

## DEPARTMENT OF GRAIN SCIENCE AND INDUSTRY

# Soybean Grading Procedures

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## Definition of soybeans

Grain that consists of 50 percent or more of whole or broken soybeans (*Glycine max* (L.) Merr.) that will not pass through an 8/64 round-hole sieve 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) **Classes.** There are two classes of soybeans: Yellow soybeans and Mixed soybeans.
- (1) **Yellow soybeans.** Soybeans that have yellow or green seed coats and which in cross section are yellow or have a yellow tinge and may include not more than 10.0 percent of soybeans of other colors.
- (2) **Mixed soybeans.** Soybeans that do not meet the requirements of the class Yellow soybeans.
- (b) **Damaged kernels.** Soybeans and pieces of soybeans that are badly ground damaged, badly weather-damaged, diseased, frost-damaged, germ-damaged, heat-damaged, insect-bored, mold-damaged, sprout-damaged, stinkbug-stung, or otherwise materially damaged. Stinkbug-stung kernels are considered damaged kernels at the rate of one-fourth of the actual percentage of the stung kernels.
- (c) **Foreign material.** All matter that passes through an 8/64-inch round-hole sieve, and all matter other than soybeans that remains in the sample after sieving. Determine the amount of foreign material in soybeans by using hand sieves and handpicking.

(d) **Heat-damaged**

**kernels.** Soybeans and pieces of soybeans that are materially discolored and damaged by heat.

(e) **Sieve. 8/64 round-hole sieve.** A metal sieve 0.032 inch thick perforated with round holes 0.125 (8/64) inch in diameter.

- (f) **Soybeans of other colors.** Soybeans that have green, black, brown, or bicolored seed coats. Soybeans that have green seed coats will also be green in cross section. Bicolored soybeans will have seed coats of two colors, one of which is brown or black, and the brown or black color covers 50 percent of the seed coats. The hilum of a soybean is not considered a part of the seed coat for this determination.
- (g) **Splits.** Soybeans with more than one-fourth of the bean removed and that are not damaged.

## *Principles Governing the Application of Standards*

### **Basis of determination**

Each determination of class, heat-damaged kernels, damaged kernels, splits, and soybeans of other colors is made on the basis of the grain when free from foreign material. Other determinations not specifically provided for under the General Provisions are made on the basis of the grain as a whole.

### **Special grades and special grade requirements**

- (a) **Garlicky soybeans.** Soybeans that contain five or more green garlic bulblets or an equivalent quantity of dry or partly dry bulblets in a 1,000-gram portion.

- (b) **Purple mottled or stained.** Soybeans with pink or purple seed coats as determined on a portion of approximately 400 grams with the use of an FGIS Interpretive Line Photograph.

### Grade soybeans as follows:

- Step 1. Examine the sample for heating, odor, animal filth, castor beans, crotalaria seeds, garlic, glass, insect infestation, purple mottled and stained, smut, stones, 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. When deemed necessary, divide out representative portions and determine the percentage of class, damaged kernels, heat-damaged kernels, foreign material, oil, protein, soybeans of other colors, and splits.

### Portion Sizes

The recommended minimum portion size is as follows:

Damaged kernels	125
Dockage	NA
Foreign material	125
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.*

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.

### Procedures for Determining Foreign Material with Hand Sieves

- Step 1. Nest the appropriate sieve(s) on top of a bottom pan. Place a 10/64-inch x 3/4-inch slotted-hole sieve on top of an 8/64-inch round-hole sieve.
- Step 2. Pour a sample portion (125 grams) into the center of the top sieve.
- Step 3. Place the sieve(s) in a mechanical grain sizer, set the sizer's time to 5, 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 5 times.
- Step 4. Consider foreign material to be all material which passed through the 8/64-inch round-hole sieve, all material—other than soybeans—that remains on top of the 8/64-inch round-hole sieve, and all coarse material that remains on top of the 10/64-inch x 3/4-inch slotted-hole sieve.

## Soybeans

Table No. 1 - Grades and Grade Requirements

	Grades U.S. Nos.			
Grading Factors	1	2	3	4
<i>Minimum Pound Limits of:</i>				
<b>Test Weight</b> lbs/bu	56.0	54.0	52.0	49.0
<i>Maximum Percent Limits of:</i>				
<b>Damaged kernels</b>				
Heat (part of total)				
Total	2.0	3.0	5.0	8.0
<b>Foreign material</b>	1.0	2.0	3.0	5.0
<b>Splits</b>	10.0	20.0	30.0	40.0
<b>Soybeans of other colors<sup>1</sup></b>	1.0	2.0	5.0	10.0
<i>Maximum Count Limits of:</i>				
<b>Other material</b>				
Animal filth	9	9	9	9
Castor beans	1	1	1	1
Crotalaria seeds	2	2	2	2
Glass	0	0	9	0
Stones <sup>2</sup>	3	3	3	3
Unknown foreign substance	3	3	3	3
Total <sup>3</sup>	10	10	10	10

### U.S. Sample grade

Soybeans that:

- (a) Do not meet the requirements for U.S. Nos. 1, 2, 3, or 4; or
- (b) Have a musty, sour, or commercially objectionable foreign odor (except garlic odor); or
- (c) Are heating or otherwise of distinctly low quality.

<sup>1</sup>Disregard for mixed soybeans.

<sup>2</sup>In addition to the maximum count limit, stones must exceed 0.1 percent of the sample weight.

<sup>3</sup>Includes any combination of animal filth, castor beans, crotalaria seeds, glass, stones, and unknown foreign substances. The weight of stones is not applicable for total other material.

### **Badly Ground and/or Weather Damage**

Soybeans and pieces of soybeans in which the seed coats are discolored and the area of coverage and intensity is equal to or greater than amount shown.

Note: The discoloration may be on one side or a combination of both sides.



### **Badly Ground and/or Weather Damage (Gray/Black)**

Soybeans and pieces of soybeans with seed coats that are discolored light gray to black. Soybeans that contain gray/black discoloration of the seed coat equal to or greater than the amount shown are considered damaged.

Note: The discoloration may be confined to one side or a combination of both sides. Soybeans with more intense seed coat discoloration will require a smaller discoloration area. Do not confuse discolored soybeans with soybeans containing pigmented streaks or blotches that are considered bicolored.



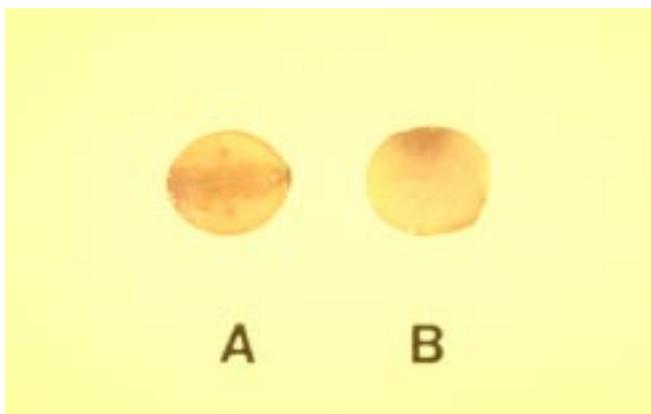
### **Damaged by Heat (Damaged/Result of Respiration)**

Soybeans and pieces of soybeans that have been damaged by heat with the area of coverage and intensity equal to or greater than the amount shown.

A: Cross-sectioned whole soybean.

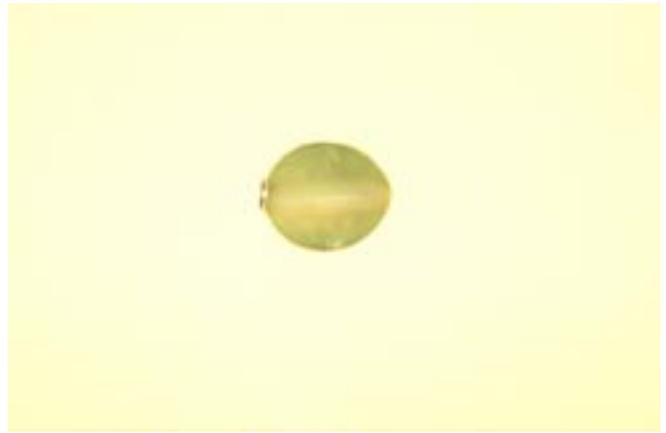
B: Split Soybean.

Note: It is often necessary to cross-section the whole soybean to determine the extent of the damage. Splits and pieces of soybeans shall not be cross-sectioned.



### Green Damage

Soybeans and pieces of soybeans that are discolored green in the cross-section with the area of coverage and intensity equal to or greater than the amount shown.



### Heat Damage (Materially Damaged/Result of Heating)

Soybeans and pieces of soybeans which are materially discolored and damaged by heat with the area of coverage and intensity equal to or greater than the amount shown.

Note: It is often necessary to cross-section the whole soybean to determine the extent of the damage. Splits and pieces of soybeans shall not be cross-sectioned.



### Mold Damage

A. Invaded by Mold. Soybeans may be discolored, distorted, misshapen, elongated, not normal in size or shape. May have splits, cracks or fissures in the seed coat with white or gray moldy growth. Soybeans that contain mold equal to or greater than the amount shown are considered damaged.

Note: Soybeans and pieces of soybeans with mold on exposed areas (meat) regardless of amount, shall be considered damaged.

B. Surface Mold Growth. Soybeans with little or no apparent deterioration having a milky white or grayish crusty growth caused by downy mildew with no splits, cracks or fissures in the seed coat. Seed coat not discolored. Soybeans that contain downy mildew on fifty percent or more of the seed coat as shown shall be considered damaged.



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

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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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