

Evaluation of Wheat for Milling Quality

Robert Dennis, Extension Agronomist and David Parsons, Assistant Extension Specialist--Field Testing

Bread Wheats. Flour from any variety of wheat may be used to make bread or pastries. However, there is considerable difference in the acceptability of varieties for specific uses. While laboratory data are helpful, the real test of a wheat for bread or pastry is in its use.

Wheat protein data are usually based on nitrogen content. Generally protein is about 16% nitrogen. Because of this, the nitrogen percent is multiplied by 6.25 to obtain an estimate of crude protein. The minimum protein level for good milling wheat is usually assumed to be 12%.

The test weight of a grain is an evaluation of density. It represents the weight of a bushel of grain and for wheat the average is 60 lbs. When bushel weight is high, the ratio of endosperm to embryo is high. The endosperm is the source of flour. When endosperms are large, a high flour yield is obtained. Good milling wheat produces 70% or more flour.

An ash content of 0.4% or less is desirable in flour. Ash content is affected by variety and growing conditions. Seed coats are relatively high in ash. When flour contains excessive bran, ash content is increased.

The protein content of flour is largely determined by the protein content of the grain before milling. For yeast-leavened bread, a protein content of 11% or more is preferred. As a general rule, flour protein will be about 1% less than that of the wheat grain used in its manufacture.

The farinograph is a machine that evaluates gluten strength. Gluten strength determines dough characteristics. Absorption values are determined by the farinograph. The yield of baked goods tends to be greater when absorption values are high.

The factor called arrival, as determined by the farinograph, refers to the time in minutes required by flour to absorb moisture. Peak is defined as the time required by the dough to form and then exert maximum resistance to the mechanical action of mixing. The farinograph also provides a value called stability. Ultimately the dough reaches a point of weakness, with continued mixing, and is no longer suitable for bread making. When breakdown occurs quickly, there is insufficient time to accomplish breadmaking as done in large, commercial bakeries.

The M.T.I. (mixing tolerance index) refers to deviations in dough strength that may occur. This value is expressed in Brabender Units (B.U.) as measured 5.5 minutes after the peak is achieved. M.T.I. values over 30 are objectionable.

A good milling flour accepts moisture readily. It then reaches the peak relatively soon, and maintains stability for 7 to 10 minutes. While weak flour is undesirable, flour may also be too "strong".

Baking evaluations give specific, and when sampling is representative, accurate information concerning flour quality. The most important factors for evaluating baked products are volume and dough character. The goal is a fine-grained, even-textured cell structure in the baked loaf. When holes in baked products are large, the gluten in the flour is usually weak. Dough characteristic ratings are P - pliable; VP - very pliable; E - elastic, with the very pliable being most desirable.

Durum Wheats. Quality is a very important factor in determining market acceptability of durum wheat. The principal factor determining subclass of durum wheats is the percent of hard and vitreous kernels of amber color.

Subclass Requirements for White (amber) Durum Wheat ^{1/}

Subclass of Durum Wheat	Hard and Vitreous Kernels of Amber Color (% by weight) ^{2/}
Hard Amber Durum	75 or more
Amber Durum	60 or more and less than 75
Durum	Less than 60

^{1/} From Official United States Standards for Grain, 1974.

^{2/} Kernels in which any part of the endosperm is not hard and vitreous, as determined by visual inspection, are said to be yellow berries.

Kernels of durum wheat in which part or all of the kernel is light yellow or off-white in color are not considered as hard and vitreous for purposes of grading. These light-colored portions of the kernel consist of soft starch with reduced amounts of protein between starch granules. When milled, the soft starch with fewer particles of adhering protein produces flour that is soft and fine. This will reduce the grade of the milled material from semolina to durum granular or durum flour.