K-STATE Research and Extension

DEPARTMENT OF GRAIN SCIENCE AND INDUSTRY

Sorghum Grading Procedures

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Definition of Sorghum

Grain that, before the removal of dockage, consists of 50 percent or more of whole kernels of sorghum (*Sorghum bicolor* (L.) Moench) excluding nongrain sorghum and not more than 10.0 percent of other grains for which standards have been established under the United States Grain Standards Act.

Definitions of other terms

(a) **Broken kernels.** All matter that passes through a 5/64 triangular-hole sieve and over a 2.5/64 round-hole sieve according to procedures prescribed in FGIS instructions.

(b) **Broken kernels and foreign material.** The combination of broken kernels and foreign material as defined in paragraphs (a) and (f) of this section.

(c) **Classes.** There are four classes for sorghum: Sorghum, Tannin sorghum, White sorghum, and Mixed sorghum.

(1) **Sorghum.** Sorghum that is low in tannin content due to the absence of a pigmented testa (subcoat) and contains less than 98.0 percent White sorghum and not more than 3.0 percent Tannin sorghum. The pericarp color of this class may appear white, yellow, pink, orange, red, or bronze.

(2) **Tannin sorghum.** Sorghum that is high in tannin content due to the presence of a pigmented testa (subcoat) and contains not more than 10.0 percent non-Tannin sorghum. The pericarp color of this class is usually brown but may also be white, yellow, pink, orange, red, or bronze.

(3) **White sorghum.** Sorghum that is low in tannin content due to the absence of a pigmented testa (subcoat) and contains not more than 2.0 percent sorghum of other classes. The pericarp color of this class is white or translucent and includes sorghum containing spots that, singly or in combination, cover 25.0 percent or less of the kernel.

(4) **Mixed sorghum.** Sorghum that does not meet the requirements for any of the classes Sorghum, Tannin sorghum, or White sorghum.

(d) **Damaged kernels.** Kernels, pieces of sorghum kernels, and other grains that are badly ground-damaged, badly weather-damaged, diseased, frost-damaged, germ-damaged, heat-damaged, insect-bored, mold-damaged, sprout-damaged, or otherwise materially damaged.

(e) **Dockage.** All matter other than sorghum 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 sorghum kernels removed in properly separating the material other than sorghum.

(f) **Foreign material.** All matter, other than dockage, that passes through a 5/64-inch triangular-hole sieve, and all matter other than sorghum that remains in the sample after sieving. Determine the amount of broken kernels, foreign material, and other grains (BNFM) in sorghum by using either a mechanical dockage tester or hand sieves, and handpicking.

(g) **Heat-damaged kernels.** Kernels, pieces of sorghum kernels, and other grains that are materially discolored and damaged by heat.

(h) **Nongrain sorghum.** Seeds of broomcorn, Johnson-grass, *Sorghum almum* Parodi, sorghum-sudangrass, hybrids, sorgrass, sudangrass, and sweet sorghum (*sorgo*).

(i) **Pericarp.** The pericarp is the outer layers of the sorghum grain and is fused to the seedcoat.

(j) **Sieves.**

(1) **1.98 mm (5/64 (0.0781) inches) triangular-hole sieve.** A metal sieve 0.81 mm (0.032 inches) thick with equilateral triangular perforations the inscribed circles of that are 1.98 mm (0.0781 inches) in diameter.

(2) **0.99 mm (2 5/64 (0.0391) inches) round-hole sieve.** A metal sieve 0.81 mm (0.032 inch) thick with round holes 0.99 mm (0.0391 inches) in diameter.

Principles Governing the Application of Standards

Basis of determination

Each determination of broken kernels and foreign material is made on the basis of the grain when free from dockage. Each determination of class, damaged kernels, heat-damaged kernels, and stones is made on the basis of the grain when free from dockage and that portion of the broken kernels and foreign material that will pass through a 1.98 mm (5/64 inches) triangular-hole sieve. Other determinations not specifically provided for in the General Provisions are made on the basis of the grain as a whole except the determination of odor is made on either the basis of the grain as a whole or the grain when free from dockage, broken kernels, and foreign material removed by the 1.98 mm (5/64 inches) triangular-hole sieve.

Special grades and special grade requirements

(a) **Smutty Sorghum.** Sorghum that has kernels covered with smut spores to give a smutty appearance in mass, or that contains 20 or more smut balls in 100 grams of sorghum.

(b) **Infested Sorghum.** Sorghum that is infested with 2 or more weevils, one live weevil and 5 other live insects injurious to stored grain or 10 live insects injurious to stored grain.

Grade sorghum as follows:

Step 1. Examine the sample for heating, odor, animal filth, castor beans, crotalaria seeds, garlic, glass, insect infestation, smut, unknown foreign substances, and other unusual conditions.

Step 2. Divide out a representative portion from the sample and determine its moisture content.

Step 3. Determine the test weight per bushel of the sample.

Step 4. Determine the percentage of dockage and the percentage of mechanically separated broken kernels, foreign material, and other grains (BNFM) in the sample.

Step 5. When deemed necessary, divide the mechanically separated BNFM and dockage-free sample into representative portions and determine the percentage of class, handpicked BNFM (add to mechanically separated BNFM to determine total BNFM), heat-damaged, damaged kernels, and stones.

Portion Sizes

The recommended minimum portion size is as follows:

Damaged kernels	15 grams
Dockage	250 grams
Foreign material	250 grams
Heating	The lot as a whole.
Infestation	The original sample or lot as a whole.
Moisture	The amount recommended by the instrument manufacturer.
Objectionable odors	The original sample or lot as a whole.
Test weight per bushel	An amount sufficient to cause grain to overflow a kettle.

Test Weight per Bushel

Test weight per bushel is the weight of the volume of grain that is required to fill a Winchester bushel (2,150.42 cubic inch) to capacity. Since test weight per bushel tends to increase as moisture content decreases, determine it as quickly as possible after the grain is sampled.

*Determine test weight per bushel **before** the removal of dockage and/or foreign material.*

Several devices may be used to determine test weight per bushel; all of these devices operate in a similar manner.

Step 1. Pour the sample through a funnel into a kettle until the grain overflows the kettle.

Step 2. After pouring the grain into the kettle, level it off by making three, full-length, zigzag motions with a stroker.

Step 3. Then weigh the filled kettle on either (1) a special beam scale attached to the funnel stand, (2) an electronic scale programmed to convert gram weight to test weight per bushel, or (3) a standard laboratory scale. If a standard laboratory scale is used, the gram weight must be manually converted to test weight per bushel by using a special conversion chart.

Sorghum

Table No. 1 - Grades and Grade Requirements

	Grades U.S. Nos.[1]			
Grading Factors	1	2	3	4
Minimum Pound Limits of:				
Test Weight (lbs./bu.)	57.0	55.0	53.0	51.0
Maximum Percent Limits of:				
Damaged kernels				
Heat (part of total)	0.2	0.5	1.0	3.0
Total	2.0	5.0	10.0	15.0
Broken kernels and foreign material				
Foreign material (part of total)	1.5	2.5	3.5	4.5
Total	4.0	7.0	10.0	13.0
Maximum Count Limits of:				
Other material				
Animal filth	9	9	9	9
Castor beans	1	1	1	1
Crotalaria seeds	2	2	2	2
Glass	1	1	1	1
Stones[2]	7	7	7	7
Unknown foreign substance	3	3	3	3
Cockleburs	7	7	7	7

U.S. Sample grade

Sorghum that:

(a) Does not meet the requirements for U.S. Nos. 1, 2, 3, or 4; or

(b) Has a musty, sour, or commercially objectionable foreign odor (except smut or garlic odor); or

(c) Is badly weathered, heating, or distinctly low quality.

[1] Sorghum that is distinctly discolored shall not grade higher than U.S. No. 3

[2] Aggregate weight of stones must also exceed 0.2 percent of the sample weight.

Procedure for Determining Dockage with Hand Sieves

Step 1. Nest the appropriate sieve(s) on top of a bottom pan. Use a 2.5/64inch round-hole sieve.

Step 2. Pour the sample into the center of the top sieve, place the sieve(s) in a mechanical grain sizer, set the sizer's timer to 20, and turn it on. If a mechanical sizer is not available, hold the sieves and bottom pan level. Then, using a steady motion, move the sieve from right to left approximately 10 inches and then return from left to right. Repeat this operation 20 times.

Step 3. Remove the dockage. Consider dockage to be all material that passed through the sieve.

Procedures for Determining Foreign Material with Hand Sieves

Step 1. Nest the appropriate sieve(s) on top of a bottom pan. Place a 12/64-inch round-hole sieve on top of a 5/64-inch triangular-hole sieve.

Step 2. Pour a sample portion (250 grams) into the center of the top sieve.

Step 3. Place the sieve(s) in a mechanical grain sizer, set the sizer's timer to 20, and turn it on. If a mechanical sizer is not available, hold the sieves and bottom pan level, and, using a steady motion, move the sieve from right to left approximately 10 inches. Return from left to right to complete one sieving operation. Repeat this operation 20 times.

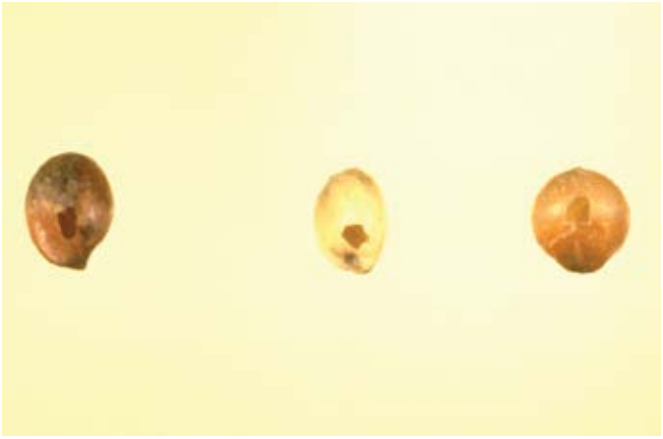
Step 4. Consider BNFM to be all material that passed through the 5/64inch triangular-hole sieve, all material—other than sorghum—that remains on top of the 5/64-inch triangular-hole sieve, and all coarse material that remains on top of the 12/64-inch round-hole sieve.

Germ Damage in Sorghum Bleach Method

Sorghum and pieces of sorghum that, after bleaching, have discolored germs that are as dark or darker than shown. Discolored germs that do not meet the minimum coverage requirement may be considered damage provided the degree of discoloration is greater than shown and the overall "prorated" appearance meets the minimum coverage and intensity level depicted. For example, to be considered damage, when the degree of discoloration is twice that shown, only half of the germ area needs to be discolored.

Sorghum-Insect Bored

Kernels that have been bored or tunneled by insects.



Mold Damage

Kernels and pieces of kernels of sorghum containing surface mold.

Note: Do not confuse with dark stains or discolorations caused by ground and/or weather conditions.

Sprout Damage

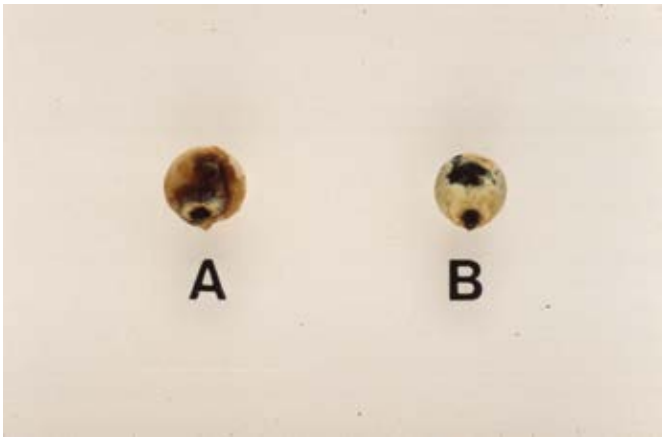
Kernels and pieces of kernels of sorghum in which the sprout definitely protrudes from the germs.

Note: Do not confuse with kernels having a split germ.

Tannin Sorghum (Bleached)

Kernel A is a bleached Tannin sorghum kernel. For classing purposes Tannin sorghum kernels must have a pigmented testa (subcoat) that shows a dark color and area of coverage equal to or greater than shown.

Kernel B is a bleached Tannin sorghum variety that has a bluish-white pericarp (seedcoat) and a purplish-brown testa. For classing purposes, Tannin sorghum with a bluish-white pericarp must have a pigmented testa that shows a dark color and area of coverage equal to or greater than shown.



Pictures and descriptions of kernel damage were reproduced from the interpretive line slides with the permission of Seedburo Equipment Company.

Text in this publication was compiled from United States Department of Agriculture publication *Official United States Standards for Grain* and *Inspecting Grain, Practical Procedures for Grain Handlers*.

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