

DURUM WHEAT QUALITY STANDARDS

David K. Parsons, Instructional Specialist II.
Michael J. Ottman, Extension Agronomist
Vernon L. Young, Research Leader,
Spring and Durum Wheat Quality Research Laboratory

Quality is an important factor to consider when choosing a durum wheat variety. The highest yielding varieties are not always desirable because 1) varieties with unacceptable quality may be discounted, 2) a premium may be paid for high quality wheat, and 3) varieties with both high yield potential and high quality are available.

The quality of durum wheat is defined in terms of its suitability for semolina and macaroni production. Semolina is the coarsely ground, purified middlings of the wheat kernel and is the principal material used in the manufacture of macaroni. The actual quality of a lot of durum wheat is influenced by the variety and growing conditions. Gluten protein influences quality factors more than any other component.

Samples of Arizona-grown wheat are periodically collected from various variety trials and sent for quality evaluations to the USDA Spring and Durum Wheat Quality Laboratory in Fargo, North Dakota. The following is an explanation of abbreviations used in the quality report along with an explanation of the quality standards.

S or STD = Standard: NK's Aldura and Mexicali C75 are often chosen as the check varieties in Arizona. In 1984 NK's Aldura and Mexicali C75 were planted to 54.5 and 29.7 percent, respectively, of the total durum wheat average in Arizona. Other states or locations would have other standard or check varieties. It is their average, listed under AVG OF STANDARDS on the table, against which the other varieties are compared. Quality deviations from these values determine the major and minor faults. Wheat and semolina protein are exceptions as they have across the board minimums for major and minor faults.

TW = Test Weight: Test weight per bushel is the weight, in pounds, per Winchester bushel of dockage - free wheat. Sixty pounds per bushel is the minimum for U.S. No. 1 Durum wheat. Varieties adapted to Arizona, sometimes called desert durums, grown with adequate water and fertilizer seldom fall below this minimum.

1000 KWT or KW = 1000 Kernel Weight: The 1000 kernel weight is determined by counting the number of kernels in a 10 gram sample of cleaned, picked wheat.

LG = % Large Kernels and SM = % Small Kernels: Kernels are sized by use of sieves to divide the sample into 3 sizes, large, medium, and small. The percent of medium size is found by subtraction of the large and small percentages from 100. Desert durums are noted for the 80 to 90% of large kernels. A seeding rate that is too high for the growing conditions can result in more seeds per pound with fewer large kernels.

WHT PRO or WP = Wheat Protein: Wheat protein, on a 14% moisture basis, is calculated by multiplying the percent nitrogen, found by the

Kjeldahl procedure, by 5.7. Percentages below 11.5% are classified as a major fault. Values between 11.5% - 12.5% are minor faulting values. Millers prefer durum wheats with a protein content of 13% or more. Yellowberry is the usual result of low protein. Protein content is primarily determined by variety and secondarily by fertilizer and irrigation practices. Often, varieties noted for their high protein content are also lower in yield. Response to less than ideal applications or timings of fertilizer and water can vary greatly according to variety.

Low protein content is usually minimized by splitting the nitrogen applications to assure adequate amounts at each stage of plant growth. The jointing to heading growth stages are most critical. Splitting of the nitrogen application is most essential in situations where the soil texture is coarse and where active leaching of nitrogen occurs with irrigation. Researchers have also found that excessive irrigation during flowering and afterward is often associated with low protein content. Nitrogen shortages in early growth stages reduce yield potential but are not necessarily associated with low protein percentages.

TOT EXT or TX = Total Extraction (Semolina Plus Flour): Total extraction includes semolina plus durum flour (smaller particle size than semolina). This is important also, particularly in producing noodles. Arizona wheats show high extraction rates. Generally there is a relationship between extraction and both kernel size and test weight.

SEMO EXT or SX = Semolina Extraction: Semolina extraction is important commercially, because it represents the percent of the kernel that is available as semolina (coarsely ground endosperm). Semolina is used almost exclusively for macaroni and spaghetti production.

DUS or DU = Semolina Dust Color Score (high score is more desirable): Values of at least 75 and preferable above 80 are desirable. The color of the semolina or spaghetti is generally accepted as the most important single grading factor with a deep amber or golden color preferable. Color is primarily determined by the variety. The more recent releases of varieties adapted to Arizona are generally much superior to those of ten years ago.

MX = Mixograph Score: Gluten strength is measured by the Mixograph, a dough testing machine. Values of 2 or less are considered weak. Strong gluten increases the bite resistance of semolina products which is especially important for the foreign trade. Gluten strength is primarily determined by variety.

SPK or SK = Semolina Speck Count: Speck count is the number of specks per 10 sq. in. Specks are any material other than pure endosperm chunks and are usually from the seedcount or bran. This indicates the bran has not separated well from the endosperm and is related to the milling efficiency of the sample. Blackpoint or other diseases which may cause the kernel to darken are another source.

SEMO MIN = Semolina Material: Sometimes there is a relationship between mineral percent and speck count if the bran is high in minerals. It is of more importance in the foreign trade. The mineral content of Arizona grown durumms tend to be higher than the northern durumms.

FALL No = Semolina Falling Number Value (values above 300 are desired): This test is primarily for detection of kernels which have sprouted in the head. This is seldom a problem in Arizona.

SEMO PRO or SP = Semolina Protein: Semolina protein of durum wheats is more important than the total protein. Protein percentages below 11.0% are classified as a major fault and percentage between 11.0 and 11.5 are classified as a minor fault. Lower protein is partly associated with seed size. With large seeds, protein content is sometimes lower since the higher carbohydrate endosperm makes up a larger percent of total seed weight. Varieties differ in the amount of protein produced, those with higher yield levels tend to have lower protein content. Varieties also differ in their response to less than adequate nitrogen availability. Some varieties respond to this lack by maintaining the protein level but dropping in yield. Others will drop both in yield and protein percentage.

VI = Spaghetti Visual Color Score (the higher the score, the more desirable): The color of the semolina, durum flour, or its finished product, spaghetti, has been generally accepted as the most important single grading factor. Arizona grown durums have, in the past, been somewhat deficient in color. Newer varieties tend to be much more acceptable. Color is mainly influenced by variety. However, the environment may cause small shifts in color from year to year. A spaghetti visual color score above 8.0 is generally preferred by millers.

FIRM or FR = Cooked Spaghetti Firmness Score (approx. 6.50 to 8.50 is the desirable range): This is sometimes called the bite test although it is done by a machine which measures the amount of work needed to sever the cooked spaghetti. The higher the value, the firmer the spaghetti. A value of approximately 7.0 appears to be of preference. Firmness is mainly influenced by variety.

RES = Residue in Water of Cooked Spaghetti: This is the weight of the solids remaining after the combined cooking and washing water is evaporated.

VALU = Sample Evaluation Number (Example 4 = Good Promise): Each sample is initially assigned an evaluation score of 4. Major and minor faults determined from the data by the computer can then reduce this score, depending on the quality factor being faulted. Wheat and semolina protein percents have fixed lower limits for faults. All other values represent the deviation from the average of the standards required to warrant a minor or major fault.