

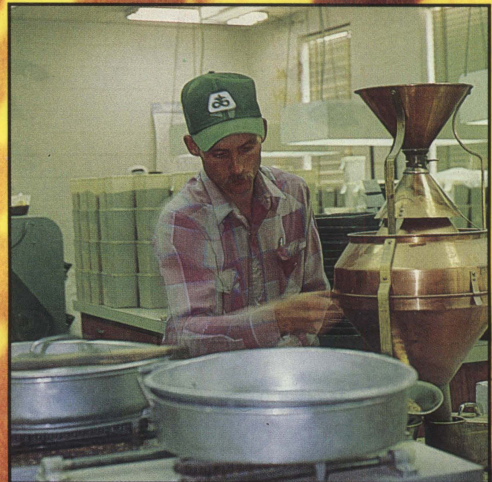
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Wheat:

Grades, Standards and Types of Damage



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Wheat: Grades, Standards and Types of Damage

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This publication was developed to provide information on grain marketing standards for growers, handlers, processors, inspectors and buyers. Clear, concise descriptions of marketing standards can be used to improve product quality and food safety. All participants in the wheat industry, from producer to consumer, should be aware of their roles in ensuring a high standard of quality.

Explanation of Grading

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Grading is a basic function in practically all transactions. Its purpose is to establish a common language, understood by both buyers and sellers, as a basis of judging the quality and value of the product in relation to its sales price. Effective grading establishes standards upon which price negotiations can be based.

Grading is the sorting of products into lots which are fairly uniform or homogeneous in quality. The characteristics by which the products are sorted are called grade specifications. Depending upon the commodity being graded, these specifications can include factors such as test weight, different types of damage, broken grains, and the presence of foreign material and other grains. The grade requirements for wheat are shown in the next section.

Standardization is the process of establishing one set of grade specifications among all buyers and sellers of a commodity. These standards involve defining the weights and measures and indications of quality used in establishing grades. If there were no established standards, it would be risky to assume that both the buyer and the seller were using the same set of grade specifications. To avoid such problems and ensure that the grading system operates efficiently, there must be an established set of standards that are recognized and constantly followed by all traders. For example, grain producers use the bushel as a weight measure. Before that measure can be used, the definition of a bushel must be determined. Congress has given the U.S.D.A. the power to designate standards and grades for agricultural products sold in interstate commerce.

In order for the grading system to be useful or effective, one must assume that the standards and grades used actually reflect differences in quality. Unfortunately, given the broad diversity of consumers or users of grains, the preferences and needs of certain users may not always be adequately reflected in the grading system. In those cases, users often include desired quality requirements along with the grade in contract specifications. The search for equitable, uniform measures of quality to facilitate the marketing of grain has been a continuing process since the beginning of organized grain markets. Current debate, and proposals for legislation and regulation, indicate that the search will probably continue for as long as grain is bought and sold.

Definition of Wheat

Wheat is defined as grain that, before the removal of dockage, consists of 50 percent or more of common wheat (*Triticum aestivum* L.), club wheat (*T. compactum* Host), and Durum wheat (*T. durum* Desf.) and not more than 10 percent of other grains for which standards have been established under the United States Grain Standards Act, and that, after the removal of dockage, contains 50 percent or more of whole kernels of one or more of these wheats.

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Grade Requirements for Wheat

	Grades (U.S. Nos.)				
	1	2	3	4	5
Grading factors					
Minimum pound limits of:					
Test weight					
Hard Red Spring wheat or White Club wheat (lbs./bu.)	58.0	57.0	55.0	53.0	50.0
All other classes and subclasses (lbs./bu.)	60.0	58.0	56.0	54.0	51.0
Maximum percent limits of:					
Defects					
Damaged kernels					
Heat (part of total)	0.2	0.2	0.5	1.0	3.0
Total	2.0	4.0	7.0	10.0	15.0
Foreign material	0.4	0.7	1.3	3.0	5.0
Shrunken and broken kernels	3.0	5.0	8.0	12.0	20.0
Total ¹	3.0	5.0	8.0	12.0	20.0
Wheat of other classes ²					
Contrasting classes	1.0	2.0	3.0	10.0	10.0
Total ³	3.0	5.0	10.0	10.0	10.0
Stones	0.1	0.1	0.1	0.1	0.1
Maximum count limits of:					
Other material					
Animal filth	1	1	1	1	1
Castor beans	1	1	1	1	1
Crotalaria seeds	2	2	2	2	2
Glass		0	0	0	0
0					
Stones	3	3	3	3	3
Unknown foreign substance	3	3	3	3	3
Total ⁴	4	4	4	4	4
Insect-damaged kernels in 100 grams	31	31	31	31	31
U.S. sample grade					
(a) Does not meet the requirements for U.S. Nos. 1, 2, 3, 4 or 5; or					
(b) Has a musty, sour or commercially objectionable foreign odor (except smut or garlic odor); or					
(c) Is heating or of distinctly low quality.					
¹ Includes damaged kernels (total), foreign material and shrunken and broken kernels.					
² Unclassed wheat of any grade may contain not more than 10.0 percent of wheat of other classes.					
³ Includes contrasting classes.					
⁴ Includes any combination of animal filth, castor beans, crotalaria seeds, glass, stones or unknown foreign substances.					

Classes of Wheat

There are eight classes for wheat: Durum wheat, Hard Red Spring wheat, Hard Red Winter wheat, Soft Red Winter wheat, Hard White wheat, Soft White wheat, Unclassed wheat and Mixed wheat.

- 1) **Durum wheat.** All varieties of white (amber) durum wheat. This class is divided into the following three subclasses:
 - a) Hard Amber Durum wheat – Durum wheat with 75 percent or more of hard and vitreous kernels of amber color.
 - b) Amber Durum wheat – Durum wheat with 60 percent or more but less than 75 percent of hard and vitreous kernels of amber color.
 - c) Durum wheat – Durum wheat with less than 60 percent of hard vitreous kernels of amber color.
- 2) **Hard Red Spring wheat.** All varieties of hard Red Spring wheat. This class is divided into the following three subclasses:
 - a) Dark Northern Spring wheat – Hard Red Spring wheat with 75 percent or more of dark, hard and vitreous kernels.
 - b) Northern Spring wheat – Hard Red Spring wheat with 25 percent or more but less than 75 percent of dark, hard and vitreous kernels.
 - c) Red Spring wheat – Hard Red Spring wheat with less than 25 percent of dark, hard and vitreous kernels.
- 3) **Hard Red Winter wheat.** All varieties of Hard Red Winter wheat. There are no subclasses in this class.
- 4) **Soft Red Winter wheat.** All varieties of Soft Red Winter wheat. There are no subclasses in this class.
- 5) **Hard White wheat.** All hard endosperm white wheat varieties. There are no subclasses in this class.
- 6) **Soft White wheat.** All soft endosperm white wheat varieties. This class is divided into the following three subclasses:
 - a) Soft White wheat – Soft endosperm white wheat varieties which contain not more than 10 percent of white club wheat.
 - b) White Club wheat – Soft endosperm white club wheat containing not more than 10 percent of other soft white wheats.
 - c) Western White wheat – Soft White wheat containing more than 10 percent of White Club wheat and more than 10 percent of other soft white wheats.
- 7) **Unclassed wheat.** Any variety of wheat that is not classifiable under other criteria provided in the wheat standards. There are no subclasses in this class. This class includes any wheat which is other than red or white in color.
- 8) **Mixed wheat.** Any mixture of wheat that consists of less than 90 percent of one class and more than 10 percent of one other class, or a combination of classes, that meet the definition of wheat.

Contrasting Classes

Contrasting classes are:

- 1) Durum wheat, Hard White wheat, Soft White wheat, and Unclassed wheat in the classes Hard Red Spring wheat and Hard Red Winter wheat.

- 2) Hard Red Spring wheat, Hard Red Winter wheat, Hard White wheat, Soft Red Winter wheat, Soft White wheat and unclassified wheat in the class Durum wheat.
- 3) Durum wheat and Unclassified wheat in the class Soft Red Winter wheat.
- 4) Durum wheat, Hard Red Spring wheat, Hard Red Winter wheat, Soft Red Winter wheat and Unclassified wheat in the classes Hard White wheat and Soft White wheat.

Economic Importance of Grades

The objective of a grading system is to help the market operate in an efficient manner, both by facilitating merchandising activities and by identifying value in the end product (Buse and Bromley, Rhodes, Hill 1988, Hill 1990).

According to the 1986 Grain Quality Improvement Act, there are four main purposes of a grading system:

- To define uniform and acceptable descriptive terms to facilitate trade;
- To provide information to aid in determining grain storability;
- To offer end users the best possible information from which to determine end product yield and quality; and
- To create tools for the market to use in establishing quality improvement incentives.

The use of an industry-wide, uniform set of grades and standards facilitates the price discovery process by establishing a basis upon which the value of one lot of grain can be related directly to another. This reduces marketing costs and marketing margins in a number of ways, leading to larger returns for producers, merchandisers, processors, retailers and consumers. While grades and standards are intended to describe quality, they do not determine price; the market and relative levels of supply and demand determine what value (price) to place on each quality characteristic.

Two of the most important advantages of uniform grades for merchandisers are that grades allow trading to be done by description rather than physical inspection, and they allow for the grouping of somewhat homogeneous lots of grain.

The cost required for each potential buyer to physically inspect each lot of grain before a transaction could take place would be prohibitive. Given the large volumes of grain traded, the speed with which it is traded and the distance over which grain moves from production to end use, merchandising margins would have to be much larger to cover the cost of trading by physical inspection. Trading by description allows many more buyers and sellers to participate over a larger marketing region. This increases competition and improves market efficiency.

Uniform grades also allow homogeneous lots of grain to be commingled and dissimilar lots to be blended into larger homogeneous lots for more efficient merchandising. Each producer receives an appropriate price for the quality of grain he produces since it is graded before it is commingled. At the same time, the merchandiser may be able to improve the average value of the total lot if the individual heterogeneous lots are blended efficiently. This allows the merchandiser to profit from the blending.

There are other economic benefits of using uniform grades. First, quality information can indicate the storability of grain and help reduce spoilage. Second, grading can help in the settlement of claims between trading partners. It is much easier to determine the market value of lost or damaged grain that has been graded and documented than for two parties to agree based only on their opinions. Third, grading can facilitate the financing of products as they move through the marketing channel. Warehouse receipts that indicate the grade of the product can be used as collateral for loans. Lending institutions are more apt to make loans on grain in storage if they have assurance of the product's quality.

Finally, grades help purchasers identify the specific quality of product that they wish to purchase. The premiums and discounts for the different grades will help users determine the most cost efficient quality to purchase for their needs. Those same premiums and discounts tell producers which grades are most in demand and help them identify the most profitable qualities of grain to produce.

Principal Wheat Kernel Damage

Germ Damage (Sick)

Kernels that are damaged as a result of respiration but are not materially discolored.



Germ Damage (Mold)

Kernels that have mold in the germ.

Note: The bran coat covering the germ should be removed carefully; scraping the bran coat too deeply could remove the mold.





Heat Damage

Kernels that are materially discolored and damaged by heat. The kernels must always be cut to determine if the color of the cross-section is reddish-brown, mahogany or cream.



Black Tip Fungus

Kernels that are affected by Black-Tip Fungus to the extent that the fungus growth is on the germ and extends into the crease of the kernel.



Blight or Scab

Kernels with a dull, lifeless, chalky appearance as a result of disease. The germ and crease also may have a moldy appearance. Kernels not damaged enough to be considered scab damaged should be examined further for moldy germs and creases.

Sprout Damage

Kernels with the germ end broken open from germination and the sprout showing, or from which the sprouts have been broken off.



Insect Damage

Kernels that have been bored or tunneled by insects.



Insect Chewed (Not Damaged)

Kernels that have been chewed by insects or rodents but are entirely free from refuse, webbing, insects or other types of damage.





Frost Damage (Blistered)

Kernels that have distinct frost blisters extending around the back of the kernel and into the crease.



Frost Damage (Candied)

Kernels with a distinctly wax-like or candied appearance. Frost-damaged (candied) kernels can be greenish, greenish-yellow, brownish or blackish in color. They frequently have dark stripes showing through the sides of the kernel.



Mold-Like Substance

Whole kernels that are 50 percent or more covered with a mold-like substance, and pieces of kernels that are discolored and covered with a mold-like substance.

Frost Damage (Discolored Black or Brown)

Kernels that are discolored black or brown and have a bleached or blistered appearance with dark lines showing through both sides. Also, kernels that are completely discolored black or brown.

Other Damage

Kernels with cracks, breaks or chews that contain mold or fungus.

Special Grades

Ergoty

Wheat that contains more than 0.05 percent of ergot. Ergot is a hard, reddish-brown or black grain-like mass of certain parasitic fungi that develops on an infected wheat plant in place of the wheat kernel.



Garlicky

Wheat that contains, in a 1,000-gram portion, more than two green garlic bulbets or an equivalent quantity of dry or partly dry bulbets.





Light Smutty

Wheat that has an unmistakable odor of smut, or that contains, in a 250-gram portion, at least five but no more than 30 smut balls of average size, or the equivalent amount of spores.

Smutty

Wheat that contains, in a 250-gram portion, smut balls, portions of smut balls or spores of smut in excess of a quantity equal to 30 smut balls of average size.



Treated

Wheat that has been scoured, limed, washed, sulfured or treated in such a manner that its true quality is not reflected by either the numerical grades or the U.S. Sample Grade designation alone.



Immature or Green Damage

Kernels that are intensely green in color.

Infested

Wheat that contains live weevils or other insects injurious to stored grain.

Definition of Terms

Damaged Kernels – Kernels, pieces of kernels and other grains that are badly damaged by ground or weather, disease, frost, heat or mold. Also kernels with germ damage, kernels bored by insects, kernels that have sprouted, or kernels damaged by any other factor.

Defects – Damaged kernels, foreign material and shrunken and broken kernels. The sum of these three factors may not exceed the limit for the factor defects for each numerical grade.

Dockage – All matter other than wheat that can be removed from the original sample by use of an approved device according to procedures prescribed in FGIS instructions. Also, underdeveloped, shriveled and small pieces of wheat kernels removed in properly separating the material other than wheat and that cannot be recovered by properly rescreening or recleaning.

Foreign Material – All matter other than wheat that remains in the sample after the removal of dockage and shrunken and broken kernels.

Other Grains – Barley, corn, cultivated buckwheat, einkorn, emmer, flaxseed, guar, hull-less barley, nongrain sorghum, oats, Polish wheat, popcorn, poulard wheat, rice, rye, safflower, sorghum, soybeans, spelt, sunflower seed, sweet corn, triticale and wild oats.

Shrunken and Broken Kernels – All matter that passes through a 0.064 x 3/8 oblong-hole sieve when sieving according to procedures prescribed in the FGIS instructions.

0.064 x 3/8 Oblong-Hole Sieve – A metal sieve 0.032 inch thick with oblong perforations 0.064 inch by 0.375 (3/8) inch.

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