content of the flour (100% flour moisture), normalized to 14% moisture content (86 g of solids per 100 g of flour). Unfortunately, this allows the moisture correction to affect a number larger than that representing the weight of solvent retained by the flour. Consequently, a small but significant error is introduced in the results. For example, if the gel weight divided by flour weight result is 1.90, 1.00 needs to be subtracted before correcting the weight of solvent retained for constant flour solids. Otherwise, the moisture correction affects 1.90 instead of 0.90, as should actually occur, leading to incorrect final values reported on a 14% moisture moisture content. Parenthetical recombination of the terms in the original equation does not give a correct result.

The correct equation should tell us the weight of retained solvent per weight of the flour standardized to 14% moisture content. Equation 2 shows the appropriate moisture correction factor. The “as-is” flour solids weight (100 minus the flour moisture) is divided by 86 (solids content at 14% moisture), to provide the factor for adjusting the flour weight to a constant 14% moisture basis (i.e., Flour14). The value measured for retained solvent weight (Equation 3) is first divided by “Flour14” and then multiplied by 100 to give the percent solvent retained for the flour, on a 14% moisture moisture content (Equation 4).

\[ \text{Flour} = \text{weight of flour at “as-is” moisture content} \]
\[ \text{Flour14} = \text{weight of flour calculated for 14% moisture content} \]
\[ \text{Retained solvent} = \text{weight of solvent picked up and retained by flour in a gel pellet, after centrifugation and decanting} \]

Calculations:

\[ \text{Flour14} = \left( \frac{100 - \text{flour moisture}}{86} \right) \times \text{flour} \]

Equation 2

\[ \text{retained solvent} = \left( \text{tube, cap, gel} \right) - \left( \text{tube, cap, flour} \right) \]

Equation 3

\[ \% \text{ SRC} = \left( \frac{\text{retained solvent}}{\text{Flour14}} \right) \times 100 \]

Equation 4

The proposed revision shown in Equation 5 incorporates the reasoning described in Equations 2 through 4.

\[ \% \text{ SRC} = \left( \frac{\left( \text{tube, stopper, gel weight} - \text{tube, stopper} \right)}{\text{flour weight}} - 1 \right) \times \left( \frac{86}{100 - \text{flour moisture}} \right) \times 100 \]

Equation 5

The proposed changes to the equation used for calculation of solvent retention will have a small but significant impact on the measured values for a given flour. In the case of flours that are used to make cookies and crackers, which require a flour moisture content of 13.0 ± 0.5% for optimum functionality, for typical swelling in the sucrose solvent as an example, a difference in calculated SRC values of 97.70% (Equation 1) compared with 98.85% (Equation 5) would result. In the case of flours that are used to make bread and pasta products, which require a flour moisture content of 14.0 ± 0.5% for optimum functionality, the differences in calculated SRC values are much smaller, especially if the flour moisture is 14%, and therefore, no moisture

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correction is required. For example, for typical swelling in the lactic acid solvent, for a bread flour at 14.5% moisture, calculated SRC values of 121.1% (Equation 1) compared with 120.7% (Equation 5) would result. Ingredient specifications may require minor adjustments to reflect the correct SRC value for a specified flour. Comparisons of new data to historical data may require recalculations.

On the basis of comments received and other relevant information, the committee made a recommendation to change the way solvent retention is calculated for both AACC Intl. Methods 56-11: SRCP and 56-10: AWRC. The proposed change from Equation 1 to Equation 5 has been put to a vote and was passed by the Soft Wheat and Flour Products Committee. At the completion of that process, the committee will forward its recommendation to the Approved Methods Technical Leadership Committee for final approval, after which time the SRCP and AWRC methods will be changed to reflect the new, correct equation.

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Editor’s Note


Reference