Practical Sorghum Sampling and Hand Sieving Procedures

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This publication provides practical procedures which can be used by producers, warehouse managers, and elevator managers for sampling and grading sorghum. The procedures and portion sizes are based on the USDA Practical Procedures for Grain Handlers. The portions and hand sieving methods presented in this Current Report are not used by official grain inspectors licensed by the Federal Grain Inspection Service. Licensed graders must use larger portions and precision mechanical equipment that will provide the most accurate and most uniform results.

Representative Sample

Obtaining a representative grain sample is an essential part of grain inspection. Without a representative sample, the final grade will not reflect the true grade or value of the grain. In order for a sample to be considered representative, it must:

1. be obtained in accordance with recommended procedures;
2. be of the prescribed size (at least 1000 grams or approximately 1 1/4 quart); and
3. be handled securely, protected from manipulation, substitution, and carelessness.

The following pages explain the proper way to do probe sampling. Some of this information was taken from Inspecting Grain-Practical Procedures for Grain Handlers, Section 1, Sampling Grain.

Probe Sampling

A large percentage of grain, as it travels from the farm to the final consumer, is at one time or another sampled with a probe. Most of the damaged grains are held back by handpickers acting as a sieve. The material which remains on top of the middle sieve, an alternative procedure is described in steps 5-6.

Step 7—Determination of Damage

The percentage of heat damaged and damaged kernels is determined by handpicking a 125-gram sample. The most common types of kernel damage are germ, frost, heat, mold, purple pigment, and insect damage.

Summary

It is important that grain handlers concentrate on determining the correct grade. Profit margins are too small to lose money because of improper grade determination. The procedures presented in this Fact Sheet are not designed to produce official grades. The procedures should produce relatively accurate estimates of dockage, foreign material, damaged kernels, and other factors affecting grades and the value of the grain.

The Equipment

Before learning the sampling procedure, the sampler should become familiar with the equipment used.

1. Hand Probe

This standard piece of equipment, sometimes referred to as a tester, is constructed of brass or aluminum. Probes come in various sizes with standard lengths of 5, 6, 8, 10, and 12 feet. The type of cartier dictates which probe length shall be used. There are two types of hand probes: compartmented probes, in which slots in the outer tube mate compartment descriptors in the inner tube, and open throat probes, in which the inner tube is open. Open throat probes tend to draw more of their sample from the top portion of the grain, while compartmented probes draw a representative sample from each layer. All grain probes are compartmented probes with an outer tube that is 1 3/8 inches in diameter.

Make sure the probe reaches the bottom of the carrier. A 5 or 6-foot probe will be sufficient for most farm trucks while hopper-bottom carriers may require a longer (6, 8 or 10-foot) probe.

2. Mechanical probe

There are two types of mechanical probes which are recommended for sampling stationary lots of grain in trucks, railcars, or other open-top carriers. The gravity-fill probe function is similar to compartmented hand probes except that after the compartment is filled it rotates to an inner tube where it is forced up by air. The core probe function by forcing the sample up into the core as the probe is pushed down and then using air to transport the sample to the output port. A third type, the in- load suction probe, which uses negative air pressure to suck the sample into the bottom of the probe, is not recommended since it tends to overestimate foreign material.

3. Sampling Canvas

Heavy canvas cloth or similar material can be used to display the sample from the compartmented probe. Another alternative is a short section of rain gutter or half section of pipe. The sampling canvas or other material should be at least 6 inches longer than the probe used to draw the sample. This size is necessary so that the grain from the entire length of each probe will not spill off the ends of the canvas. Sampling canvases must always be kept clean, dry, and free of holes.

4. Sampling Containers

Containers such as heavy cloth or canvas bags and metal buckets or plastic cans may be used to transport the sample to the inspection station. Sample containers should be free of all old grain, insects, and other waste material prior to use. Air-tight containers or bags lined with a polyethylene wrapper should be used to store grain to prevent loss of moisture and to protect the sample from adverse environmental conditions such as rain or humid weather.

General Procedures

Before sampling any career, record on your sample ticket the carrier’s identification number. Visually examine the entire lot of grain. Take a handful of grain from several locations and check for odor. Record any unusual conditions on your sample ticket. Next, spread your canvas and check to see that the probe and canvas are clean and dry. You are now ready to start sampling.
Step 1—Obtain a Representative Sample

Use the probing procedures described above, or a tailgate sampler or other method, to obtain a representative sample of approximately 1000 grams.

Step 2—Objectionable Odors, Insects, and Harmful Conditions

Except for smut or garlic odors, sorghum with a much greater than 1% objectionable odor (COFO) is "U.S. Sample grade." Use the entire sample to determine the odor. Fumigant or insecticide odors are not considered COFO if they dissipate after aerating the sample for up to 4 hours. The presence of two or more live insects injurious to stored grain causes the grain to be designated "infested" but does not affect the numerical grade. Heating is a condition common to grain which is spoiling and also causes the grain to be designated "U.S. Sample grade." Be careful not to confuse heating with sound grain which is warm due to storage in bins, railcars, or other containers, and which is not spoiling and which is made up of distinctly different parts in regard to condition, and infestation, and contamination. Also, compare the probe to others drawn from the same lot.

Step 3—Moisture

Moisture is an essential measure of sorghum storability and value and should be determined prior to removing dockage. Moisture can be determined with any device which has been tested and approved by the Oklahoma Department of Agriculture. Moisture meters should be calibrated once a season and maintained in adherence with the manufacturer’s recommendation. Many moisture meters (such as the Montomco) require that a specific weight sample be used. The use of an approximate sample weight will result in an inaccurate measure of moisture content. Additionally, some of the newer moisture meters also display an estimate of test weight. This test weight estimate cannot be legally used in determining grade since it is based on a small sample size (often 100 grams or less).

Step 4—Determining the Test Weight

Test weight is a measure of the weight of grain required to fill a specific volume (pint, quart, or bushel). To determine test weight, pour the entire dockage-free sample through a funnel into a kettle until the grain overflows the kettle. Level off the kettle. The test weight is determined by weighing the filled kettle on either a special beam scale, an electronic scale programmed to convert grain weight to test weight, or a standard laboratory scale. If a standard scale is used, the grain weight must be corrected to test weight per bushel. (Multiply the grains in a one-quart kettle by 0.0705 to obtain the test weight in pounds per bushel.)

Step 5 (a) — Determination of Dockage in Sorghum Using Sieves

The entire sample (approximately 1000 grams) should be used to determine the level of dockage. Dockage sorghum is considered dockage if it consists of two or more live insects injurious to stored grain (1.00 to 1.99 is recorded as 1.0%). Dockage is weed seeds, weed stems, chaff, straw, grain other than sorghum, sand, dirt, and any other material other than sorghum which can be removed readily from sorghum by use of appropriate sieves. Following are the guidelines for hand sieving to determine dockage (Figure 3).

1. Record the weight of sample used (approximately 1000 grams).
2. Assemble a 2-1/2/64 round-hole sieve on top of a round pan.
3. Sieving only about 1/4 of the sample at a time, shake the sorghum vigorously for the material to pass through the sieve.
4. After the complete sample is sieved, weigh the material that passes through the 2-1/2/64 round-hole sieve to determine the percent of dockage.

Step 5 (b) — Determination of Dockage With a Mechanical Dockage Tester

1. Record the weight of sample used (approximately 1000 grams).
2. Clean the dockage tester, insert the appropriate sieves (#6 sieve in the top carriage and #1 sieve in the bottom carriage for a Carter Day Dockage Tester), insert the appropriate riddle (#6 barley riddle on a Carter Day Dockage Tester), and make adjustments recommended by the manufacturer which give results comparable to FGIS standard equipment (air=1, feed=46 on a Carter Day Dockage Tester).
3. Turn on the tester and pour the sample into the hopper.
4. After the sample has cleared the last sieve, turn the tester off.
5. Remove and weigh the dockage, which is considered to be all material which passes through the bottom #1 sieve on a Carter Day Dockage Tester (pan F in Figure 4).
6. Remove and weigh the foreign material, which, on a Carter Day Dockage Tester, is all coarse material that passes over the riddle (pan B in Figure 4) along with all material other than sorghum which is handpicked from the mechanically cleaned sample.
7. Remove and weigh the broken kernels, foreign material, and other grains (BNFM), which is all material that passes through the #6 top sieve but stays on top of the #1 bottom sieve (pan E in Figure 4).

Step 6 — Determination of Broken Kernels, Foreign Material, and Other Grain Using Hand Sieves

Sieves should be used for coarse material to provide the percentage of broken kernels, foreign material, and other grains (BNFM). If the percentage of BNFM is 4% or above, the grain is not USDA #1 Sorghum and may be discounted. If the percentage of damaged kernels is 2% or above, the sorghum cannot be USDA #1. The determination of broken kernels, foreign material, and other grains is based on the portion used in determining dockage after the dockage has been removed. Following is a procedure to determine the percentage of broken kernels, foreign material, and other grains (Figure 5).

1. For sieving, assemble a #5/6 triangular sieve on a bottom pan and then place a 2-1/2/64 round-hole sieve on top of the pan.
2. Sieving only about 1/4 of the sample at a time, shake the sorghum vigorously for the material to pass through the sieve.

The Carter Day Dockage Tester is the only machine currently used by FGIS for official inspections. Other brands of mechanical dockage testers provide similar results. References to the Carter Day Dockage Tester are provided for illustrative purposes only and should not be interpreted as any form of endorsement.